An analysis of variables influencing the use of the corporate form of organization in American agriculture

by

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CHAPTER I. INTRODUCTION

The corporate farm is a much debated institution in American agriculture. It is a phenomenon that has been given a new dimension by each succeeding generation of agricultural analysts of the twentieth century. At least three distinct topics have been discussed under the rubric of corporate farm. During the 1930s the corporate farm was discussed in terms of land ownership by corporations, mainly banks and insurance companies, resulting from high mortgage foreclosure rates brought about by the Great Depression [44, pp. 99-100]. Corporations owned 11.9 percent of Iowa farmland in 1939 [43, p. 305]. Post World War II discussions of the corporate farm revolved around the possibility of using the corporate form of business organization as a management and estate planning tool for farm operators [11, 22, 23, 27, 28, 35, 95]. The corporate farm became associated with investment in agriculture by nonfarm interests in the form of large diversified publicly owned corporations in the literature of the last ten years as evidenced by the writings of Ray [56, p. 1] and Breth [7, p. 22].

Organization and Land Tenure Goals

A major goal of land tenure policy in the United States has always been individual owner-operatorship of farms [66, p. 233]. As a social goal, it was placed at the apex of Spillman's agricultural ladder in 1919 [64, p. 170]. This is the assumed goal of farmers in most studies of farm ownership such as those by Timmons and Barlowe in 1949 [67, p. 851] and Berk in 1971 [3, p. 1].

The goal of owner-operatorship must be viewed in the broader perspective as a means to the higher goals of increased productivity and an acceptable income distribution in the agricultural sector. Owner-operatorship may be only one of many efficient means of achieving this greater end.

The owner-operatorship goal should not be confused with the organizational means used to achieve the goal. United States land policy has tended to equate owner-operatorship with the sole proprietorship form of business organization. This has confused a means with an end. Owner-operatorship can exist under any number of organizational forms as long as the farm operator can exert control over the land, capital, and personal management resources used.

A corporate farm manager may be classified as an owner-operator if the resources necessary to carry out the farming operation are owned or controlled personally or indirectly by owning corporate stock. Only when the manager cannot exert control over essential resources is the owner-operatorship goal not reached.

Business Organizational Forms in Agriculture

All of the popular forms of business organization existing in the United States are present in the agricultural sector. Table 1.1 shows the percent of firms and percent of business receipts by type of business organization for the United States' economy at large and for the agricultural sector.

Sole proprietorships are relatively more popular in agriculture, accounting for 85.4 percent of firms and 67.8 percent of receipts in

Table 1.1. Percent of firms and receipts 1969[a]

	Percent of Firms	Percent of Receipts[b]
Economy at Large		
Sole Proprietorships	78.4	12.4
Partnerships	7.7	4.5
Corporations	13.9	83.1
Agriculture[c]		
Sole Proprietorships	85.4	67.8
Partnerships	12.8	17.4
Corporations	1.2	14.1
Other	.6	.6

[a]Source: U. S. Department of Commerce, Bureau of the Census [90b, Table 745] and [88, part 2, Table 11].

[b]Figures for receipts in agriculture are found under "Market value of all agricultural products sold" in the Census of Agriculture.

[c]For farms with sales of $2,500 or more.

that sector as opposed to 78.4 percent and 12.4 percent respectively for the economy at large.

The corporation has not been a widely used form of organization in agriculture as shown by Table 1.1. The literature suggests that the limited use of the corporation results from a concern over ownership of agricultural resources by persons outside of agriculture. The concern over outside ownership of agricultural resources may be heightened by the legal separation of ownership and management of a corporation. The ownership of agricultural resources by off-farm investors may produce a shift in entrepreneurship from farm operator to investor as outlined by Harris in 1974 [76, p. 9]. This shift in entrepreneurship, often associated with the corporate farm, does not occur with incorporation of an on-going

farm operation by the operator who subsequently becomes an employee of the corporation and a controlling shareholder [80, p. 9]. However, characteristics attributed to corporations in other sectors of the economy, such as "bigness" and market concentration, seem to strengthen the association between the loss of entrepreneurship by farm operators and the corporate form of organization in the writings of Ray [56] and Breth [7].

Purpose and Need for Study

The perceived conflict between the goal of owner-operatorship of farms and the corporate farm has led seven states, Minnesota [40, c. 500.24], Missouri [41], South Dakota [63, c. 249], Oklahoma [50, c. 18, § 951], Kansas [33, c. 17-5901], North Dakota [47, c. 10-56-01], and Wisconsin [94, c. 238], to place restrictions on the use of the corporate form of organization in agriculture. These restrictions are designed to influence the suspected trends away from owner-operatorship of farms. The United States Congress has also shown some interest in the problems associated with ownership of farms by corporations controlled by off-farm interests [72, 73]. However, no affirmative legislative action was taken.

Research has long been needed to determine the extent of corporate activity in American agriculture, the differences between corporate and noncorporate farms, the relationship between the corporation and the tenure goals of society, and the effect of legal restrictions on forms of organization available to agricultural firms on the tenure structure of the sector. Information generated by research in the above areas is

needed by policy-makers to initiate programs designed to close any gap existing between the present situation and the goals of society.

This inquiry is offered in response to the need for information concerning the extent of use of the corporate form of organization in American agriculture and the differences, if any, between corporate and noncorporate farms. It is believed that the results of the study will prove useful to individuals interested in the present and future structure of the agricultural sector of the American economy.

Definition of Terms

The sole proprietorship is a form of business organization in which one individual holds all equity interest in the business, may employ others to assist in the conduct of the business, receives all net business income which is taxed as the owner's personal income, and assumes full liability for all obligations of the business [53, p. 1].

An "individual or family" farm is defined by the 1969 Census of Agriculture to include sole proprietorship farm operations, managed by one person, husband-and-wife operated farms, and farms where children provided part of the labor [88, p. 126]. Because the census is the major data source for this study, the terms individual operation and sole proprietorship are used interchangeably when referring to farm businesses.

A partnership is defined by the Uniform Partnership Act as ". . . an association of two or more persons to carry on as co-owners a business for profit" [68, § 6(1)]. Crane and Bromberg state that a partnership is a legal, financial and personal relationship among the partners [10, p. 1]. Each partner has equal right to participate in management, authority to

deal with third persons, and liability for debts secured by the partnership [10, p. 1]. Profits or losses flow through the partnership and are distributed to the partners on a basis determined by the partnership agreement and are treated as personal income (or loss) of each partner [91, § 704 (a)(a) and 705].

A limited partnership is composed of (a) one or more general partners who manage the business and assume liability as do participants in a general partnership, and (b) one or more limited partners who provide capital and share in profits but do not share in losses beyond their capital contribution and do not take part in management [10, p. 143]. A limited partner does not become liable as a general partner for the debts of the partnership beyond the investment in the firm unless the limited partner takes part in the control of the business [68, § 7].

A corporation is a legal entity separate and apart from its officers, shareholders, and directors and is a creation of the state in which it is incorporated [62, p. 787]. In most jurisdictions corporations have, among other powers, the power to have perpetual succession, to sue and be sued, and to make contracts and incur liabilities [1, p. 74, 75, 83]. Shareholders or subscribers to shares of a corporation are under no obligation to the corporation or its creditors beyond the extent of their investment [1, p. 504]. Except for tax option or "Subchapter S" corporations, a corporation is a separate tax entity and is subject to the federal corporation income tax at the historic rates of 22 percent of the first $25,000 of taxable income and 48 percent of income in excess of $25,000 [91, § 11]. The Tax Reduction Act of 1975 reduced these rates to 20 percent of the

first $25,000 of taxable income, 22 percent on the second $25,000 of taxable income, and 48 percent on taxable income above $50,000 for the year 1975 [72, § 303]. The Revenue Adjustment Act of 1975 extended these rates for the first six months of 1976 by providing for a tax of 21 percent on the first $25,000 of taxable income, 35 percent on the second $25,000 of taxable income and 48 percent on taxable income exceeding $50,000 for the full year 1976 [70, § 4].

A corporate farm for the purpose of this study is any farm organized as a corporation within the laws of the several states. No attempt is made to differentiate "family" and "nonfamily" corporations because this type of classification is not possible with the basic data source, the 1969 Census of Agriculture. The only classification of corporations made by the census and used in this study is by number of shareholders, distinguishing between those with ten or fewer and those with more than ten. Corporations with ten or fewer shareholders tend to be closely held family units, however, the correlation is by no means perfect. This distinction based on number of shareholders is also one classification on which Subchapter S tax status is based.

Subchapter S tax status [91, § 1371-1377] allows a corporation to avoid double taxation of earnings by allowing corporate ordinary income, capital gains, and operating losses to pass through the corporation to the shareholders to be reported on their individual income tax returns. This provision can be beneficial to small, closely held operations that wish to enjoy the privileges of incorporation (such as easily transferable shares, limited liability of shareholders, the status as a legal

entity that may sue and be sued, and perpetual or self-determined duration), but wish to avoid higher taxes that may result from double taxation of dividends or marginal corporate rates that are higher than those faced by the individual shareholders.

The requirements for Subchapter S status other than the shareholder limit mentioned above are: the corporation must be a domestic corporation [91, § 1371 (a)], each shareholder must be an individual or an estate of a deceased individual [91, § 1371 (a)(2)], none of the shareholders may be a nonresident alien [91, § 1371 (a)(3)], the corporation may not have more than one class of stock issued and outstanding [91, § 1371 (a)(4)], the corporation may receive no more than 20 percent of total gross receipts derived from royalties, rents, dividends, interest, annuities, and sale or exchange of stock or securities [91, § 1372 (e)(5)], and no more than 80 percent of its gross receipts may come from sources outside the United States [91, § 1372 (e)(4)].

Limitations of Study

This study deals with the organization of the farm business and not with land tenure *per se*. Land tenure policy and trends in land ownership are discussed only for historical perspective. If a farm is organized as a corporation but rents all land and machinery from persons who happen to own and manage the corporation, the farm is classified as a corporation. This distinction should be kept clearly in mind. No attempt is made to examine corporations that are landlord operations and do not actively engage in farming; rather, only active farming operations are considered.

Objectives of Study

This study is designed to examine the use of the corporate form of business organization by producing units in the agricultural sector of the American economy. The specific objectives of the study are as follows:

1. To determine differences in characteristics of farm units organized as sole proprietorships, partnerships, and corporations;
2. To identify and measure factors influencing the form of business organization used by farm units;
3. To develop an explanatory model of business organization in American agriculture using the factors identified in the second objective above;
4. To analyze policy measures that use the form of business organization as the instrumental variable to close the gap between the norms of society and the existing situation.

Organization of Study

The study is organized into five chapters. The first chapter is an introduction which consists of sections discussing the corporate farm, the organization and land tenure goals, the business organizational forms in agriculture, the purpose and need for the study, definitions of terms, and objectives, limitations and organization of the study.

The second chapter reviews past theoretical and empirical studies of corporate farms including the findings of the 1969 Census of Agriculture. The third chapter outlines the factors influencing organizational

choice, hypotheses development, available data, and statistical procedure. The fourth chapter presents the results of the statistical analysis and tests of specific hypotheses stated in Chapter III. The fifth chapter includes a summary of the study, a discussion of policy implications of the results, and recommendations for further research.

CHAPTER II. REVIEW OF LITERATURE

The technical and popular agricultural literature of the last fifty years is replete with attempts to explain and define the corporate farm phenomenon. Studies of corporate farming have a wide variety of content because of the many topics discussed under this rubric. For the purpose of this study, the literature is classified into five topical categories; studies published prior to 1950, publications dealing with incorporation of the on-going family-farm operation, general explanatory and theoretical literature, empirical studies of family-farm incorporation at the state level, and national empirical studies of corporations in agriculture.

The studies reviewed include articles from popular and refereed journals, publications of state agricultural experiment stations and cooperative extension services, and publications of the United States Department of Agriculture.

Early Studies

Rowley launched much of the present day discussion concerning corporate farming with a one page article in 1928 [57, p. 376]. Rowley considered labor shortages and high wages, inadequate financial resources, and poor and unscientific management practices to be the major problems faced by farmers of the early twentieth century. He proposed that groups of owner-operators pool their farm operations to form larger units to be farmed by a corporation owned by the former owner-operators. The corporation would own land or rent land from its owners and hire a full time trained manager. Shareholders would provide extra labor if necessary.

Shareholders not needed for labor could retire to the city and collect their share of corporate profits. The type of corporate farm envisioned by Rowley was to be a larger-than-family farm. He did not consider the incorporation of individual farms that would continue to be operated by one family after incorporation.

Rowley believed that such a larger-than-family corporate farm organization would prove very profitable for the former owner-operators. Increased profitability would result from economies of scale to be derived from operation of a larger farm unit. These economies would come from (1) the ability to achieve greater coordination of activities, (2) the potential of utilizing the more advanced technologies of capital equipment, and (3) the possibility of increasing profitability due to specialization in the production of a few commodities, rather than the wide diversification needed for subsistence by owner-operators of the time.

Another agricultural phenomenon of the 1930s frequently described as the corporate farm problem concerned the increased number of foreclosures on mortgaged farms brought about by the depressed farm economy of the period. Murray followed this phenomenon closely in Iowa, publishing three articles over the six year period 1933-1939 [43, 44, 45]. Data were gathered from county plat books. Land was classified as corporate if title to the land was in the name of a corporation [44, p. 99]. Murray identified two possible sources of inaccuracies of the data. First was the fact that land that had been sold on contract by a corporation still appeared on the plat books as owned by the corporation and

was recorded as corporate land for this study. The second possible inaccuracy was that land subject to a Sheriff's certificate held by a corporation for which title had not passed to the corporation, was classified as noncorporate [44, p. 99]. Murray felt that these possible errors would cancel each other out [44, p. 99]. The results of these periodic surveys of land ownership appear in Table 2.1.

Table 2.1. Corporate-owned land in Iowa 1933-1939[a]

	Thousands of Acres[b]	Percent of Farm Land in Iowa Owned by Corporations
1933 September	2,688	7.9
1935 January	3,431	10.1
1937 January	3,811	11.2
1939 January	4,044	11.9

[a]Source: Murray, 1939 [43, p. 309].

[b]Includes all farm land with title in name of a corporation.

The trend during this period was toward an increasing proportion of Iowa farm land owned by corporations. The breakdown of corporate ownership by type of corporation appears in Table 2.2. Insurance companies were by far the largest corporate holder of farm land in the state.

In 1933 corporate ownership of land varied substantially from county to county [44, p. 100]. Murray tried to explain the variability of corporate ownership among counties by land value; the areas of high corporate activity were generally areas of low land values. Murray felt that this negative correlation between corporate ownership and land value

was due to mistakes in loan practices of lending agencies, specifically, overlending on land of poor quality [44, p. 101]. When prices fell in 1931, these lower quality farms were least able to survive the heavy debt payments.

Table 2.2. Land holdings of corporations by type of corporation, 1933-1939[a]

Type of Corporation	Thousands of Acres				Percent of all Farmland in Iowa Owned by Corporations			
	1933[b]	1935	1937	1939	1933[b]	1935	1937	1939
Insurance Cos.	1,343	2,044	2,510	2,752	3.9	6.0	7.4	8.1
Deposit banks, open and closed	536	499	388	347	1.6	1.5	1.1	1.0
Federal land bank[c]	76	129	189	232	.2	.4	.6	.7
Joint Stock land banks	256	276	253	253	.85	.8	.7	.7
Land, investment and mortgage cos.	332	317	290	241	1.0	1.0	.9	.7
Misc.	145	1,166	181	219	.4	.4	.5	.7
Total	2,688	3,431	3,811	4,044	7.9	10.1	11.2	11.9

[a]Source: Murray, 1939 [43, p. 311].

[b]Data for 1933 center approximately on September, for all other years on January.

[c]Includes land holdings of Federal Farm Mortgage Corporation.

By 1937 the pattern of corporate owned land did not follow land values as closely as four years earlier because of increased corporate land ownership in areas of high land values [45, p. 98-99]. Murray modified his earlier hypotheses by considering specific aspects of land value. He hypothesized that corporate land holding would be negatively associated with the percent of nontillable land in an area. Murray reasoned that because loan companies preferred to loan money to the more

productive segments of agriculture, namely cash crops, areas with large amounts of nontillable land would not be heavily mortgaged and would not be foreclosed as rapidly [45, p. 109-110].

Murray also hypothesized that the proportion of land owned by corporations would be positively associated with geographic areas where land has serious erosion problems. In areas where land is tillable but of low quality, lending companies would tend to overvalue and loan more money on the land, thus placing a heavy debt burden on the farms. As prices fell, operators would increase corn or other cash crop acreage to help meet the debt payments. This increased cultivation would cause abandonment of conservation practices and increased erosion problems [45, p. 110-111]. These hypotheses were never subjected to statistical testing.

Incorporating the Family Farm

Post World War II discussions of corporate farming centered on the use of the corporate form of business organization as a management and estate planning tool for the on-going family farm operation. A series of publications by state cooperative extension services explored the process of incorporation and its possible advantages to the family farm.

In 1959, Harl, Timmons, and O'Byrne authored one of the first publications dealing with incorporation of the family farm [23]. They listed limited liability of shareholders, possible increased access to equity and debt capital, continuing operation, ease of gradual inter-generational transitions of ownership and management, better retirement

planning possibilities, and income and other tax reductions as possible advantages of incorporation [23, pp. 294-296]. Possible disadvantages considered were increased complexity of record keeping and the cost of incorporation [23, p. 296].

Limited liability is a frequently cited incentive for incorporation because shareholders of a farm corporation are not responsible for corporate obligations, except to the extent of their investment in the corporation. This concept protects the farm operator who may be the major stockholder of the farm corporation and has assets in addition to investment in the farm. Limited liability may also encourage investment in the farm corporation by off-farm investors by eliminating the risk of loss beyond the extent of investment [23, p. 294].

Limited liability may prove to be less useful to some farm corporations because substantially all of the assets of the individuals involved are committed to the corporation. Also, creditors may require shareholders of a closely held corporation to secure personally corporate debt obligations which negates the benefits of limited liability as to contract type obligation [23, p. 294].

The perpetual life of a corporation makes planning for the intergenerational transfer of ownership and management easier because of the increased planning horizon. However, perpetual life can only be of benefit to the farm firm within the long range objectives of the farm operation [23, p. 295]. Only if the long range objective of the firm includes its continuation beyond the death of the principal owner does perpetual life of a corporation become an effective estate planning tool.

The corporate form of organization can also offer certain tax-deductible benefits to farm employees that are not available to self-employed farm operators. The key eligibility requirement for these benefit plans is employee status. Group term life insurance, medical plans and deferred compensation or retirement plans are probably the most important types of benefit plans that can be made available to corporate employees. Employer contributions to qualified employee deferred compensation plans are tax deductible by the corporation [91, § 404 (1)(a)]. Detailed discussions of these plans are given by Harl 1974, [75], and Krausz 1965, [36].

Self-employed farmers (partners or sole proprietors) are not eligible to participate in employee plans. Deferred compensation plans are available to self-employed individuals; however, self-employed persons do not receive the same favorable tax status as employee status [36, pp. 20-22]. The differential tax treatment accorded plans for self-employed persons was reduced by the Employee Retirement Income Security Act of 1974 which increased the maximum tax deduction that can be made by a self-employed individual for contributions to a qualified retirement plan from $2,500 or 10 percent of earned income to $7,500 or 15 percent of earned income, whichever is the lesser [69, § 2001]. This action improved the status of self-employed retirement plans, but the fact remains that a corporation can deduct all employer costs relating to qualified defined benefit (pension) plans and up to 25 percent of compensation paid or accrued to employees may be deducted under a defined contribution (profit sharing) plan [91, § 404 (a)(7)].

Tax considerations of incorporation were summarized by Harl, Timmons, and O'Byrne in 1959 [23, p. 296]. A detailed outline of income and social security tax effects of incorporation on the farm operation was provided by Harl in a later publication [20, pp. 65-85].

Numerous states including Kansas, 1960 [14]; Michigan, 1959 [26]; Oklahoma, 1970 [39]; Oregon, 1961 [28]; and Washington, 1974 [37]; have published materials containing much of the information outlined in the preceding paragraphs. The differences among these publications are the result of variability among both state laws concerning corporate activity in agriculture and the viewpoints expressed by the authors concerning the applicability of the corporate form of organization to the agricultural sector of particular states.

General Explanatory and Theoretical Literature

Another segment of the corporate farm literature is composed of studies of factors influencing the use of the corporate form of business organization in agriculture. These articles attempt to explain why certain variables might influence the use of the corporation in an effort to build a theory of the corporate farm.

Crossman, 1953, developed a list of changes having a bearing on the corporate farm problem [11, p. 953]. He classified those changes as abrupt or gradual. In the abrupt category, he included changes in social security law, tax law, liability law, credit programs of repayment and interest charges, and social ordinances or institutions affecting the agricultural infrastructure [11, p. 953]. He classified trends toward larger commercial farms, more specialized farms, increased farm

mechanization, more intense use of inputs to increase productivity, and growth of profitable off-farm investment opportunities as gradual changes affecting the corporate farm problem [11, p. 953].

Trends toward more intensive use of inputs and the increased mechanization of farms point to a need for more operating capital in farming and the trends toward larger and more mechanized farms create a problem of capital availability for beginning farmers [11, p. 954]. Trends toward higher capital investment and need for more operating capital in farming may influence the use of the corporation in agriculture because of the corporation's potential ability to attract investment capital from outside the agricultural sector.

Godwin and Jones, 1971, stated that partnerships and closely held corporations might prove useful in providing closer links between producing units and distribution channels in agriculture [15, p. 813]. Schermerhorn, in a discussion of the Godwin and Jones paper, emphasized that the integrated corporations would become a dominant factor in the future of agriculture because they provide a method for solving many problems arising in the sector [59, p. 817].

The problems foreseen by Schermerhorn that could be solved by such corporations included the trend toward market oriented agriculture requiring increased coordination and control, trend toward industrialization of agriculture creating a highly capitalized agribusiness system with increased difficulty of acquiring capital from traditional sources, and the need for increased management capabilities [59, p. 818]. These are areas identified by Godwin and Jones as forces requiring industrialization of

agriculture [15, p. 807] and endogenous forces at work changing the structure of the agricultural sector [15, p. 809].

Scofield observed that corporate farms as a group are not typical farm units as viewed from a national perspective [60, p. 17]. Corporate farms tend to concentrate in the production of beef cattle, poultry, fruits, and vegetables rather than field crops. Firms involved in the production of these commodities (except beef cattle) are frequently involved in the manufacturing or marketing of farm inputs or the processing and marketing of the commodities produced on the farm [60, p. 17]. The firms involved in processing and marketing of agricultural commodities are often seeking closer coordination and control of farm production in order to meet anticipated marketing requirements [60, p. 17].

Scofield also observed that the continued development of new production technologies is the most pervasive force at work in the agricultural sector that may require changes in business organization and capital structure of farm firms to meet the capital requirements of the new production technologies. Access to land and capital resources, other essential production inputs, and market channels for output are the most basic problems faced by the farm firm today that may involve external economies of scale [60, p. 18]. The large-scale operations needed to achieve these economies of scale may be more readily achieved by corporations than proprietorships because of expanded possibilities for capital formation [60, p. 18].

The history of corporate farms in America was the subject of a recent article by Raup [54]. Raup stated that two economic arguments

explain and justify the growth of corporate farming, economies of size and the provision of adequate capital stocks [54, p. 281]. Raup listed integrated poultry and egg production, large-scale beef feedlots, mechanized orchards, citrus and nut groves, pineapple and sugar cane production, and vegetables for canning as types of farming that exhibit economies of size and require capital stocks beyond the reach of the single-proprietor [54, p. 286].

Ottoson and Vollmar outlined four areas that provide incentive for the establishment of nonfamily corporate farms. These areas were specialization and new technologies of production, managerial specialization, volume buying and selling, and the possibility of integrating two or more stages in the production process [51, pp. 298-300]. These are areas of possible economies of size for most large-scale agricultural enterprises and not exclusively corporations.

Ottoson and Vollmar also discussed diseconomies of nonfamily corporate farms. Possible diseconomies discussed included: the use of a permanent hired labor force that may not always be optimal in size because of seasonality in farm production; a larger degree of risk and uncertainty due to more specialized production schedules that increase the vulnerability of the farm to fluctuations in prices of inputs, outputs and yield; managerial complexity; limitation on size due to geography and soil conditions; and the potential upward pressure on land prices due to the existence of a large farm corporation in an area [51, pp. 301-303].

The articles in this section represent a variety of definitions and explanations of the corporate farm phenomenon. From these studies one could conclude that the use of the corporation as a form of business

organization in agriculture is related to (1) the state of the tax laws, (2) long term trends toward larger and more specialized farms and potential economies of scale generated by these trends, (3) the amount of capital needed to maintain efficient production methods (high fixed cost), (4) the need for large amounts of operating capital (high variable costs), (5) the degree of integration needed among production, processing, and marketing, and (6) the degree of risk and uncertainty present in agriculture.

State Empirical Studies

Although no attempt was made to study empirically corporate farms on a national basis before 1968, studies in at least five states involved surveys of selected known corporate farming operations. These studies sought descriptive characteristics of corporate farms and their shareholders and reasons why the corporate form of organization was chosen.

Iowa

Twenty randomly selected farm corporations formed the sample for a 1960 study of corporate farming in Iowa [22, p. 561]. The researchers found that seven of the twenty were operating farms owning all assets used except land in some cases. Nine were landlord operations with most shareholders being off-farm residents. The remaining four were combinations of farm operations and landlord enterprises [22, p. 562].

Shareholder characteristics In 19 of the 20 case studies, shareholders were related by blood or marriage [22, p. 561]. The number of shareholders ranged from two to thirteen [22, p. 562]. In fifteen cases

all shareholders were on the board of directors and in eleven cases all shareholders were officers and board members. In seventeen cases all directors were shareholders and in two firms an attorney for the corporation served as a director but was not a shareholder. Businessmen, minor children, persons farming independently of the corporation, and retired farm operators and their spouses made up a majority of the off-farm stockholders [22, p. 562].

Size The corporate farms included in the study ranged in size from 160 to 3,000 acres owned or rented by the corporation [22, p. 562]. Operating corporations averaged 846 acres while landlord operations averaged 523 acres [22, p. 562].

Reasons for incorporation The most frequent response to the question asking why the corporate form of organization was used was the ease with which property could be transferred [22, p. 563]. Other reasons given in order of frequency were ease of continuation of the business after the death of the original owner, income tax advantages, limited liability, and access to capital and retirement planning [22, p. 563].

The initial cost of incorporation averaged $471 for twelve of the thirteen corporations responding to the question. The remaining case involved a much higher cost because of special problems [22, p. 563]. Nineteen of the twenty corporations studied were satisfied with the decision to incorporate [22, p. 563].

Minnesota

A Minnesota study of the same period sought to determine trends in incorporation of farms. The corporations were identified from a search

of the Minnesota Secretary of State's records of incorporation. The study found that 103 farming corporations had been created in Minnesota between 1913 and 1958 [2, p. 3]. Thirteen farm corporations had ceased operations during that period. The years of heaviest incorporation activity were 1955 and 1956 when twenty-four farm corporations were chartered [2, p. 3].

The Minnesota study also reviewed the advantages and disadvantages of incorporation for the family farm [2, pp. 12-17]. The report discussed extensively the ability of the corporate form of organization to attract equity and debt capital to the farm firm because of the limited liability and perpetual life characteristics [2, p. 16].

Alabama

A search of incorporation records of the State of Alabama revealed that 270 corporations with farming operations listed in their objectives of incorporation had been formed since 1900 [95, p. 27]. At least fifty were still active in 1963 [95, p. 27]. Only five of these fifty were incorporated before 1950. Fifteen of these corporations were classified as family (owned or managed by members of a single family or more than one family in cases such as father-son arrangements) farms [95, p. 27].

Case study Three of the fifteen family farm corporations and eight nonincorporated family farms were included in a case study analysis of the corporate farm [95, p. 27]. The eleven case studies included three corporations (one of which had progressed from a sole proprietorship to a partnership and finally to a corporation in less than twenty years), sole proprietorships (one of which was in the process of intergenerational

transfer), partnerships, and a firm in the process of incorporation [95, pp. 27-29].

Findings The study concluded that the costs of incorporation were not an important factor in the decision to incorporate [95, p. 30]. The corporation was believed to be useful in accumulation of capital [95, p. 31]. The amount of taxes paid under all three types of organizations did not differ significantly [95, p. 34]. Problems of intergenerational transfer of the farm operation were managed successfully by all three types of organizations [95, p. 31].

Indiana

Weigle attempted to identify and study farm corporations in Indiana. Names and locations of farm corporations were obtained from county cooperative extension agents, personnel of the Indiana Production Credit system, and employees of the Federal Land Bank. All sources were checked against the files of the Indiana Secretary of State [92, p. 29].

Survey Questionnaires were sent to the officers of 355 corporations that had farm, farming, land, and similar words in their corporate title [92, pp. 29-30]. Two hundred thirty-five questionnaires were returned and 182 corporations were classified as engaged in farming to some extent [92, p. 30].

Survey findings Ease of transfer of ownership in the business was the most frequently mentioned reason for incorporating [92, p. 84]. Other frequently mentioned reasons included continuity of ownership and management, ability to combine the ownership of two or more persons, and limited liability [92, p. 84]. The family attorney was the most frequent

source of information on incorporation, mentioned by 39.6 percent of the respondents [92, p. 84].

Only 4.1 percent of the reporting corporations had more than ten shareholders. Almost three quarters of the corporations had all stock held by persons related by blood or marriage [92, p. 84].

Almost half of the corporations owned all land farmed by the corporation. Over 20 percent of the corporations were landlord operations not engaged in active farming. Part-owners accounted for 13.5 percent of the corporation and 8.2 percent rented all of the land operated by the corporation [92, p. 88].

Over 72 percent of the 169 corporations reporting gained 60 percent or more of gross sales from a single enterprise. Fifty-five percent of the corporations were general farms (no single enterprise responsible for 60 percent or more of gross sales) or specialized in the production of field crops. Only 13.6 percent specialized in eggs and 12.4 percent specialized in raising and selling market hogs [92, p. 90].

Sixty-eight percent of the reporting corporations had incorporated within four years of the study and only 4.7 percent had been incorporated over twenty years [92, p. 91]. Average cost of incorporating the farm business was $384 for the 144 corporations reporting incorporation costs [92, p. 91].

Weigle also found relationships between the degree to which stockholders were related by blood or marriage and the major reason given for incorporation. In cases where all shareholders were related, ease of transfer of ownership and management was given as the most important reason for incorporating [92, p. 94]. In situations where 51-99 percent

of the stockholders were related, limited liability was given as the main reason for incorporation. In cases where 50 percent or fewer of the stockholders were related by blood or marriage, ability to combine the interests of several owners with ease was the most important reason for incorporation [92, p. 94].

Case study A case study analysis was included in order to compare the effects of the different forms of business organization on the family farm. Conclusions of this inquiry were similar to studies cited earlier. Large farm operations were able to reduce federal and state income taxes by incorporation when no dividends were paid. Small and medium sized farms did not benefit from reduced income taxes because of incorporation [92, p. 129]. The corporate organization did not induce favorable treatment from institutional lenders [92, p. 130]. The study concluded that family corporations did not attract outside capital, but off-farm family members tended to leave capital in the farm if returns were comparable to other investments [92, p. 130]. No specific criteria were cited as the basis for these judgments.

California

Moore and Snyder conducted a mail survey of 2,566 incorporated firms thought to be engaged in agricultural production in California in 1968 [42, p. 1]. This was part of a national survey to be reviewed later in this chapter. Their mailing list for the survey was obtained from the California Franchise Tax Board and was assumed to represent the total population of corporate farms based on 1968 income tax returns [42, p. 1].

A 75 percent response rate was obtained and almost half of the mailed questionnaires were suitable for further analysis [42, p. 1]. A follow-up study of nonrespondents determined significant differences between the two groups, the nonrespondents being significantly larger operations than the respondents. Tabulations were adjusted proportionally to reflect this bias [42, p. 1].

Control, organization, and year incorporated Over half of the corporate farms in California were controlled (ownership of over 50 percent of stock) by individuals or families [42, p. 2]. Corporate farms controlled by unrelated persons or other corporations tended to have higher gross sales than those controlled by families or individuals [42, p. 2].

Twenty-three percent of all corporate farms in the state at the time of the survey (1968) were organized as Subchapter S [91, § 1371-1377] corporations and over 46 percent of all corporate farms reporting had incorporated since 1960 [42, pp. 4, 15].

Resources employed Corporate farms in California had a tendency to hire management skills, with 645 of 1,286 corporations reporting hired managers who were not shareholders [42, pp. 4-5]. Corporate farms employed 42,544 persons working six months or more in 1968, and almost 90 percent of these employees were not related to owners [42, p. 5].

Land tenure classification listed 734 corporate farms as owning all land operated, 273 renting all land operated, and 504 farmed owned and rented land in their operations. Corporations operated less than fifteen percent of all privately owned land in farms in California [42, p. 5].

All corporate farms (farming and those with outside interests) averaged 3,678 acres while corporations having only farming operations averaged 2,293 acres. Corporate farms with additional interests outside of agriculture accounted for 8.9 percent of corporate farms reporting and had an average size of 16,553 acres [42, p. 5].

Agricultural activities Corporate farms were specialized in the production of high risk, capital intensive commodities [42, p. 7]. Corporations accounted for 89 percent of melon, 62 percent of lettuce, and 35 percent of carrot acreage in California. All of these commodities were considered high risk commodities requiring large amounts of operating capital per acre [42, p. 7].

Corporations operated in the capital intensive areas of the livestock industry [42, p. 8]. Almost 46 percent of fed cattle sold in California were fattened on corporate farms and feedlots. Corporations accounted for over thirty percent of broilers and laying hens sold in California [42, p. 34]. However, only five percent of dairy cows were on corporate farms. Moore and Snyder speculated that the low degree of corporate involvement in dairy operations might have been due to the restrictive milk pricing system in California [42, p. 8].

National Empirical Studies

United States Department of Agriculture 1968 survey

The first study to estimate the use of the corporation in agriculture on a national basis was conducted in 1968. Each county office manager of the Agricultural Stabilization and Conservation Service (ASCS)

was asked to develop a list of corporations directly engaged in farm production by consulting the records of that office and those of other county officials, such as the registrar of deeds, extension agent, and ASCS committeemen. Corporations owning land but not directly engaged in production were specifically excluded [78, p. 3]. Corporate farms were reported on a county basis so all farms operated by a corporation within a county were combined and reported as one unit. Units operated in other counties were reported as separate farms [78, p. 3]. A mail survey was used in California because the ASCS results proved to be incomplete. Names from the State Corporation Income Tax Office were used to augment the ASCS mailing list and the large operator list maintained by the Statistical Reporting Service [78, p. 3]. The results of this California survey were reported by USDA with data from other states and by the University of California [42, 76, 77, 78].

This survey reported 13,313 corporate farms in the fifty states or approximately 1 percent of commercial farms [78, p. 3]. These farms accounted for 7 percent of estimated land in commercial farms in 1968. The report estimated that corporations accounted for 8 percent of gross sales of agricultural commodities in the United States [78, p. 10]. Table A.1 in Appendix A gives a more complete summary of this information. Corporate activity was highest in Florida and California and these two states accounted for over 20 percent of all agricultural corporations reported. This survey also reported that a majority of farm corporations were "family or individual" corporations which appears to be an imprecise classification because this classification was based on the judgment

of the ASCS county officers without the benefit of specific guidelines [78, p. 6].

Other characteristics The survey attempted to cover other characteristics of farm corporations such as nonfarm business activities, labor and management employed, number of years since incorporation, and commodities produced. The report states that 63 percent of the corporations reported farming as their only business activity. However, this may be subject to possible misinterpretation because some of these corporations may be subsidiary units of corporations that are engaged in other activities [78, p. 7]. The report also states that stockholders or members of stockholder families comprised about one-third of the labor force of farming corporations and almost two-thirds of those corporations had managers who were major stockholders or members of a major stockholder's family [78, pp. 4, 13]. Data from the study concerning commodities produced by corporate farms did not include specific commodity sales information [78, p. 17]. The cross-sectional nature of the study did not allow analysis of the growth rate of the use of the corporation in agriculture because entry and exit ratios could not be determined, although over half of the farms surveyed began farming as a corporation since 1960 [78, p. 16].

Data limitation This survey had many faults especially in terms of the method of data collection. Two alternative data sources were available, records of articles of incorporation filed with the several Secretaries of State and Internal Revenue Service information. Checks against both sources suggested some underestimation of the number of

corporate farms [19, p. 271]. The ASCS survey technique was used because of time pressure and favorable results in a pretest pilot study [60, p. 8]. Although this survey had many shortcomings it shed some light on a subject that lacked a quantitative foundation on a nation-wide basis and provided a benchmark for future research [60, p. 9].

Tax return study

Another source of information that has proved useful in studies of farm corporations is federal income tax returns for farm businesses. A report by the United States Department of Agriculture (USDA) based on these data was published in 1973 [79]. However, the number of income tax returns reported by IRS as having agricultural activities and the number of farms reported by the USDA survey and the Census of Agriculture are not the same because of differences in definitions and reporting methods. Because of these differences this study, the 1968 USDA survey, and the 1969 Census of Agriculture cannot be compared directly. Most of these differences are reviewed by Coffman [83, p. 22].

Definitional differences The IRS tabulates returns from share-rent landlords separately from the tenant while USDA counts this arrangement as one farm unit. Each partner in a partnership files a separate tax return making the total number of tax returns showing agricultural income exceed the number of farms reported by the Census and USDA [83, p. 22].

The Census counts as a separate farm unit all operations overseen by a single farm operator. A corporation may own several of these units that are reported as independent farm units. However, the Census classifies all farm units within a single county operated by a corporation as one

farm unit [88, p. 128]. This latter rule was also followed by the USDA survey of 1968. IRS filing procedures usually combine all farming units of a corporation into a single unit for tax purposes [83, p. 22].

Farms organized as sole proprietorships report farm receipts and expenditures separately from other sources of income when filing tax returns (on Schedule F), so that the information pertaining to the farm business is available for analysis [83, p. 22]. However, in the case of the multi-line corporate farm all sources of income and expenses are combined for each corporation.

Corporations are classified as farm or nonfarm on the basis of the line of business that generates the largest portion of their total receipts. This means that farming activities of corporations are reported specifically as farming activities only when farming generates the largest portion of the total receipts of the corporation. If farming is a minor activity of the corporation, farm receipts and expenditures are reported as part of the nonfarm business of the corporation [83, p. 22]. This means that some corporate farms do not show up as part of the agricultural corporation classification. It also means that the figures reported for agricultural corporations (the largest portion of total receipts from agriculture) include the nonfarm activities of these corporations as well.

Another difference between census and IRS methods involves valuation of assets. The Census asks farm operators to report the estimated market value of all assets, while the IRS uses the reported book value of assets [83, p. 1]. This may cause considerably reporting differences, especially concerning the value of land, buildings, equipment and breeding stock.

Results of the study A summary of the number and percent of tax returns and business receipts classified by form of organization is provided in the form of Table A.2. This table shows that the number of corporations and their business receipts increased in absolute and relative terms from 1957 through 1969. Data from years preceding 1963 were estimated from the classification "agricultural, forestry, and fisheries." Corporate tax returns represented less than one percent of all returns of farm businesses. One interesting note is that the 20,000 farm corporations reported by the IRS in 1968 was higher than the 13,313 reported by the USDA survey of the same year. This points to serious underestimation by the USDA study; however, since corporate farms are such a small percentage of all farms, this difference has little impact on the calculated percent of all farm units organized as corporations. The corporate share of business receipts in agriculture increased significantly from 1957 to 1969 (6.8 percent and 15.3 percent respectively).

Tables A.3 and A.4 provide a picture of the size and distribution of farm corporations as measured by business receipts. Over eight percent of farm corporations received more than $500,000 each in receipts in 1967. This was a far larger percentage of firms than occurred in the sole proprietorship or partnership classification. The report also stated that Subchapter S corporations increased more rapidly in numbers than other farming corporations [83, p. 5].

The rate of return to equity of farm corporations in the 1963-68 period averaged 5.3 percent [83, p. 15]. However, when based only on corporations reporting profits, the rate of return of corporate farms in

the same period varied from 13.5 to 16.8 percent before corporate income taxes. The percent of farm corporations reporting losses ranged from 42 to 53 percent and losses as a percent of equity ranged from 32 to 46 percent [83, p. 15]. The report states that, compared to other industries, returns for farm corporations seemed too low to attract significant amounts of risk capital from investors [83, p. 16]. Rates of return for farm corporations were probably overstated because asset value was reported at cost and not at market value [83, p. 16]. For many operations, the difference between cost and market value is especially significant with respect to land.

An attempt was also made to calculate returns to size for farm corporations. As Table A.5 shows, rate of return increased for farm corporations as the asset stock increased and annual fluctuation in rate of return declined as the stock increased [83, p. 16]. When the calculations were made only for corporations reporting profits, returns declined as asset size increased. Variation in rate of return was lowest for the middle asset groups. One explanation for this difference in variability of rates of return seemed to be that size of losses decreased as the asset size of the firm increased [83, p. 19]. Other explanations and possible limitations of this analysis were discussed in an appendix to the report [83, p. 24].

1969 Census of Agriculture

The 1969 Census of Agriculture marked the first national attempt to classify all farms by type of organization. In section 37 of the Census reporting form 69-A1, farm operators were asked to describe their

organization as an individual or family farm (excluding partnership and corporation), partnership including family, corporation including family (not to include co-ops) with ten or fewer shareholders or more than ten shareholders, or other.

The census definition of an individual or family farm included sole proprietorships managed by one person, husband-and-wife operated farms, and farm operations where children provided part of the labor [88, p. 126]. Partnerships included all cases where the interest of two or more individuals were joined or aggregated in the operation of the farm. The distinction between an individually operated farm and a partnership is not completely clear from these definitions. Neither definition uses the existence of a partnership agreement to distinguish between individual farms and partnerships. Comparisons with IRS data reveal that a large proportion of partnerships reported by the census apparently did not file a partnership tax return [88, p. 126]. The "other" classification includes all types of business organizational forms that are not sole proprietorships, partnerships, or corporations. The census lists estates, trusts, institutional organizations and cooperatives in this classific tion [88, p. 127]. Classification as a corporation depended on the legal standing of the farm operation within the state [88, p. 127].

Classification as to type of organization for a farm unit was made by the farm operator. The question on type of organization was asked only of class 1-5 farms (at least $2,500 in sales of agricultural products) [88, p. 126].

All agricultural activities associated with an operator were reported as comprising one farm except when substantial activities occurred in more than one county in which case farm units were reported on a county basis [88, p. 128]. Data discrepancies could have occurred because one corporation may operate several farms, each under a different independent manager, or one operator may be responsible for what would normally be considered two or more separate farm operations.

Possible errors The census data have come under criticism for various problems in collection methods. Problems exist with the organization classification scheme because of the vague definitions discussed in the preceding section. It is felt by some, including the official census report [88, pp. 127-128], that the format of the question may have confused many operators, thus resulting in inappropriate responses. However, the question remains as to whether this confusion caused an under or over estimation of the number of corporate farms.

The official position is that the number of corporate farms was over reported by the census. This position is taken by the official report to be true for farms which are generally individual operations that rent land from a corporation and thus believed it appropriate to report their operations as corporations [88, p. 127]. Based on a telephone follow-up to the census questionnaires [88, p. 127], the report also stated that a large proportion of these inappropriately reported farms were located in the South and had sales of less than $20,000 which tended to lower the mean sales figure for corporations. A similar error may have occurred in reports of crop-share operations in the South. No attempt was made by the Bureau of the Census to correct the data for either error [88, p. 128].

Results In spite of the criticism mentioned above, the 1969 Census of Agriculture remains the most complete and reasonably accurate data source on corporations in American agriculture. A brief review of the information contained in the census allows some general characteristics of corporate farms and their position in relationship to other forms of organization to be established.

Table 2.3 reveals the fact that operating corporations account for 1.2 percent of all farms in the United States and that such corporations with more than ten shareholders account for one-tenth of one percent of all farms. This table also points out the regional concentration of corporate farms in the Northeast, South and West.

Table 2.3. Percent distribution of farms[a]

	United States	North-east	North Central	South	West
All farms	100.0	100.0	100.0	100.0	100.0
Sole proprietorships[b]	85.4	87.3	85.7	85.4	83.2
Partnership	12.8	10.4	13.2	12.6	12.8
Corporation	1.2	1.8	0.6	1.4	3.3
10 shareholders or fewer	1.1	1.7	0.6	1.2	3.1
More than 10 shareholders	0.1	0.1	0.1	0.1	0.3
Other	0.6	0.5	0.5	0.7	0.7

[a]Source: U.S. Department of Commerce, Bureau of the Census 1969, Volume II, Chapter 3, p. 128 [59, p. 128].

[b]Defined as "individual or family" farms by the Census.

Size of corporate farm Size is often defined in terms of the absolute level of use of one or more resources in a production process. Many variables may be used to measure farm size including acres, value of land, value of production, labor requirements, and operating outlays [66, p. 237]. The first three are the most widely used in studies of land tenure [66, pp. 237-238].

Table 2.4 shows the relative distribution of land by type of organization. Corporations make up only 1.2 percent of all farms but operate 8.8 percent of all land in farms. The regional differences are also apparent in this table. The large ranching operations in the Western United States greatly influence the proportion of land held by corporation for the country as a whole.

Table 2.4. Percent distribution of land in farms[a]

	United States	North-east	North Central	South	West
All farms	100.0	100.0	100.0	100.0	100.0
Sole proprietorships[b]	72.5	82.4	80.7	73.5	60.7
Partnership	17.8	13.5	16.5	18.5	18.9
Corporation, total	8.8	3.6	2.3	6.5	19.5
10 shareholders or fewer	7.2	3.1	2.0	4.8	16.4
More than 10 shareholders	1.6	0.5	0.3	1.7	3.0
Other	0.9	0.5	0.5	1.4	0.9

[a]U.S. Department of Commerce, Bureau of the Census [59, p. 128].

[b]Defined as "individual or family" farms by the Census.

The size and relative position of corporations can also be measured in terms of sales. Table A.6 indicates that corporations are responsible for over 14 percent of all sales of agricultural products for class 1-5 farms. Table 2.5 looks at the position of corporations in terms of sales in a slightly different perspective. Over fifty percent of all corporate farms were class 1 farms (sales of over $40,000) while only 12.8 percent of all farms qualified as class 1 farms. However, 9.6 percent of corporations were reported as class 5 farms (sales of $2,500-4,000). This significant proportion could be the result of the possible overreporting of corporations with sales of less than $20,000 as indicated earlier. It could also indicate the use of the corporate form of organization by small farm operators.

Table 2.5. Percent distribution of farms by value of sales[a]

	Total	Class 1	Class 2	Class 3	Class 4	Class 5
Total	100.0	12.8	19.1	22.8	22.5	22.8
Sole proprietorship[b]	100.0	10.9	18.7	23.0	23.2	24.1
Partnership	100.0	20.8	22.2	22.6	18.9	15.5
Corporation, total	100.0	57.4	13.2	10.5	9.2	9.6
10 shareholders or fewer	100.0	57.1	13.5	10.6	9.2	9.6
More than 10 shareholders	100.0	60.7	10.4	9.3	9.7	10.0
Other	100.0	10.7	16.6	21.4	24.8	26.4

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, p. 132].

[b]Defined as "individual or family" farms by the Census.

Size has also been measured by the average number of acres per farm. This information is presented by region and by type of organization in Table 2.6. In every region corporate farms average at least twice the size of all farms. In the North Central states, where corporate farms are the least prevalent (Table 2.3), corporate farms average over three and one-half times the size of individually operated farms.

Source of sales Another interesting aspect of the corporate farm question is source of sales. Tables A.7 and A.8 shed considerable light on this subject. Table A.7 shows that although corporations account for slightly over 14 percent of all agricultural sales, they account for much higher proportion of sales in certain commodities such as other field

Table 2.6. Average size of farm (acres)[a]

	United States	North-east	North Central	South	West
Total	529.7	211.0	392.6	479.8	1,492.2
Sole Proprietorship[b]	449.6	199.2	369.6	413.3	1,088.4
Partnership	737.5	272.0	491.4	707.3	2,211.7
Corporation, total	3,757.3	429.4	1,415.4	2,277.6	8,680.2
10 shareholders or fewer	3,371.4	391.8	1,369.8	1,827.7	7,963.2
More than 10 shareholders	7,991.0	1,082.6	1,881.0	6,914.5	16,902.9
Other	834.2	229.5	417.8	1,013.4	1,957.9

[a]Source: U.S. Department of Commerce, Bureau of the Census [59, p. 129].

[b]Defined as "individual or family" farm by the Census.

crops (sugar cane and pineapple mainly), fruits, vegetables, poultry, cattle other than dairy, and nursery products. This suggests the hypothesis that the corporate form of organization is more advantageous in certain segments of agriculture. This same phenomenon is evident in Table A.8 where these same commodities contribute over 80 percent of sales for the typical corporate farm and almost 90 percent for corporations with more than ten shareholders.

Table A.7 also indicates that corporations play an important role in the cattle industry, being responsible for 22.8 percent of dollar sales in that subsector. Table 2.7 approaches this situation from another perspective. Corporations are responsible for 25.1 percent of all cattle sold and 37.3 percent of all cattle sold that were fattened on grains or concentrates. In contrast, corporations sold only 4.5 percent of all calves and 3.3 percent of calves fattened on grains and concentrates. The data from Table 2.7 seem to indicate that the corporate activity in this subsector of American agriculture is concentrated in feeding operations for sale of fed beef.

Cattle fattened on grains and concentrates account for over 55 percent of all mature cattle sold while fed calves represent only 9.8 percent of all calves sold [88, p. 162]. Table A.7 and 2.7 seem to indicate that the 22.8 percent of dollar sales of cattle and calves other than dairy attributed to corporations is the result of heavy corporate involvement in certain parts of the industry, namely confinement feeding operations for mature beef, and little activity in other types of operations.

Table 2.7. Cattle and calves sold by type of organization[a]

All cattle and calves	Total	Sole proprietorship[b]	Partnership	Corp. with 10 or fewer shareholders	Corp. with more than 10 shareholders	Other
Percent of cattle sold	100	56.0	18.4	20.0	5.1	.4
Percent of calves sold	100	78.7	16.2	4.0	.5	.7
Fattened on grains and concentrates						
Percent of farms selling cattle	100	82.2	16.0	1.3	.1	.4
Cattle/farm	157	83	182	3,688	9,923	74
Percent of cattle sold	100	43.4	18.6	29.2	8.1	.2
Percent of farms selling calves	100	84.3	14.7	.5	.0	.5
Calves/farm	32	30	37	210	66	30
Percent of calves sold	100	79.5	16.7	3.2	.1	.5

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, part 2, Table 11].

[b]Defined as "individual or family" farm by the Census.

Poultry is another segment of agriculture that has attracted substantial corporate activity as indicated by Table A.7. Table 2.8 provides a breakdown of unit sales for this industry. Chickens older than three months, turkeys and ducks have the highest percentage of corporate sales.

Table 2.8. Poultry sales by type of organization[a]

	Total	Sole proprietorship	Partnership	Corp. with 10 or fewer shareholders	Corp. with more than 10 shareholders	Other
Chickens 3 mo. or older % sold	100	70.26	11.21	15.64	2.66	.25
Broilers and other meat chickens less than 3 mo % sold	100	86.03	9.01	4.17	.50	.29
Turkeys of all ages % sold	100	56.42	13.18	24.19	5.67	.52
Ducks % sold	100	45.02	9.43	45.48	.01	.05
Geese % sold	100	65.62	5.54	.72	.56	27.56

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, part 2, Table 11].

Other field crops, vegetables, and fruits are the additional major areas of corporate activity in agriculture according to Table A.7. Table A.9 gives more detailed information on specific commodities within these classifications. Corporations with ten or fewer shareholders are responsible for sizeable proportions of production of these commodities ranging from 25.95 percent for the category all vegetables to 7.24 percent for all cherries. The percent of production accounted for by corporations with more than ten shareholders ranges from 5.8 percent of peaches to .82 percent of Irish potatoes. Corporations account for a larger than average proportion of the land devoted to production of these commodities ranging from 8.76 for cherries to 24.18 for all vegetables. This is considerably above the national average of 8.81 percent of land in farms organized as corporations.

Table A.9 also shows that these commodities hold some other factors in common. All commodities in this group for which information was published by the census have a high proportion of land under irrigation, ranging from 67 percent for tomatoes to 27.8 percent for sweet corn. In all cases, the percent of land farmed by corporations under irrigation is greater than the overall proportion for the commodity. From another perspective, corporations maintain a larger proportion of land used to produce these commodities under irrigation than other forms of organization. This percentage ranges upwards to 99.78 for corporations with more than ten shareholders producing alfalfa seed.

Table A.10 examines one of the sectors of agriculture where corporate activity is minimal, namely cash grains. Corporations farm only 1.80 percent of all acres in field corn for grain and are responsible for 1.9 percent of field corn produced. This is in contrast to the commodities considered previously. Barley is the only grain with significant corporate activity; however, in this case, corporations were responsible for only 7.77 percent of production. It is interesting to note that barley is one of the few commodities in this group where a sizeable proportion of production acreage is irrigated. It is somewhat ironical that the cash grain farm of the Great Plains (where the fear of corporate farming originated during the depression) is one of the least affected by corporate activity.

The dairy industry is another sector of low corporate activity according to Table A.7. The contrast with the beef industry seems somewhat surprising considering the fact that both require substantial capital

investment in terms of herd and physical facilities. This same phenomenon was observed earlier by Moore and Snyder in California [42, p. 2].

Summary

This chapter has attempted to present a review of the empirical and nonempirical studies of the corporate form of business organization in American agriculture. The studies were reviewed in the context of the group of publications in which they were classified. The groups of publications were studies prior to 1950, research on incorporating the family farm, general explanatory and theoretical studies, state empirical studies, and national empirical studies. The findings of these studies were used to construct the hypotheses presented in Chapter III that guide the study.

CHAPTER III. THEORETICAL DEVELOPMENT, DATA AVAILABILITY, AND STATISTICAL PROCEDURES

Neoclassical economic theory of the firm assumes a single decision maker for the firm. For the farm firm, this assumption is frequently translated into the existence of an owner-operator who makes decisions, bears the costs, and receives the returns from production [75, p. 141]. When two or more individuals own production resources or services of resources that are contributed to the farm firm, the allocation of costs and returns from production to resource owners can become a factor affecting resource allocation and firm efficiency.

The form of organization utilized by the farm firm can affect resource allocation and firm efficiency, because the organizational structure of the firm allocates the costs and returns from production to suppliers of the inputs used in production. The allocation of costs and returns made by the organizational structure of the firm may or may not correspond to the ideals based on marginal value productivity formulated in microeconomic theory. The organizational structure of the firm also specifies the conditions under which the firm can continue to function as a legal unit. This affects the time horizon faced by the firm in the decision making process and consequently influences the decisions made concerning resource allocation over time.

In order to maintain static firm efficiency, Harl stated that the organizational structure of a firm must insure that (1) each owner's share of the factor of variable input must be the same as the share of product output obtained therefrom, (2) each resource owner should receive

the full share of the product earned by each unit of fixed and variable resource contributed, and (3) the shares of all products must be the same for each resource owner if one party can make decisions as to the level of output [75, p. 140].

The question remains as to the effects of choice of form of organization with respect to attainment of these criteria. The sole proprietorship fulfills these criteria because there is only one resource owner to receive the returns from production, and the resource owner is the decision maker, so that the share of all products are the same when one party makes the decision as to the level of output.

The corporation also seems to fulfill these three criteria. The contribution of each resource owner is initially valued using the uniform scale of corporate stock, a fixed dollar value of a debt instrument, or a negotiated salary or rent for the use of resource services. Once resources are contributed to the corporation in exchange for corporate stock or instruments of specified income streams, the allocation of returns to resource owners is based on the number of shares or bonds held, and the legal relationships that exist between the corporation and its shareholders and creditors. In this way, the corporate form of organization assures that shares of all products are the same for all resource contributors that assume equal amounts of risk, in a situation where one party makes the production decisions. Each resource contributor receives a share of product output in proportion to the resource contributed. Of course, for annual contributions of nonuniform inputs (or inputs of nonuniform value) such as labor and management, the task of resource

compensation in accordance with marginal productivities still exists.

Other forms of organization that allow for the contribution of resources by more than one individual such as crop-share leases, father-son lease arrangements, and to a lesser extent partnerships, may not be able to fulfill the three static efficiency criteria outlined above. One problem that arises with these organizational structures is that they are not as able to adjust returns to resource owners made necessary by changing resource values and productivities, as firms organized as corporations. If returns to resource owners do not change to meet new conditions, the efficiency of the firm can be adversely affected. Essentially, the economic tasks of resource allocation and income distribution are simplified in a firm which, as an entity, embraces a high proportion of the inputs utilized in the production process.

The organizational structure of the firm can also affect the efficiency of a firm over time. Because of the long-run nature of agricultural production, the organizational structure of a farm firm should, for maximum efficiency, allow each resource owner an opportunity to receive return on investment in fixed or variable resources made in one production period and not forthcoming until a subsequent period [75, p. 144]. The form of organization should not increase uncertainty or cause shifts in resource use between time periods [75, p. 144].

The factors identified in this chapter as influencing the use of the corporation by farm firms were selected in part because each represents a segment of a firm's organizational structure that affects the method by

which resource owners are compensated, which in turn, has an impact on the productive efficiency of the firm.

The literature reviewed in Chapter II covered three different phenomena that have been referred to as the corporate farm problem: incorporation of on-going, family-managed farm operations, landlord corporations that own land but do not engage in farming as a corporation, and corporations that engage in farming operations ostensibly for profit but are not family farm operations. This study was designed to examine the operating corporation in American agriculture; thus, it focuses on those firms with little or no landlord operations that can be easily assigned to the first and third groups listed above. No attempt was made to differentiate between family and nonfamily farm corporations inasmuch as data presently available do not classify corporations on that basis.

The variables most frequently mentioned in previous attempts to explain the existence of corporations in agriculture were economies of size [11, 54, 57], high fixed cost of capital intensive technologies of production [11, 51, 54, 59], high variable costs of production [11, 42], risk and uncertainty [42], managerial ability and access to information [29, 51, 93], estate planning [20, 92], and institutions such as the state of the law [20]. Each of these variables was examined in this study and general hypotheses describing the relationship of these variables with the use of the corporate form of organization were formulated to guide this inquiry.

An attempt is also made in this study to examine the use of the partnership in the agricultural sector. The partnership is a possible multiple ownership alternative to the corporation as a form of business

organization. The variables used to examine the use of the corporation are also used to examine the partnership to see if the same relationships hold between these variables and partnerships as between the same variables and corporations.

The measurement of the theoretical variables is defined by the general hypotheses discussed in the second section of this chapter. Instrumental variables to be used to approximate the concepts expressed by the theoretical variables are defined from the data available in the 1969 Census of Agriculture. Specific hypotheses using these instrumental variables are formulated to make possible statistical testing of the general hypotheses.

The third section of this chapter outlines the statistical procedures to be used to test the specific hypotheses. Test statistics are presented and the assumptions underlying the analysis are reviewed.

Factors Influencing Organization

Economies of size

The most widely recognized explanation for the use of the corporation in agriculture is based on the concept of economies of size [11, 54, 57]. This school of thought places emphasis on the increasing size of farms over the last fifty years [11, p. 1953] and the belief that, in some cases, large farm units are more efficient than small farms [57, p. 376]. The corporation is said to be a possible aid in the attainment of optimal sized farms [60, p. 18].

The term economies of size is used in this study to replace the usual term economies of scale because, as presented by Madden [79, p. 1],

economies of scale usually denotes a situation where resource proportions are held constant as firm size expands. Since this situation rarely occurs in agriculture, the term economies of size is used to refer to any change in cost per unit of production resulting from a change in the quantity of resources employed by the firm [75, p. 1].

Sources of economies of size The economies derived from large scale farming operations allegedly come from many sources. Those most frequently cited in the literature include the ability to increase managerial efficiency by hiring more highly trained personnel or by further education of existing management, the possibility of reducing costs of inputs and improving terms of sale for outputs due to market power that may result from increased size of operation, and the use of more advanced production technologies that are usually labor saving and involve a high fixed cost but can significantly lower unit cost if spread over a large amount of output [38, 51, 57, 59, 65].

Economies of size and the corporation The economies of size mentioned above are thought to be gained from a movement from the small operations to larger farm units that require more land, labor, and capital. The relationship between economies of size and the corporation depends on the supposition that the corporate form of organization facilitates the acquisition of the resources mentioned above because of limited liability, the technical division between ownership and management, and perpetual life. By facilitating the acquisition of land, labor, and capital, the corporation is believed by some to increase the efficiency with which the farm firm reacts to changes in production technology that require a larger resource base.

One effect of limited liability may be to help attract off-farm equity capital to the firm because of the decrease in risk to the investor. Perpetual life of a corporation may encourage lenders to extend long-term credit to the farm firm for the purchase of capital equipment because this characteristic of a corporation helps reduce the risk of dissolution of the farm business upon the death of the principal owner or operator. The division between ownership and management may clarify the managerial chain of command in larger farm operations, thus encouraging better utilization of managerial and other resources. The combination of limited liability and perpetual life may persuade off-farm heirs of a farm business to maintain their interest in the firm, further reducing the risk of dissolution upon the death of the principal owner or operator. These three characteristics of the corporate form of organization may help the farm firms obtain and maintain an optimal resource base.

The relationship between economies of scale in agriculture and the corporate form of organization outlined above is conceived in a long-run framework. Changes in production and management technologies have usually created potential economies of size. Farm firms demand more resources in attempts to take advantage of these newly available economies. The demand for additional resources thus is believed to create a demand for organizational forms that facilitate the acquisition of these resources. Because changes in plant size are in the nature of long-run adjustments, any increase in the use of the corporation would presumably be removed (by some period of time) from the initial recognition of the existence of economies of size. This study does not consider the time series aspect

of the relationship between economies of size and incorporation of the farm firm because no time series data which classifies farms by type of organization exist at the present time. Past Censuses of Agriculture have classified farms by tenure of the operator but not by type of organization. However, in the future, information concerning type of organization is scheduled to be collected by the census which, in a period of years, would generate the data necessary to test this relationship.

Because the relationship between the existence of potential economies of size and the observed size of farm firms is not of a precise nature due to the time lag between the availability of technologies creating economies of size and their adoption by farm operators, and because of the lack of time series data, the researcher was forced to assume that adjustments in farm size due to the existence of economies of size resulting from changes in production or management technologies occur instantaneously. Therefore, the relationship between economies of size and the corporate form of organization is reduced to the association between size of farm firms at a point in time and the extent of use of the corporate form of organization by those firms.

Hypothesis This study hypothesizes a positive relationship between the average size of farm firms and the use of the corporate form of business organization in agriculture.

Estate planning

Most discussions of farm organization list estate planning as a major reason for using the corporate form of organization [3, 19, 20, 22, 23, 26, 35, 37, 39, 92, 95]. The empirical studies conducted in Iowa and

Indiana reviewed in Chapter II confirm the importance of estate planning as a major reason for incorporation of the farm business. Frequent responses to questions asking why the corporate form was chosen included; (1) ease with which property can be transferred and (2) perpetual life of the corporation. Both responses involve key decisions that must be made in estate planning that arguably can be facilitated by use of the corporate form of organization.

The importance of estate planning in agriculture is directly related to the indivisibility of many farm assets such as land and equipment. Without a means of dividing the farm estate without dividing physical assets, such as land and equipment, among two or more heirs, the death of the owner-operator may result in the liquidation of the farm business or the creation of two or more farm units of less than optimal size. Even if the division of the farm firm is avoided, the payment of estate taxes and settlement costs may also create a shortage of working capital for the heir remaining active in the farm business. These problems are related to the generally assumed existence of economies of size in agriculture.

The importance of estate planning is also dependent on the age of the farm operator. Farm operators of advanced age are probably more aware of and concerned about the effect of their estate planning decision on their beneficiaries than are younger operators.

Hypothesis Because the relationship involving estate planning, economies of size, and the corporation is measured to some degree by the instrumental variable for economies of size, the estate planning reason for incorporation is studied using age of the farm operator as the point

of reference. This study hypothesizes a positive relationship between the age of farm operators and the use of the corporate form of organization. This study also assumes that this hypothesized relationship is strongest for those farm firms planning to continue into the next generation. Unfortunately, data on individual farm units needed to study the validity of this assumption, relative to plans for the farm business to continue as a viable economic entity into the next generation, are not available.

High fixed-cost of capital-intensive technology

Discussions of economies of size in agriculture usually include the use of technologies that substitute capital for labor or, more specifically, manpower [65, p. 78]. These technologies helped increase output per man-hour of labor almost eight times between 1910 and 1969 [74, Table 18]. During this same time, an index designed to measure total farm inputs of mechanical power and machinery using the years 1957-1959 as the base years (1957-1959 = 100) rose from 22 to 115 [74, Table 21]. These technologies are generally accomplished by high fixed costs in terms of the equipment itself and for complementary resources, such as land and skilled labor needed to obtain minimum unit cost of production. Raup believes that there are types of farming for which capital requirements and economies of size are beyond the reach of the traditional single proprietor [54, p. 286]. In this category Raup includes integrated poultry and egg production, large scale beef feedlots, mechanized orchards, citrus and nut groves, pineapple and sugar cane, and vegetables for canning, with beef breeding listed as vulnerable to this condition [54, p. 286].

One organizational solution to this problem may rest with the corporation, partnership, production contract, or some other organizational form or arrangement that can tap additional nonfarm sources of capital to finance the operation.

This motive for the use of the corporation in agriculture was discussed in the literature as early as 1928 [57]. Crossman, 1953, listed increased farm mechanization and the trend to larger commercial farms as gradual changes that should influence the use of the corporation in agriculture [11, p. 1953]. More recently, Schermerhorn discussed the possibility of corporations becoming a dominant force in agriculture because they provide a method of acquiring capital for a highly capitalized agri-business system caused by a trend toward industrialized agriculture fed by technological advances [59, pp. 817-818].

Hypothesis This study hypothesizes a positive relationship between the use of capital-intensive, high fixed-cost technologies and the use of the corporate form of organization in agriculture. As the use of these technologies increases over time, the corporation is expected to become more prevalent. In cross-sectional terms, sectors of agriculture that utilize capital-intensive, high fixed-cost technologies are expected to show greater use of the corporation than those sectors that do not use technologies of this type.

High variable production costs

Another characteristic associated with corporate farms in the literature reviewed in Chapter II was high variable production costs. Moore and Snyder listed high risk, high capital requirements, and the need

for large amounts of operating capital as three basic characteristics of crops grown by corporate farms in California [42, p. 7]. Scofield characterized corporate farms as having high gross sales and production expenses that take a larger proportion of gross income than is typical for less specialized farms [60, p. 14].

Use of short-term credit Farms that experience production expenses that consume a high proportion of gross sales may have difficulty financing these expenses. Short-term credit (less than twelve months in duration) is one way to finance farm production costs. As shown by Table 3.1, farms of all types of organizational structure use short-term credit to finance operating expenditures. Operating expenditures are equivalent to production expenses defined by the 1969 Census of Agriculture [87, p. B-11] less depreciation, changes in inventory values, cash rent paid, and expenses paid by landlords, and including expenditures paid or provided by contractors [89, p. A-9].

The percent of farms that make some use of short-term credit to finance operating expenditures ranges from 17.3 percent for "other" farms to 28.3 percent for corporations with ten or fewer shareholders. The percent of total operating expenditures financed in this manner ranges from 22.9 percent for sole proprietorships to 25.2 percent for partnerships. However, farms that make use of short-term credit to finance operating expenditures exhibit considerable differences in per farm use of short-term credit according to type of organization. Sole proprietorships average $16,800 of short-term credit for operating expenses per farm while corporations with more than ten shareholders average $1,164,600 per farm.

The last two columns of Table 3.1 attempt to correct the credit per farm figures for the fact that corporate farms are larger operations in terms of acres and fixed assets. The fourth column divides column three by acres per farm for each type of farm. The resulting credit per acre statistic ranges from 35.5 for partnerships to 145.7 for corporations with more than ten shareholders, excluding the "other" classification. The last column of Table 3.1 gives short-term credit used for operating expenditures per dollar value of land and buildings. The range in farms is .103 for "other" farms to .859 for corporations with more than ten shareholders.

Table 3.1 indicates that corporations make greater use of short-term credit in proportion to their stock of fixed assets than sole proprietorships and partnerships, even though the percent of farms using this type of financial arrangement does not vary greatly by type of organization. There are two possible explanations for this behavior. The first may be that the type of commodities produced by corporations requires relatively greater amounts of operating expenses. This is the line of reasoning used by Scofield [60, p. 14], and Moore and Snyder [42, p. 7]. The second explanation could be that perpetual life and the potential for continuity of management of a corporate farm lowers the risk perceived by the lender resulting in a larger line of credit. This portion of the analysis deals only with the difference in production expenses by type of organizational structure.

Hypothesis This study hypothesizes a positive relationship between variable production expenses and the use of the corporate form of organization.

Table 3.1. Use of credit of 12 months or less for operating expenditures[a] by type of organization[b]

	Percent of total operating expenses bought on credit of less than 12 months	Percent of farms reporting any operating expenditures bought on credit of less than 12 months	Credit of less than 12 months per farm used for operating expenditures ($1,000)	Credit of less than 12 months used for operating expenditures per acre $	Credit of less than 12 months used for operating expenditures per $ value of land and buildings
Sole Proprietorships[c]	22.9	19.4	16.8	37.4	.184
Partnerships	25.2	22.2	26.2	35.5	.187
All Corporations	23.6	27.9	212.7	56.6	.387
Corporations with 10 or fewer shareholders	23.5	28.3	173.7	51.5	.365
Corporations with more than 10 shareholders	23.8	20.6	1,164.6	145.7	.859
Other and no 1969 report	23.8	17.3	14.2	17.0	.103

[a]Defined as all operating expenditures as defined in the Census [87, B-11] less depreciation, change in inventory values, cash rent paid, and expenditures paid by landlords, and including operating expenditures paid or provided by contractors [89, p. 8 A9].

[b]Source: U.S. Department of Commerce, Bureau of the Census [88, Table 11], [89, Table 59].

[c]Defined as "individual or family" farms by the Census.

Risk and uncertainty

Risk and uncertainty are concepts that have long posed roadblocks to complete understanding of economic phenomena. Knight was one of the first to recognize the effects of these concepts on economic theory when he stated

> It is this true uncertainty which by preventing the theoretically perfect outworking of the tendencies of competition gives the characteristic form of 'enterprise' to economic organization as a whole and acccunts for the peculiar income of the entrepreneur [34, p. 232].

He distinguished between risk and the true uncertainty mentioned above.

> The practical difference between the two categories, risk and uncertainty, is that in the former, the distribution of the outcome in a group of instances is known (either through calculation a priori or from statistics of past experience), while in the case of uncertainty this is not true . . . because the situation dealt with is in a high degree unique [34, p. 233].

Rational economic behavior can then be defined in this framework as an attempt to minimize uncertainty [34, p. 238]. Knight believed that people do not wish to eliminate all uncertainty and that the differences with which people perceive uncertainty is the basis of the enterprise system.

Farmers, as rational economic decision makers, are concerned with reducing uncertainty. Heady, Kehrberg and Jebe stated in 1954 that

> . . . in the absence of uncertainty in the production and decision-making process, capital would generally be available in unlimited quantities, and fewer resources would be rented by farmers. Perfect foresight in farming would allow perfect decisions in the use of all resources [24, p. 619].

In a 1974 publication, Just concluded that subjective variance and covariance of returns to production had a significant impact on production decisions, and thus supply decisions, of farmers in the San Joaquin Valley

of California [32, p. 22]. The only instance where this measure of perceived risk of production was not significant in decision-making was in the case of commodities strongly regulated by government programs, especially cotton and rice [32, p. 22].

Sources and effects A 1973 discussion of organization and control of United States agriculture listed uncertainty as one of three forces currently inducing change in the organization of agriculture [25, p. 854]. Sources of uncertainty listed in that study included business succession and time span, pricing, inventions and their adoption rates, allocative competition from emerging forces outside the subsector in question, and acts of God. Madden and Partenheimer added yield uncertainty, human uncertainty, and institutional uncertainty to this list [38, p. 101]. They also hypothesized that uncertainty is a limiting factor in farm enlargement and that managerial ability to deal with this uncertainty is the limiting resource to increased farm size [38, p. 103].

> When uncertainty increases with size of farm, thus making coordination more difficult and increasing the probability of business failure, a practical upper limit may be imposed.
>
> Conversely, as uncertainty is reduced, farm size tends to rise [38, p. 103].

Heady, et al. posed the possibility of a tradeoff between income stability and magnitude of potential income [24, p. 692]. They also suggested that beginning farm operators may prefer to sacrifice some future income for income security in the first year of operation [24, pp. 692-693].

The corporation and uncertainty The corporation may be able to help the farm firm operate more effectively in an environment of uncertainty, created by several of the problems mentioned in the last section, especially those related to business succession and adoptation of new technologies and resources of production. Because of perpetual life and the availability of certain estate planning techniques, the corporation may provide a stable environment for the succession of management of the farm business. The corporation also offers the potential to spread the uncertainty of the farm operation over more than one owner without the assumption of total liability for obligations of the farm business by each investor.

Hypothesis This study hypothesizes a positive relationship between the presence of uncertainties in farm operations and the use of the corporate form of organization.

Managerial ability

The literature reviewed in Chapter II expresses a continuing concern over the need for quality management skills in agriculture [51, 57, 59]. The availability of information [9, p. 45] and educational achievement [16, pp. 424-425, 17, p. 961] are two factors that seem to have significant impact on the quality of managerial decision making.

Education In an environment of perfect information, Welch hypothesized that education affects production through the "worker effect" [93, p. 42]. This effect is simply the increase in production resulting from improved skills. When information is imperfect, the "allocative effect" supplements the worker effect of education. The allocative effect is exemplified by the increased ability to allocate time and resources

which results from education. Welch also believed that agriculture was not a typical sector of the economy because a large share of the productive value of education was the result of the allocative effect [93, p. 47].

Huffman attempted to isolate and test the significance of the allocative effect of education on the managerial ability of farm operators by an ex post analysis of decisions made by managers. He concluded that there was a positive and significant relationship between level of education of a farm operator and his ability to make decisions in a period of disequilibrium in an input market [29, pp. 95-96].

This study assumes that level of education is positively correlated with other measures of managerial ability and, therefore, level of education is used as a proxy for managerial ability. Rowley, 1928, believed that corporation farms, formed from groups of small owner-operator units, could improve profitability by hiring trained management. Schermerhorn, 1971 [59], stated a belief that the integrated corporation could meet the need for increased management capabilities in agriculture because the corporate firm could offer more management development possibilities within the firm and more fringe benefits than the firm organized as a sole proprietorship. Again, the corporation (the large integrated firm in this case) is said to increase managerial ability in agriculture. No empirical evidence was offered to substantiate this hypothesis.

Management is also related to corporations through the economies of scale phenomenon. Sundquist [65, p. 80] believed that large scale operations require better management than smaller operations. A large

scale operation may be in a good position to acquire better management because it can hire several people who are specialized in certain areas of the operation rather than someone who must make all decisions.

Godwin and Jones, 1971 [15], have a slightly different perspective. They believe there is a trend in agriculture toward more sophisticated and knowledgeable management. This trend is one of the endogenous forces in agriculture causing changes in the structure. This new breed of farm operators is believed to explore various methods of organization including the corporation and select the one that meets their particular needs. This could cause an increase in the use of the corporation because of its characteristics that may not have been known to operators in the past.

Hypothesis Two lines of reasoning emerge from this discussion; 1) corporate farms demand and attract a higher level management ability to meet the additional complexity of corporate farm operations, and 2) the rising educational and sophistication level of farm operators creates an increased interest in the use of the corporate form of organization, resulting in greater use of this form of organization. In either case, the correlation between the educational level of farm operators and the use of the corporation should be positive. This study hypothesizes a positive relationship between the educational level of farm operators and the use of the corporation.

Information Managerial ability should also improve as the information used in decision-making improves. Knowledge of alternative organizational forms, including the corporation, is an important part of this information base. Information on organizational alternatives can

be obtained from lawyers, accountants, personnel of the Cooperative Extension Service, and various popular publications. Weigle found that attorneys and accountants were the major sources of information on incorporation of the family farm [92, p. 84].

Hypothesis This study hypothesizes a positive relationship between the availability of information concerning the corporate form of organization and the use of the corporation as a method of farm organization.

Coordination of producing and processing

Agricultural marketing research has always placed great emphasis on the efficiency with which the market coordinates the production and processing of agricultural products. Godwin and Jones discussed the need for closer links between producing units and distribution channels [15, p. 811]. They also suggested that limited partnerships and closely held corporations may be ways to accomplish this linkage [15, p. 813]. They felt that new technologies in production and processing may require more uniformity of quality in product output [15, p. 807]. Schermerhorn, 1971, stated that the trend toward market oriented agriculture requiring increased coordination and control is one problem that the integrated corporation might be able to solve [59, p. 818]. Hildreth et al. stated that the structure of any sector of agriculture may depend on organizational linkages, such as markets and other arrangements, for decision formulation and power transmission [25, p. 852]. Scofield stated that corporations tend to operate in products where processing and marketing phases require large volumes of raw materials of uniform quality to be

delivered on a pre-determined schedule [60, p. 15]. This is especially true of fruits, vegetables, and sugar beets.

Hypothesis This study hypothesizes a positive relationship between the production of commodities for which processing technologies require a high degree of coordination between production and processing, and the corporate form of organization.

Law

Since the corporation is a creature of state law, use of the corporate form of organization in agriculture depends on the corporation laws of several states. Six states, Kansas [33, c. 17-5901], Minnesota [40, c. 500.24], Missouri [41], North Dakota [47, c. 10-56-01], South Dakota [63, c. 249], and Wisconsin [94, c. 238], have laws that place significant limits on corporate activity in agriculture. The laws of Kansas, 1931, and North Dakota, 1932, were passed during the Great Depression and have presented formidable barriers to corporate farming for many years. The prohibition of corporate farming in Oklahoma resulted from a constitutional limit that some had interpreted for many years as imposing a ban on land ownership by corporations outside of incorporated cities. The statutes of the other states are of recent vintage and provide special exemption to the so-called "family farm corporation" [86, p. 52].

North Dakota The North Dakota statute originally passed in 1932 prohibits domestic and foreign corporations from engaging in the business of farming or agriculture [47, c. 10-06-01]. The only exception to this prohibition is for cooperative corporations when 75 percent of their

members or shareholders are actual farmers residing on farms or depending principally on farming for their income [47, c. 10-06-04].

Kansas The Kansas corporate farm statute originally passed in 1931 [33, c. 17-202a] prohibited corporations from producing, planting, raising, harvesting, or gathering wheat, corn, barley, oats, rye, or potatoes or the milking of cows for dairy purposes [33, c. 17-5901]. A 1965 amendment added grain sorghum to the prohibited list, but allowed production of all prohibited commodities by corporations with no more than ten shareholders, all of whom were Kansas residents, and that controlled no more than 5,000 acres of land [33, c. 17-5901 (a)(1-4)].

Oklahoma Article twenty-two, section two, of the Oklahoma Constitution adopted in 1907 prohibits corporations from ". . . buying, acquiring, trading, or dealing, in real estate other than real estate located in incorporated cities and towns and their additions . . . except such as shall be necessary and proper for carrying on the business for which the corporation was chartered and licensed" [49, Art. 22, § 2]. This prohibition was interpreted as a ban on corporation farming until 1969. In that year the Oklahoma Supreme Court held that corporations could be formed in Oklahoma for the general purpose of engaging in the business of farming with powers, among others, of owning and holding real estate outside the limits of incorporated cities and towns [52, Leforce v. Bullard, 454 P. 2d 297, and Oklahoma Land and Cattle Company v. State of Oklahoma 456 P. 2d 544]. A law enacted in 1971 places several restrictions on corporate activity in agriculture including, (1) no shareholder other than natural persons, estates, trustees of trusts for the benefit

of natural persons or banks or trust companies, corporations owned by no shareholders other than those described above, (2) not more than 20 percent of the corporations gross receipts shall be from any source other than farming, ranching, or the extraction of minerals by others, and (3) no more than ten shareholders unless shareholders in excess of ten are related as lineal descendants or by marriage [50, c. 18 § 951]. There is also an exemption for research farms, feeding of livestock, forestry operations, and charitable corporations [50, c. 18 § 954].

Other states The statutory prohibitions on corporate farm activity of the other states mentioned above (Minnesota, Missouri, South Dakota, and Wisconsin) have been enacted since 1969 [86, p. 52]. Because these statutes could have had no effect on the data reported by the 1969 Census of Agriculture, only the limitations placed on corporate farming by North Dakota, Kansas, and Oklahoma which were in effect for substantial periods of time before the census are considered in this study. It seems reasonable to hypothesize that the corporation would not be a widely used form of farm business organization in states having substantial limitations on corporate activity in agriculture.

Hypothesis This study hypothesizes a negative relationship between the existence of legal limitations on corporate activity in agriculture prior to 1969 and the use of the corporation as a method of business organization in agriculture.

Summary

This section identifies the factors believed to affect the use of the corporation in American agriculture. The factors identified were economies of size, estate planning, high fixed-cost of capital-intensive technologies, high variable production costs, risk and uncertainty, managerial ability, coordination of production and processing, and the state of the law.

The next section of this chapter attempts to identify measurements of these theoretical variables. Specific hypotheses are developed to guide the development of the statistical model. The last section of this chapter outlines the statistical procedures used to test the specific hypotheses.

Data and Hypothesis Development

Quantification of the conceptual variables defined in the last section is made possible to a great extent by the 1969 Census of Agriculture. Other data sources include the 1964 Census of Agriculture and the 1970 Census of Population. This section defines measurements of the theoretical variables and develops specific hypotheses to be tested by the statistical procedures outlined in the next section.

Aggregation

All empirical research on corporate farms conducted prior to the publication of the 1969 Census used the individual farm as the observational unit [22, 42, 63, 75, 76, 78, 92]. In previous studies, characteristics of a selected sample of these units were observed and

generalizations were made to the population. The 1969 Census of Agriculture attempted to measure the entire population of all farms by individual questionnaires. However, because of disclosure restrictions, individual observations are not available. The county is the most disaggregated unit that is published from the census data.

Measurements published as county aggregates necessarily reflect the agriculture of the area and past decisions of many operators rather than the actions of one farmer. Differences between farms at this level could prove important to any study of corporate farming. Corporate farms might be atypical of the county in terms of acres, sales, and commodities produced, but these differences do not appear at the county level of aggregation. However, it is believed that many of the differences between corporate and noncorporate farms are reflected in the variability among counties.

The county was chosen as the observational unit for this study. A greater number of statistics are computed by the census at the state level; however, aggregation to the state level would mask differences in agricultural production within states. The use of county data means that all farm units in the county are represented by the mean value of the characteristics considered. All counties are treated as equal observations; counties are not weighted to reflect their proportion of national agricultural production since all agricultural counties are used in the analysis, producing a representation of American agriculture sufficiently accurate for this study.

Twenty-nine counties and independent cities are omitted from the analysis because of their lack of agricultural activity. The omitted jurisdictions are as follows: Nantucket County, Massachusetts; Bronx, Hamilton, Kings, New York, and Richmond Counties, New York; Crawford and Keweenaw Counties, Michigan; Menominee County, Wisconsin; Cook County, Minnesota; Dare County, North Carolina; Arlington County and Chesapeake City, Virginia; McDowell County, West Virginia; Knott and Perry Counties, Kentucky; Franklin and Monroe Counties, Florida; Orleans Parish, Louisiana; Clear Creek, Gilpin, Lake, and San Juan Counties, Colorado; Los Alamos County, New Mexico; Ormsby County and Carson City, Nevada; Yellowstone National Park, Montana; and Alpine and San Francisco Counties, California.

Variables defined

All variables defined in this section are measured on a county basis. All variables consider only class 1-5 farms (farms reporting $2,500 or more in sales of agricultural commodities) because farms with less than $2,500 in sales of agricultural commodities were not classified by type of organization.

Use of the corporation The first concept to be measured is corporate activity in agriculture at the county level; the following measures are considered: proportion of farms that are organized as corporations, proportion of land in farms operated by corporations, and proportion of sales of agricultural products accounted for by corporations.

Proportion of sales is probably the measurement that most accurately describes the activity of corporate farms in a given geographic area. However, data on sales of agricultural commodities by corporate farms are only available at the state and national levels of aggregation.

Proportion of land in farms would be considered an adequate substitute for proportion of sales if a direct relationship among land area, production, and price could be established. This relationship has not been established without error because of differences in management skills of operator, productivity of the land and price fluctuations of various commodities that are present in the agricultural sector.

Proportion of farms that are incorporated underestimates corporate activity in a county if corporate farms are larger in area, production, and sales than the average farm. The fact that corporate farms are, on the average, larger operations than farms in general is evident from the census tables included in Chapter II and Appendix A. However, this variable is probably the best and most direct gauge of the use of the corporate form of organization among farm operators.

This study uses five different variables to measure the use of the corporation and partnerships in American agriculture. They are: 1) the proportion of all farms that are corporations, 2) proportion of all farms that are corporations with ten or fewer shareholders, 3) proportion of all farms that are corporations with more than ten shareholders, 4) the proportion of all farms that are partnerships, 5) proportion of all farms that are corporations or partnerships.

Five variables dealing with the amount of land in farms are defined as measures of the farming activities of the corporation farms. They are: 1) the proportion of all land in farms operated by corporations, 2) proportion of all land in farms operated by corporations with ten or fewer shareholders, 3) proportion of all land in farms operated by corporations with more than ten shareholders, 4) proportion of all land in farms operated by partnerships, 5) proportion of all land in farms farmed by corporations and partnerships.

The fourth and fifth variables in each of the above lists are designed to examine the use of the partnership in agriculture. The partnership is a possible multiple ownership alternative to the corporation as a form of business organization.

Size of farms Size of farms is measured by the dollar value of agricultural products sold per farm. This measure was chosen over assets per farm and acres per farm in order to minimize the effects of regional differences in acres per farm and assets per farm that are pronounced in these data. Regional differences are taken into consideration using classification variables.

Fixed costs The estimated market value of land, buildings, and equipment per dollar of sales of agricultural products is used to measure fixed costs of farm units. Again, per farm, and per acre measures are not used because of the potential effects of regional differences.

Variable production costs Variable costs of production are measured by "total production expenses" per dollar of sales. Two components of total production expenses are worthy of special

consideration, namely, "hired labor cost" and "all other production expenses."

Operators of corporate farms are, in all likelihood, employees of the corporation and their salaries are probably reported to the Census of Agriculture as hired labor costs; whereas, operators of sole proprietorships consider themselves self-employed and probably do not report any portion of the cost of maintaining their services on the farm as a hired labor cost. Payments made to family members in exchange for labor services are specifically included in the category of hired labor expenditures in the census reporting form [87, p. B-11]. Even if operators of sole proprietorship farms report payments to family members, the data indicate that these operators apparently did not report the cost of hiring their own labor services as a hired labor expenditure of the firm. This potential for differential treatment of farm operators causes reported hired labor expenditures to be artificially high for counties with a large proportion of farms that are corporations and artificially low for counties with little corporate farm activity, which makes the hired labor portion of total farm production expenses unacceptable for use in the analysis.

The category "all other production expenses" includes current operating expenses, depreciation, taxes, interest, cash rents, insurance, and repairs [87, p. B-11]. The census reports that the dollar amounts assigned to this category should not be considered completely accurate because of possible reporting errors [87, p. A-4]. The researcher also considers the classification of such items as depreciation, taxes, interest, cash rents, and insurance as variable costs as a possible

misrepresentation of their true effect on the decision making process; although these payments accrue in the current period, they are the result of decisions that are long-run rather than short-run in nature.

As an attempt to correct for these problems, an alternative measure of variable production costs is used in the major portion of the statistical analysis of this study. This alternative measure is calculated by subtracting hired labor costs and "all other production expenses" from total production expenses and dividing by dollars of sales. This variable should be a more acceptable proxy for variable costs of production.

Risk and uncertainty, and coordination of production and processing The Census of Agriculture does not provide the year by year time series information necessary to construct an acceptable index of risk and uncertainty in terms of income, yields, or prices. Other sources of agricultural statistics do not allow disaggregation to the county level. An appropriate measurement of coordination of production and processing was also unavailable. These two variables are omitted from consideration in the statistical model of this study, but they should be considered in any subsequent research on corporate farming.

Education The percent of all farm operators with four or more years of college education in 1964 is used to measure the educational level of farm operators. The year 1964 is chosen because that is the only year for which detailed educational information on farm operators is available in the Census of Agriculture. The five year lag could be hypothesized as the time period needed for any increase in the

educational level of farm operators to be reflected in their choice of organization forms for farm businesses.

Age This study hypothesized a positive relationship between the age of farm operators and the use of the corporate form of organization because of the estate planning motive for incorporations. The variable to be used to test the extent of the estate planning motive for incorporation of farms is calculated as the proportion of farm operators fifty-five years of age or older in 1969 because it is believed that farm operators in this age group are more aware of their estate planning needs due to their reduced life expectancy and high probability of larger estates than those accumulated by younger operators. Thus, it is hypothesized that the larger the proportion of operators in this group, the more consideration is given to the corporation as a form of organization for the farm firm.

Legal information This study hypothesizes a positive relationship between the availability of information concerning the corporate form of organization and the use of the corporate form of organization in agriculture. Weigle found that family attorneys and accountants were the most frequently mentioned sources of information concerning incorporation of the farm business [92, p. 84]. This study assumes that the existence of attorneys and accountants in a given geographic area depends on the ability of the population of the area to support their services, and, assuming the homogeneity of population across geographic areas, depends on the size of the population in an area. Therefore, as a result of the above assumption, the availability of information concerning incorporation

of the farm business is positively related to the population of the area.

Another known source of information concerning the incorporation of the farm business is the information made available by the personnel of the Cooperative Extension Service across the country. This information is not tied to population as was assumed in the preceding paragraph. Its effectiveness and availability to all segments of the farm population is difficult to judge. This source of information is not considered in this study.

The availability of legal information is measured in this study by a classification variable. Counties falling within a standard metropolitan statistical area (SMSA) as defined by the Census of Population 1970 [90a, App.-4] and counties containing a city of population 25,000 to 50,000 are given the value one. Other counties are assigned the value zero.

State of the law The legal status of corporate farming is also described by a classification system. The variable Law is defined as having the value one if a county is in Oklahoma, Kansas, or North Dakota, and the value zero otherwise.

Regional classification The census tables reviewed in the second chapter reveal substantial regional differences in the use of the corporation in agriculture. As an attempt to analyze these differences, the country was divided into ten regions represented in the statistical analysis by the variable "regions." The ten regions were defined as follows: Northeast: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Vermont, New York, Pennsylvania, Delaware, and Maryland;

Lake States: Michigan, Wisconsin, and Minnesota; Corn Belt: Ohio, Indiana, Illinois, Iowa, and Missouri; Northern Plains: North Dakota, South Dakota, Nebraska, and Kansas; Appalachia: West Virginia, Virginia, North Carolina, Kentucky, and Tennessee; Southeast: South Carolina, Georgia, Alabama, and Florida; Delta States: Mississippi, Arkansas and Louisiana; Southern Plains: Oklahoma and Texas; Mountain States: New Mexico, Colorado, Wyoming, Montana, Idaho, Utah, Arizona, and Nevada; and Pacific States: California, Oregon and Washington. This same regional breakdown has been used in numerous USDA studies [74, 75, 76, 78, 82, 84, 85].

Hypothesis development

Nine specific null hypotheses are defined for statistical testing. Each null hypothesis has ten sub-hypotheses reflecting the ten measures of corporate activity defined earlier in this chapter. The nine hypotheses defined in terms of the first definition of corporate activity are as follows:

1. There is no significant relationship between the proportion of farms that are corporations and the market value of agricultural products sold per farm.
2. There is no significant relationship between the proportion of farms that are incorporated and the value of land, buildings, and equipment per dollar of sales of agricultural products.
3. There is no significant relationship between the proportion of farms that are incorporated and the variable production costs per dollar of sales of agricultural products.

4. There is no significant relationship between the proportion of farms that are corporations and the percent of farm operators with four or more years of college education.
5. There is no significant relationship between the proportion of farms that are corporations and the proportion of farm operators that are fifty-five years of age or older.
6. There is no significant difference between the proportion of farms that are incorporated in counties located in an SMSA and counties not in an SMSA.
7. There is no significant difference between the proportion of farms that are incorporated in Oklahoma, Kansas, or North Dakota and all other states.
8. There are no significant differences in the proportion of farms that are incorporated in the ten regions of the country.
9. There are no significant differences in the relationships defined by hypotheses one through seven due to regional classification.

The ten sub-hypotheses are associated with the ten measures of use of the corporate and multiple ownership forms of organization in agriculture defined earlier in this chapter. Each of the sub-hypotheses is associated with each one of the first eight main hypotheses. The sub-hypotheses are defined in the same manner as the main hypotheses with the following being used to measure corporate or multiple owner farming:

a. proportion of farms that are incorporated

b. proportion of farms that are corporations with ten or fewer shareholders

c. proportion of farms that are corporations with more than ten shareholders

d. proportion of farms that are partnerships

e. proportion of farms that are corporations or partnerships

f. proportion of land in farms operated by corporations

g. proportion of land in farms operated by corporations with ten or fewer shareholders

h. proportion of land in farms operated by corporations with more than ten shareholders

i. proportion of land in farms operated by partnerships

j. proportion of land in farms operated by corporations and partnerships

Summary

Table 3.2 provides a summary of the theoretical relationships and available data discussed in this chapter. The table gives the variable name, its definition in terms of available data, the data source, and the expected direction of its relationship with the use of the corporation in agriculture. The various measures of the use of the corporation and other multiple owner forms of organization in agriculture are listed in the second half of Table 3.2.

Table 3.2. Summary of data to be used in regression analysis

Variable name	Definition	Source of data or variable construction	Expected direction of relationship with variable measuring use of the corporation
Size	dollar value of sales of agricultural commodities per farm	1969 Census of Agriculture	+
Fixcst	estimated market value of land, buildings and equipment per dollar value of sale of agricultural commodities	1969 Census of Agriculture	+
Vlbcst	estimated total production expenses per dollar value of sales of agricultural commodities	1969 Census of Agriculture	+
Adjpc	estimated total production expenses less hired labor costs and miscellaneous production expenses per dollar value of sales of agricultural commodities	1969 Census of Agriculture	+
Age	proportion of all class 1-5 farm operators that are 55 years of age or older	1969 Census of Agriculture	+
Educ	percent of all farm operators that have four or more years of college education	1964 Census of Agriculture	+

Table 3.2. Continued

Variable name	Definition	Source of data or variable construction	Expected direction of relationship with variable measuring use of the corporation
Smsa	classification variable which equals one if county is in an Smsa and equals zero otherwise	1970 Census of Population	+
Law	classification variable which equals one if county is in Oklahoma, North Dakota or Kansas and equals zero otherwise	state statutes	-
Regions	system of nine variables and the mean that classifies counties into one of ten geographic regions	USDA Statistical Bulletin No. 233	
Corp	proportion of class 1-5 farms that are corporations	1969 Census of Agriculture	
Corpsm	proportion of farms that are corporations with ten or fewer shareholders	1969 Census of Agriculture	
Corplg	proportion of farms that are corporations with more than ten shareholders	1969 Census of Agriculture	
Part	proportion of farms that are partnerships	1969 Census of Agriculture	

Table 3.2. Continued

Variable name	Definition	Source of data or variable construction	Expected direction of relationship with variable measuring use of the corporation
Corpart	proportion of class 1-5 farms that are corporations or partnerships	1969 Census of Agriculture	
Land	proportion of land in class 1-5 farms operated by corporations	1969 Census of Agriculture	
Landsm	proportion of land in class 1-5 farms operated by corporations with ten or fewer shareholders	1969 Census of Agriculture	
Landlg	proportion of land in class 1-5 farms operated by corporations with more than ten shareholders	1969 Census of Agriculture	
Partld	proportion of land in class 1-5 farms operated by partnerships	1969 Census of Agriture	
Landcp	proportion of land in class 1-5 farms operated by corporations or partnerships	1969 Census of Agriculture	

Statistical Procedure

This study used the classical linear regression model and analysis of covariance to analyze the hypotheses formulated in the preceding section of this chapter. The models follow the general format given by equation 3.1 below,

$$Y = X\beta + \mu \tag{3.1}$$

where Y is a column vector of size n containing the observed values of the dependent variable, X is an n x k matrix of observed values of the k independent variables, β is a column vector of size k of unknown regression coefficients, and μ is column vector of size n of disturbance terms; and conform to the four standard assumptions of regression analysis.

a. $E(\mu) = 0$

b. $E(\mu\mu') = \sigma^2 I$

c. rank of X is k and $k < n$

d. X matrix is nonstochastic

The first assumption simply states that the expected value of the disturbance term is zero. The second assumption states that the disturbance terms have common variance σ^2 and are pairwise uncorrelated. The third assumption means that there are no exact linear relationships among any of the variables in the matrix X and the number of observations exceeds the number of parameters to be estimated. The last assumption states that in repeated sampling the sole source of variation in Y is the variation in the μ vector, and the properties of estimators and tests are conditional upon X [31, pp. 122-123].

The data to be used in this analysis do not conform completely to the last three assumptions. There is a high probability that a linear relationship of some degree may be present in the X matrix. This may be especially true of the variables measuring size of farm, high fixed cost, and production costs. However, this is a data problem and should not be the criterion for change in model specification. Farrar and Glauber point out that because the existence of multicollinearity tends to increase sample standard error of regression coefficients, it virtually assures a tendency for relevant variables to be discarded incorrectly from regression equations in a model building process [12, p. 94]. Principal component analysis can be used to solve this problem, however, if the resulting components cannot be given an economic interpretation, the exercise is almost meaningless [12, p. 97]. Principal component analysis is not used because the number of dependent variables under consideration is not great, and any combination of these variables using principal component analysis would probably have no economic meaning.

Another problem of the analysis may be one of misspecification of the model. Because the economic theory of the corporate farm is not well developed, the researcher may have omitted variables that have a significant impact on the analysis. The model includes no measure of risk and uncertainty or coordination of production and processing as developed in the first section of this chapter. No appropriate data representation of these variables could be found or synthesized. This omission means that the ordinary estimated least squares regression coefficients $\hat{\beta}$ would be expected to be biased with the extent of the bias dependent on the

correlation between the variables included in the model and those that are excluded [31, p. 169].

The X matrix of this model is stochastic because, as with most economic data, the values of X are stochastic and not fixed. This means that the ordinary least square estimators, $\hat{\beta}$, are inconsistent. However, if it is assumed that the X variables are distributed independently of μ, it can be shown that the ordinary least squares estimator provides the same best linear initial estimator of β as was the case with a fixed X matrix.

Regression analysis

The objective of the regression analysis is to obtain estimates of the unknown regression coefficients β which describe the relationships between the independent variable of X and the dependent variable Y. The regression equation is specified below as equation 3.2. The dimensions of each matrix are indicated in parenthesis.

$$\underset{(3040 \times 1)}{Y} = \underset{(3040 \times 8)}{X} \underset{(8 \times 1)}{\hat{\beta}} + \underset{(3040 \times 1)}{\mu} \qquad (3.2)$$

The eight independent variables are given in the list below.

X_1 = 1 for all n/intercept

X_2 = Size

X_3 = Fixcst

X_4 = Vlbcst

X_5 = Age

X_6 = Educ

X_7 = Smsa

X_8 = Law

The variable names were defined in Table 3.2. The ordinary least squares technique is used to obtain estimates of the regression coefficients. The variance-covariance matrix of the model is examined for the existence of multicollinearity. The "t" and "F" statistics are used to test the significance of individual regression coefficients. This basic model was run for each of the ten variables defined to be measures of corporate activity in agriculture.

Covariance analysis

Analysis of covariance is used to test for intercept and slope differences due to regional classification. This analysis is outlined by Johnston [31, pp. 192-207]. This analysis is an attempt to statistically test for the equality of regression coefficients for all regions [31, p. 194]

Analysis of covariance requires solution of three different models, the original regression on the X matrix defined in the last section, regression on an X matrix augmented by a (n x (p-1)) matrix of classification variables where n is the total number of observations and p is the number of classes, and separate regression on data in X on observations of each class. Three F statistics can then be constructed to test for differences in intercepts between regions, differences between regression slopes due to region, and overall differences.

Summary

This chapter develops the theoretical relationships relating to corporate farms, describes data sources and develops instrumental measurements of the theoretical variables, develops specific hypotheses to be tested and outlines the statistical procedures used in hypothesis testing.

CHAPTER IV. FINDINGS

The findings of the statistical analysis outlined in Chapter III are presented in this chapter. The results of the analysis are summarized in the tables of Appendices B and C. The chapter includes a review of the findings, an analysis of the findings and a summary of tests of hypotheses.

All of the estimated regression equations that are reviewed in this chapter consist of one of the ten dependent variables defined in Chapter III, regressed on the variables Size, Fixcst, Adjpc, Age, Educ, Smsa, Law, and the regional classification variables. The equations are estimated for the nation as a whole, using all 3040 observations, and for each of the ten regions. Some equations use only 3039 observations at the national level because of a card reader error involving Aransas County, Texas. The high (.01) level of significance criterion is used in all tests of significance, unless otherwise stated. The tables in Appendices B and C present significance probabilities calculated to four decimal places.

Review of Findings

The estimated regression equations reviewed in this section are identified by the dependent variable under consideration. All equations are estimated with and without the regional classification variables at the national level and for each of the ten regions. Specific hypothesis tests are summarized in a later section of this chapter.

Corp

The first and most important equation under consideration consists of the dependent variable Corp (proportion of farms that are corporations) regressed on the variables Size, Fixcst, Adjpc, Age, Educ, Smsa, Law, and the regional classification system. The results of the least squares estimation of this equation are given in Tables C.1 and C.2. For the national estimation of this equation using 3039 county observations, all estimated regression coefficients are significantly different from zero at the .01 level. All estimated regression coefficients have the expected sign except for Adjpc. The intercept is of little value in the context of this analysis, but it is included for completeness and because there is no theoretical reason to force the regression line through the origin. The independent variables Size, Fixcst, Adjpc, Age, Educ, Smsa, and Law account for 41.902 percent of the variation in the dependent variable Corp as reported by the square of the multiple correlation coefficient, R^2. The addition of the regional classification variable boosts the R^2 value to .49429.

Two F statistics are calculated to test the effect of regional classification. The first is the traditional test for differences in the intercept term due to classifications and is found in the top half of Table C.1 [31, pp. 196-197]. This statistic is significant at the .01 level meaning that, as a group, the estimated regression coefficients for the regional classification variables are significantly different from zero. Johnston also develops an F statistic to test for class slope differences [31, p. 198]. The F statistic for testing intercept

differences is based on the assumption that slopes are constant across classes. If the F statistic for slope differences proves significant, the test for intercept differences is no longer valid [31, p. 199]. The F statistic for slope differences is given at the bottom of Table C.1, and shows that slopes differences are significantly different from zero at the .01 level. The null hypothesis of constant slopes across regions must be rejected in favor of the alternative hypothesis of different slopes of coefficients across regions.

The regional classification variables could be picking up any number of forces having a bearing on the analysis that are regional in nature and have not been explicitly included in the analysis. This study assumes that the major cause of the significance of regional classification lies in the different characteristics of agricultural production that are found in the various regions.

The variable Size (sales of agricultural commodities per farm) accounts for another proportion of the variation in the proportion of farms that are corporations as reported in Table C.1. The estimated regression coefficient for the variable Size is significantly different from zero at the .01 level which leads to the rejection of the null hypothesis (1) of Chapter III, concerning Size and the existence of corporate farms, at the .01 level of significance. The alternative hypothesis of a positive relationship between the average size of farm in terms of sales per farm and the proportion of farms that are corporations is accepted.

The variable Fixcst (estimated value of land, buildings, and equipment per dollar of sales) is used to assess the effect of fixed capital investment on the use of the corporation in agriculture. As reported in Table C.1, the sign of the estimated regression coefficient is positive as expected and the coefficient is significantly different from zero at the .01 level of significance. This information supports the rejection of null hypothesis (2) of Chapter III at the .01 level, and subsequent acceptance of the alternative hypothesis of the existence of a positive relationship between the amount of fixed capital investment per dollar value of sales of agricultural commodities and the use of the corporate form of organization in agriculture. These first two findings seem to varify the beliefs that corporate farms are larger in terms of sales than farms in general, and that corporate farms use production techniques that are more capital intensive and require levels of fixed investment that are higher than those used by farms that are not corporations.

The variable Adjpc is used to measure variable production costs and is defined as total production expenses [87, p. A-4] less "hired labor" and "all other production expenses" per dollar of sales of agricultural commodities. The results of the ordinary least squares procedures reported in Table C.1 show a negative regression coefficient for Adjpc, contrary to expectations. The estimated coefficient is significantly different from zero at the .01 level which leads to the rejection of null hypothesis (3) at the .01 level for this equation. Although the negative coefficient is significant, a negative relationship between

variable production costs and the proportion of farms that are corporations is not supported by the theoretical development of Chapter III. This finding may point to flaws in the theoretical construct; however, it seems to be more a problem of data availability, as explained below.

The variable Vlbcst is another measure of variable production costs. It includes "hired labor" and "all other production expenses." This variable is used in place of Adjpc in this same equation. The results of the least squares estimation of the equation are reported in Table C.21. The estimated regression coefficient for Vlbcst is positive and significantly different from zero at the .0287 level.

The inclusion of hired labor cost and miscellaneous production expenses reverses the sign of the regression coefficient and significance is cited at a lower level. Hired labor expenses probably include salaries paid to corporate farm operators, even when the operator is a principal stockholder of the corporation. The same operator would probably not report his/her salary as a labor cost if the farm is organized as a sole proprietorship. Exclusion of this portion of production expense in addition to miscellaneous expenses results in a negative sign for the regression coefficient for the variable Adjpc.

These results seem to show that the relationship between the corporate form of organization and the level of variable production expenses is inconclusive. Although the estimated regression coefficient for the variable Adjpc is negative, the exclusion of a potentially large component of variable production expenses (hired labor costs) has a significant impact on this result. Without labor costs, the negative relationship

between the existence of corporation and variable production expense seems to reinforce the positive relationship between the existence of corporations and the use of capital intensive production technologies.

The variable Age (proportion of farm operators that are fifty-five years of age or older) is included to assess the estate planning motive for the use of the corporate form of organization in agriculture. The least squares regression coefficient for Age is positive and is significantly different from zero at the .01 level as reported in Table C.1. Null hypothesis (4) is rejected at the .01 level and the alternative hypothesis of a positive relationship between the proportion of farm operators that are 55 years of age and older and the proportion of farms that are corporations is accepted. The acceptance of this alternative hypothesis supports the theory that an older farm operator is more likely to consider the corporate form of organization if only because of its estate planning features, than is a young farm operator.

Table C.1 shows that the variable Educ (percent of farm operators that have four or more years of college education) has an estimated regression coefficient that is positive and significantly different from zero at the .01 level. This result supports rejection of null hypothesis (5) and acceptance of the alternative hypothesis of a positive relationship between the percent of farm operators with four or more years of college education and the proportion of farms that are corporations. Educational level seems to have a significant impact on the choice of organizational form by farm operators.

The variables Smsa and Law were introduced into the equation using the "class" statement of the Statistical Analysis System regression package. The class system is used to create classification variables from alphabetic or numeric data [61, p. 100]. Because of the order in which data cards were read into the computer, this statement reversed the 1, 0 definition of the variable Smsa and Law. This defined the variable Smsa to equal one if a county did not fall in an SMSA or have a population center of 25,000 - 50,000 and zero otherwise. The variable Law became equal to one if a county was in a state that did not have restrictive corporate laws, and zero otherwise. This reversal of definition also reverses the expected signs of regression coefficients for these variables. The expected signs for the variables Smsa and Law become negative and positive respectively.

The variables Smsa and Law have estimated regression coefficients that are significantly different from zero at the .01 level. The Smsa least squares regression coefficient is negative and the Law least squares regression coefficient is positive, which is contrary to expectations outlined in Chapter III but consistent with the revised expectations outlined in the previous paragraph.

The same equation is estimated without using the "class" statement to construct classification variables, and the results of this exercise are given in Table C.23. The signs of the estimated regression coefficients for Smsa and Law are consistent with the expectations outlined in Chapter III but reversed from Table C.1. Algebraically, the absolute values of the coefficients calculated by these two different procedures

should be the same. The slight numeric differences between the results of Tables C.1 and C.23 are due to the difference in degrees of freedom. The intercept values calculated by the two procedures will be different, but the intercept is of little value in this analysis.

This same equation is estimated separately for each of the ten regions. Examination of Table C.2 confirms the finding of slope differences across regions, given in Table C.1. The estimated regression coefficient for the variable Size (sales of agricultural commodities per farm) remains positive and significant at the .01 level in all regions. The least squares estimate of the regression coefficient for the variable Fixcst (estimated value of land, buildings, and equipment per dollar of sales) becomes negative in the Lake States and the Corn Belt. It is not significantly different from zero at the .01 level in these two regions and is significant only at the .0282 level in the Southern Plains. This indicates that fixed costs per dollar of sales is not significantly related to the use of the corporate form of organization in the midwest and Southern Plains.

Using the .01 level of significance as the criterion, the estimated regression coefficient for Adjpc (variable production expenses less labor and miscellaneous expenses per dollar of sales) is negative and significantly different from zero in all regions except the Southern Plains, Mountain, and Pacific States. The coefficient is positive only in the Southern Plains where it is not significantly different from zero.

These findings indicate that the level of variable production expenses is not significantly related to the use of the corporation by farm businesses in the Western United States. Labor costs are very

important in certain segments of agriculture in these regions. The inclusion of labor costs could significantly alter this finding.

The variable Age (proportion of farm operators that are fifty-five years of age or older) is positively related to the proportion of farms that are corporations in the Northeast, Lake States, Corn Belt, and Southern Plains as shown by the estimated regression coefficients for the variable Age in Table C.2. In all other regions, the estimated regression coefficient for Age is negative but not significantly different from zero at the .01 level. The age of farm operators is significantly related to the use of the corporate form of organization in two regions (Lake States and Corn Belt) where corporate farms make up less than one percent of all farms (Table A.6). Because this study uses the variable Age to assess the estate planning motive for the use of the corporation these findings could lead to the conclusion that the estate planning motive has a significant impact only in the Midwest, a region of little corporate farm activity.

The educational level of farm operators as measured by the variable Educ (percent of farm operators with four or more years of college education) is related to the proportion of farms that are corporations in a positive direction in all regions except Appalachia. However, the estimated regression coefficient for this variable is not significantly different from zero at the .01 level in the Northeast, Corn Belt, Northern Plains, Appalachia, and the Pacific States. If the significance criterion is lowered to the .05 level, Educ becomes significant in the Northeast.

The estimated regression coefficient for the variable Smsa (classification of counties as rural or urban) is significantly different from zero at the .01 level only in the Corn Belt. This finding in combination with the preceding paragraph seems to say that, in the Corn Belt, the location of a county near an urban area has more bearing on the proportion of farms that are corporations than does the educational level of farm operators in the county. If, as stated in Chapter III, educational achievement and access to legal information from lawyers in an urban center are two ways of improving managerial skills of farm operators, farm operators in the Corn Belt may be utilizing only one of these sources of managerial improvement.

In the two regions affected by restrictive corporation laws, the variable Law has an estimated regression coefficient that is significantly different from zero. Restrictive corporate laws have had a significant negative affect on the use of corporate form of organization by farm businesses in those states.

The percent of variation in the proportion of farms that are corporations explained by the independent variables for the ten regions as given by the square of the multiple correlation coefficient, R^2, ranges from 72.768 percent for the Southeast to 30.982 percent for Appalachia. This large range indicates that the equation effectively explains the existence of corporate farms in some regions but not in others.

Regional differences in agricultural production can be observed to some extent in the tables of common statistics found in Appendix B. These tables indicate that not only do the means of the variables Size,

Fixcst, Adjpc, Age, and Educ vary among regions, but each of their standard deviations also exhibit regional variability. The variable Educ has a standard deviation of 1.8734 in the Corn Belt, a standard deviation of 5.6582 in the Southern Plains, and a national standard deviation of 4.2385. The variable Size has a standard deviation of 5,445.4 in the Lake States and a standard deviation of 30,324 in the Southeast. This information seems to indicate that characteristics of farm business and farm operators exhibit more homogeneity in some regions than in others. Thus, variables that vary concurrently with the variable Corp in some regions do not exhibit the same variability in other regions and thus do not explain as large a proportion of the variation in the variable Corp. In regions such as the Corn Belt where agricultural production as characterized by the independent variables used in this study does not exhibit perhaps as much variation as elsewhere, any differences between corporate and noncorporate farms that may exist are not revealed by these county level aggregate data.

Corpsm

The second equation of interest consists of the dependent variable Corpsm (the proportion of farms that are corporations with ten or fewer shareholders) regressed on the variables Size, Fixcst, Adjpc, Age, Educ, Smsa, Law, and the regional classification system. Because most farm corporations reported by the 1969 Census of Agriculture have ten or fewer shareholders, the variables Corp and Corpsm are highly correlated. Table B.2 gives the simple correlation coefficient between Corp and

Corpsm as .98. The results of the estimation of this equation given in Tables C.3 and C.4, closely parallel those given for the variable Corp.

The estimation of this equation for 3039 agricultural counties in the U.S. yields much the same result as given for the first equation. The square of the multiple correlation coefficient, R^2, is slightly smaller for this equation at .47719 and .40041 for estimation with regional classification and without regional classification respectively. All estimated regression coefficients for the independent variables are significantly different from zero at the .01 level.

The F statistic for regional intercept differences indicates differences significant at the .01 level. The F statistic for regional slope differences also shows regional differences significant at the .01 level. The regional difference exhibited by this equation also parallel those given by the previous equation. The least square coefficient for Size (sales of agricultural commodities per farm) is positive and significantly different from zero at the .01 level in all regions. The Fixcst (estimated value of land, buildings, and equipment per dollar of sales) estimated regression coefficient is negative and not significantly different from zero at the .01 level in the Lake States and the Corn Belt. The coefficient is positive but not significantly different from zero for the Delta States, and is significantly different from zero only at the .05 level for the Southern Plains.

The variable Adjpc (variable production expenses less hired labor and miscellaneous expenses per dollar of sales) follows much the same regional pattern as in the preceding equation. The estimated regression

coefficient for Adjpc is negative and significantly different from zero at the .01 level in all regions except the Southern Plains where it is positive and not significantly different from zero, and in the Pacific and Mountain States where it is negative but significantly different from zero only at the .05 level.

The variables dealing with farm operator characteristics, Age (proportion of farm operators fifty-five years of age and older), and Educ (percent of farm operators with four or more years of college education) also follow the previous pattern. The estimated regression coefficient for Age is positive and significantly different from zero at the .01 level in the Northeast, Lake States, Corn Belt, and Northern Plains. It is negative and significantly different from zero in the Southern Plains. The estimated coefficient is not significantly different from zero in the other regions. In the Pacific States, the coefficient is negative and significantly different from zero at the .0164 level. The estimated regression coefficient for the variable Educ is positive and significantly different from zero at the .05 level except in the Corn Belt, Northern Plains, Appalachia, and Pacific States.

The estimated regression coefficient for the variable Smsa (rural, urban classification variable) is significantly different from zero at the .01 level only in the Corn Belt. The estimated regression coefficient for the variable Law (restrictive state corporation law classification variable) is significantly different from zero in the two regions where it enters the equation.

Regional R^2 values are somewhat lower than that recorded for the previous equations. The regional R^2 values for this equation range from .70498 for the Southeast to .29894 for Appalachia.

Corplg

The third equation uses the variable Corplg (proportion of farms that are corporations with more than ten shareholders) as the dependent variable. On the national level, the independent variables of the equation account for only 10.923 percent of the variance in the dependent variable Corplg as shown in Table C.5. The variables Age, Smsa, and Law have estimated regression coefficients that are not significantly different from zero at the .01 level. The variable Law has an estimated regression coefficient that is significantly different from zero when the regional classification system is omitted from the equation. These results represent the first break from the pattern established by the first equation.

The F statistic for regional slope differences indicates that regional differences are an important factor in this equation as is shown in Table C.6. Least squares estimation of this equation for the Northeast region yields an R^2 value of .05032. None of the estimated regression coefficients is significantly different from zero at the .01 level. The Lake States exhibit a slight improvement in the square of the multiple correlation coefficient over the Northeast because the estimated regression coefficient for Educ is positive and significantly different from zero at the .01 level.

The Corn Belt has an R^2 value of .16443 and estimated regression coefficients for Size, Adjpc, Age and Smsa significantly different from zero at the .01 level. Only the estimated regression coefficients for Size and Fixcst are significantly different from zero in the Northern Plains. The variable Law has an estimated regression coefficient significantly different from zero at the .0243 level in the Northern Plains. Appalachia has an R^2 of .05147 for this equation with estimated regression coefficients for Size and Fixcst significant at the .01 level.

The Southeast again exhibits the highest R^2 value (.46924) of any region, and has estimated regression coefficients that are significantly different from zero for the variables Size, Fixcst, and Educ. The estimation of the same equation for the Delta States shows the same pattern of significance for regression coefficients as that given for the Southeast. However, the square of the multiple correlation coefficient is only .27697 in the Delta States.

Only the variable Size has an estimated regression coefficient significantly different from zero in the Southern Plains. Adjpc and Educ have estimated regression coefficients that are significantly different from zero in the Mountain States. Estimation of the equation for the Pacific States generates an R^2 value of .27559 and estimated regression coefficients significantly different from zero at the .01 level for the variables Size and Age.

It is clear from the results presented in Tables C.5 and C.6 that many of the relationships that held between the independent variables under consideration and the proportion of farms that are corporations

of all shareholder sizes, do not hold for corporations with more than ten shareholders.

Part

This equation is included in the analysis to see if the same variables hypothesized as explaining the existence of corporations in American agriculture also explain the existence of another multiple ownership form of organization, the partnership. The results of the estimation of this equation using all 3040 observations are given in Table C.7. The independent variables explain 19.716 percent of the variation in the proportion of farms that are partnerships when regional classification variables are used, and 9.414 percent when regional classification is not used.

The variables Fixcst, Smsa, and Law have estimated regression coefficients that are not significantly different from zero at the .01 level when the equation is estimated on the national level with regional variables included. When the equation is estimated without regional classification, the estimated regression coefficient for Fixcst becomes significantly different from zero at the .01 level. However, the estimated regression coefficient for Educ is significantly different from zero when regional classification is included, but is not significant when the regional classification variables are not included in the equation.

As in the preceding equation, there are statistically significant regional differences in intercept and slope as noted by the appropriate F statistics in Table C.7. The regional regression results found in

Table C.8 support this conclusion. The independent variables explain over 30 percent of the variation exhibited by the variable Part (proportion of farms that are partnerships) in only three regions, the Delta States, Pacific States, and Southern Plains. The variables Size and Adjpc have estimated regression coefficients that are significantly different from zero in all three regions. The estimated regression coefficient for Fixcst is significantly different from zero in the Delta States and Educ has an estimated regression coefficient that is significantly different from zero in the Southern Plains and Pacific States.

The seven remaining regions have low R^2 values. The Southeast region is conspicuous by its inclusion in this group. In the Southeast region, the same set of independent variables that explain 7.699 percent of the variation in the variable Part, explain 72.768 percent of the variation in the variable Corp.

Corpart

The variable Corpart (proportion of farms that are corporations or partnerships) is the dependent variable in the fifth equation. The variable is designed to measure the use of both multiple owner forms of organization, corporations and partnerships. The least squares estimation of the regression of Corpart on the standard set of independent variables for all counties in the U.S. yields an R^2 of .38427 with regional classification and .31614 without regional classification. Estimated regression coefficients for all variables except Age and Smsa are significantly different from zero at the .01 level. The fact that Age is not significant is a result of its significance in a positive direction for the

variable Corp and in a negative direction for the variable Part. When the variables Corp and Part are added together to form the variable Corpart, the variation that caused the variables to be significant in the previous equation, cancels out.

Again, there are regional differences in intercept and slope by the appropriate F statistics in Table C.9. The regional regression results found in Table C.10 show that the variable Size has an estimated regression coefficient that is positive and significantly different from zero at the .01 level in all regions. The estimated regression coefficient for the variable Fixcst is positive and significantly different from zero at the .01 level in all regions except the Corn Belt where it is negative and not significant, the Southern Plains where it is positive but not significant, and the Pacific States where it is positive but significantly different from zero at only the .0264 level. The variable Adjpc has estimated regression coefficients that are negative and significantly different from zero in all regions. The estimated regression coefficients for Educ tend to be positive and significantly different from zero. However, the coefficient is not significantly different from zero at the .01 level in the Lake States, Northern Plains, Northeast, and Delta States. The Educ coefficient is negative and significantly different from zero at the .01 level in Appalachia. The estimated regression coefficients for the variable Smsa are not significantly different from zero in any region and the estimated coefficients for the variable Law are significant in the two regions where the variable is relevant. The regional R^2 values range from .65356 for the Delta States to .18714 for Appalachia.

Land

The five variables Land, Landsm, Landlg, Partld, and Landcp all measure the proportion of land in farms operated by farms organized with multiple owner forms of organization. This is a break with the first five variables that measure the proportion of farms using these multiple owner forms of organization.

Estimation of the equation with Land (proportion of land in farms operated by corporations) as the dependent variable on all 3040 observations yields estimated regression coefficients that are significantly different from zero at the .01 level for all independent variables except Age and Smsa, as presented in Table C.11. The square of the multiple correlation coefficient for this equation is .36736 with regional classification and .26679 when the regional classification variables are not included.

The F statistics for regional intercept and slope differences indicate significant regional differences. Examination of the regional regression results in Table C.12 shows that the regional R^2 values range from .51392 for the Southeast to .08187 for the Southern Plains. The variable Size has estimated regional regression coefficients that are positive and significantly different from zero at the .01 level in all regions except the Southern Plains. The estimated regression coefficients for Fixcst is positive and significantly different from zero at the .01 level only in the Northern Plains, Southeast, and Mountain States. Adjpc has estimated regression coefficients that are not significantly different from zero at the .01 level in six regions, but are negative and

significantly different from zero in the Northeast, Lake States, Appalachia, and Delta States. The estimated regression coefficients for the variable Age is significant at the .01 level only in the Corn Belt. Education has estimated regression coefficients that are significantly different from zero only in the Lake States and the Southeast. The estimated regression coefficients for the variables Smsa and Law are significantly different from zero in the Corn Belt and Northern Plains respectively.

Landsm

The results of the estimation of the equation using Landsm (proportion of land in farms operated by corporations with ten or fewer shareholders) as the dependent variable are given in Tables C.13 and C.14. The estimation of this equation using 3039 observations results in an R^2 value of .29144 when regional classification variables are included, and of .18903 when the regional variables are not included. Estimation of the equation using the regional classification variables results in estimated regression coefficients for Age, Educ, Smsa, and Law that are not significantly different from zero at the .01 level. Without regional classification, coefficients for Educ and Law are significantly different from zero at the .01 level. Signs of estimated regression coefficients follow the pattern of the previously estimated equations.

The F statistics for regional differences in intercept and slope indicates significant regional differences. Regional R^2 values range from .37085 for the Southeast to .02989 for the Southern Plains. The variables Age, Educ, Smsa, and Law that do not have estimated regression

coefficients that are significantly different from zero at the national level, do have significant coefficients in some regions. The variable Age has estimated regression coefficients that are significantly different from zero at the .01 level in the Northeast, Corn Belt, and Northern Plains. Educ has estimated regression coefficients that are significant in the Southeast and Delta States, while the variable Smsa has an estimated regression coefficient that is significantly different from zero in the Corn Belt. The estimated regression coefficient for Law is significantly different from zero in the Northern Plains.

Landlg

The set of independent variables explains only 9.602 percent of the variation in the variable Landlg (proportion of land in farms operated by corporations with more than ten shareholders) even when the regional classification variables are included in the equation. This result is given by the square of the multiple correlation coefficient reported in Table C.15. Only the variables Size, Fixcst, Adjpc, and Educ have estimated regression coefficients that are significantly different from zero at the .01 level using all 3040 observations and when regional classification variables are included. The estimated regression coefficient for Fixcst is not significantly different from zero when the regional classification variables are not included.

Regional differences are also present in this equation. Regional R^2 values range from .03640 for the Northern Plains to .39910 for the Southeast. The Southeast region exhibits only two estimated regression coefficients, Size and Fixcst, that are significantly different from

zero. Three regions, the Northeast, Lake States, and Northern Plains, do not have any estimated regression coefficients that are significantly different from zero.

Partld

The variable Partld is defined to be the proportion of land in farms operated by partnerships. The independent variables of the equation explain only 8.644 percent of the variation in Partld when regional classification variables are used and 3.933 percent when the regional classification variables are not included, as reported in Table C.17. At the national level, only Size and Adjpc have estimated regression coefficients that are significantly different from zero at the .01 level.

Regional differences are again an important factor as shown by the F statistics for regional intercept and slope differences reported in Table C.17. Table C.18 shows that regional squares of multiple correlation coefficients range from .34342 for the Delta States to .01954 for the Southeast. The variables Age and Educ have estimated regression coefficients that are significantly different from zero in the Corn Belt. The estimated regression for Age is negative and significantly different from zero in Appalachia. The Delta States region has estimated regression coefficients that are significantly different from zero at the .01 level for the variables Size, Adjpc, Age, Educ, and Smsa.

Landcp

The variable Landcp is defined as the proportion of land in farms operated by corporations and partnerships. The independent variables used throughout this analysis account for 32.867 percent of the variation

in Landcp when regional classification variables are included and 25.679 percent without regional classification as reported in Table C.19. When the equation is estimated using all 3040 observations, all variables have estimated regression coefficients that are significantly different from zero except Age and Smsa.

As with all other equations, regional differences are significant for this equation. Regional R^2 values range from .57233 for the Delta States to .12846 for the Mountain States. The Delta States region shows significant estimated regression coefficients for all variables except Educ. Only the variable Size has an estimated regression coefficient significantly different from zero in the Mountain States.

Other regressions considered

Table C.21 reports the results of the least squares estimation of an equation having Corp (proportion of farms that are corporations) as the dependent variable and the standard set of independent variables except that the variable Vlbcst (variable production expense per dollar of sales) is substituted for Adjpc (variable production expenses less hired labor and miscellaneous expenses per dollar of sales). The estimated regression coefficient for Vlbcst is positive, reflecting the inclusion of hired labor and miscellaneous production expenses in the variable Vlbcst. However, this coefficient is not significantly different from zero at the .01 level.

Table C.22 shows the results of the estimates of five different equations including the usual independent variables for the 99 counties of Iowa. The findings of this procedure show that for the variable Corp,

only the variable Smsa has an estimated regression coefficient that is significantly different from zero at the .01 level. This result is consistent with the findings for the Corn Belt region outlined previously.

An effort was also made to consider a model based on a natural logarithmic transformation of the independent variables. This transformation makes the basic relationship defined by the model multiplicative rather than additive, which is the case with the ordinary linear model. The basic mathematical development of this model is outlined by Johnston [31, pp. 50-51].

Fifty county observational units were not used in this model because they had zero values for one of the continuous independent variables (Size, Fixcst, Adjpc, Age, Educ), which result in undefined values when natural logarithms are taken. The results of this regression of the proportion of farms that are corporations on the natural log transformation of the continuous independent variables Size, Fixcst, Adjpc, Age, and Educ, and the nontransformed classification variables Region, Smsa, and Law are given in Table C.24. These results are much like the results of the same estimation without the log transformation, given in Table C.1. Results of the transformed model show that the variable LSize, LFixcst, LAdjpc, LAge, and LEduc (the L added to each variable name signifies the transformed value of the variable) all have estimated regression coefficients that are significantly different from zero at the .01 level. However, the variable Smsa is significant only at the .0468 level, and Law is significant only at the .0807 level. This represents a slight reduction in the influence of these two variables from the nontransformed model where the respective probabilities were .0060 and .0097.

The R^2 value for this estimated equation is .44459, which is a slight reduction from the .49429 value for the original model. This reduction in explanatory power indicates that the assumption of a linear relationship between the dependent and independent variables is probably more representative of the true relationship that exists between the independent and dependent variables than the multiplicative representation given by the semi-log model. However, neither model is able to completely explain these relationships.

Another interesting result of the transformed model is that the absolute value of the estimated coefficient for the variable LSize is larger by five decimal places than the equivalent coefficient in the linear model. The other estimated coefficients do not change as dramatically. Changes in the absolute value of estimated regression coefficients due to the semi-log by transformation reflect the effects of the change in scale of measurement of the independent variable brought about by the transformation, and should not be interpreted as reflecting major changes in basic relationships when signs and levels of significance of the estimated coefficients remain the same, as is true in this case.

Use of a double-log transformation was considered [31, p. 51]. However, transformation of the dependent variable Corp to natural log form was considered impractical because of the number of observations that would be lost due to the number of counties reporting no corporate farms. The semi-log transformation results in the loss of 50 observations; whereas a double-log transformation would result in the loss of several hundred observations.

Analysis of Results

This section attempts to analyze the findings presented in Appendices B and C, and to formulate some general conclusions from these results. The traditional "F" and "t" statistics are used to test significance of particular variables, while the squares of the multiple correlation coefficient, R^2, is used to assess the ability of the independent variables to explain the variation exhibited by the dependent variables.

Independent variables

The first null hypothesis formulated in Chapter III states that there is no significant relationship between the proportion of farms that are incorporated and the market value of agricultural commodities sold per farm. This hypothesis is rejected at the .01 level of significance at the national level and in each of the ten regions. The estimated regression coefficient for the variable Size is significantly different from zero for all dependent variables considered at the national level and in almost every region. The hypothesized positive relationship between size of farm as measured by the variable Size and the use of multiple ownership forms of organization, especially the corporation, seems firmly established.

When all 3040 observations are used, the variable Fixcst (estimated value of land, buildings, and equipment per dollar of sales) has estimated regression coefficients that are significantly different from zero at the .01 level for all dependent variables except Part, Landlg, and Partld. A review of the regional estimations shows that the variable Fixcst has

statistically significant coefficients for the dependent variables Corp, Corpsm, Land, and Landsm, but with few exceptions not for the variables defined to deal with corporations having more than ten shareholders and partnerships. Fixcst has little impact in the Corn Belt, having a significant coefficient only for the equation with Landlg as the dependent variable. This last finding seems to say that the level of fixed costs has little impact on the use of the corporation by farms in the Corn Belt.

These results seem to indicate that the level of fixed cost of investment has a definite impact on the choice of form of organization. Counties that have high fixed costs also have a high proportion of farms that are corporations with ten or fewer shareholders. This relationship does not seem to extend to partnerships or corporations with more than ten shareholders. The relationship between fixed cost and the corporation with ten or fewer shareholders does not hold in the Corn Belt and Lake States. The failure of this relationship to hold for partnerships and corporations with more than ten shareholders at the national level may be the result of other factors that are more important in the choice of business organization. For partnerships, the formalization of father-son operations may be of greater importance. For corporations with more than ten shareholders, tax considerations may be of key importance. However, in areas where corporations are an important element of the agricultural sector, such as the Southeast (where corporations with more than ten shareholders account for over four percent of sales of agricultural commodities (Table A.6)), the estimated regression coefficient for Fixcst is significantly different from zero at the .01 level. The level of fixed

costs is related to the use of the corporation in areas where the corporation is used by a large number of farm businesses.

With one exception, whenever the estimated regression coefficient for Adjpc is significantly different from zero, it has a negative sign rather than the anticipated positive sign. If farm firms face different combinations of fixed and variable costs of production due to past financial history or requirements of the production techniques used, and if the variables Adjpc and Fixcst are positively correlated with the actual variable and fixed costs faced by farm firms in each county, then one can conclude from this information that corporate farms tend to have high fixed costs and low variable costs of production. However, caution should be used in interpretation of these findings because all labor costs are excluded from the variable Adjpc due to the data problem mentioned earlier. If a true proxy for labor costs is added to Adjpc, the estimated regression coefficient could become positive, thus verifying the expectations expressed in Chapter III.

The estimated regression coefficient for the variable Age (proportion of farm operators fifty-five years of age or older) is significantly different from zero at the .01 level at the national level only for the variables Corp, Corpsm, and Part. Regional estimates confirm this result. This variable was never found to be significant in the Southeast and Mountain States.

The variable Age was included in the analysis to measure the estate planning motive for use of the corporate form of organization. It was hypothesized that older farm operators would be more likely to organize

their farm business as corporations for estate planning reasons because of the assumed size of their estates and their shorter life expectancies, than younger farm operators. It could be that corporate farm operators are younger than their counterparts on farms organized as sole proprietorships. This would generate a negative regression coefficient for the variable Age.

The estimated regression coefficient for Age is negative in the Southern Plains and Pacific States for the variable Corpsm and at the national level for the variable Part. The fact that Age is not significant for variables dealing with corporations with more than ten shareholders could be the result of the combination of the estate planning motive of older farm operators and the greater use of the corporate form of organization by younger operators who may be more receptive to different forms of organization. The negative coefficient for Age when the variable Part is considered may result from the use of partnerships by younger farm operators who have chosen this form of organization over the corporation for taxation and other reasons.

The variable Educ (percent of farm operators with four or more years of college education) has estimated regression coefficients that are positive and significantly different from zero for all dependent variables except Part, Partld, and Landsm. Also, the variable Educ is never significant in the Northern Plains, and is significant in the Corn Belt for those variables dealing with partnerships, Part, Corpart, Partld, and Landcp. This information tends to support a positive relationship between the educational level of farm operators and the use of the corporate form

of organization. In the Corn Belt, educational level seems to be associated with partnerships rather than corporations. It is also noted that the estimated regression coefficient for Educ is negative and significantly different from zero in Appalachia for the variable Corpart. The estimated regression coefficient for Educ is not significantly different from zero for the variable Corpsm in the Corn Belt, Northern Plains, Appalachia, and the Pacific States.

The Corn Belt, Northern Plains, and Appalachia regions are areas of little corporate activity in agriculture, and the activity that is present does not seem to be influenced by the educational level of farm operators. The variable Educ is significant for most dependent variables in regions of high corporate involvement in agriculture, the Southeast, Delta States, Southern Plains, and Mountain States. However, this pattern of significance for Educ in areas of high corporate activity fails to hold in the Pacific States, where the mean of the variable Educ is the highest in the nation (Table B.21).

The variable Smsa (rural, urban classification variable) failed to explain a significant amount of the variation displayed by the dependent variables used in this analysis. At the national level the estimated regression coefficient for this variable is significantly different from zero only for the dependent variable Corpsm. The Corn Belt is the only region where the variable is consistently significant. The variable was designed to measure the availability of professional information concerning incorporation of the farm firm by proximity of the county to an urban center. A variable such as the number of lawyers per capita, if

available, could have been used as a proxy for the availability of professional information. However, lawyers per capita would not precisely express the relationship between the number of farm operators and the number of lawyers working in the business organization field. The fact that Smsa is significant in the Corn Belt raises the possibility that use of the corporation in farming in most areas of the country is a function of, among other things, the educational level of the farm operator, while in the Corn Belt, the availability of professional information as measured by location to an urban center is a more important consideration than educational level of the operator.

The variable Law (state corporation law classification variable) has estimated regression coefficients that are significantly different from zero for the dependent variables Corp, Corpsm, Corpart, Land, and Landcp. The variable Law is significant for the two regions of the country for which it is relevant. The state of the law does influence the form of organization utilized by farm businesses.

Dependent variables

The extent to which the set of independent variables explains the existence of multiple ownership forms of organization varies among the ten dependent variables considered for analysis. The square of the multiple correlation coefficient, R^2, is used to judge the extent to which the independent variables explain the variation in the dependent variables. The independent variables including the regional classification variables explain 49.429 percent of the variation in the proportion of farms that are corporations at the national level, but only

8.644 percent of the variation in the proportion of land in farms operated by partnerships. Generally, the independent variables are more successful in explaining the variation in the dependent variables dominated by corporations with ten or fewer shareholders, Corp, Corpsm, Corpart, Land, Landsm, and Landcp. Another generalization that can be drawn from these particular regressions is that the independent variables do a better job of explaining the proportion of farm businesses that are corporations or partnerships than the proportion of land in farms operated by these types of farm firms.

The explanatory power of the independent variables also varies across regions for all dependent variables. The Southeast region has the highest R^2 value of any region for all but three dependent variables. The Delta States region is consistently in the top three regions ranked by R^2. The Southeast has a very low R^2 for the variables Part and Partld, while the Delta States rank first for these two dependent variables. Appalachia is consistently low in terms of R^2 value.

These findings indicate that the relationships that hold between the independent variables and the use of the corporation in agriculture, do not hold for the use of the partnership. These relationships are unique to corporations.

Specification errors and data problems

This chapter attempts to review and analyze the results of the least squares estimation of the regression equations outlined in Chapter III. The major finding of this review process is that the set of independent variables, Size, Fixcst, Adjpc, Age, Educ, Smsa, Law, and regional

classification displays great variability in its ability to explain the variation displayed by the ten dependent variables at the national and regional level. Two possible explanations for this phenomenon are errors in specification of the equations and the problems of variable definition.

The equations are not completely specified in terms of the discussion of Chapter III because variables for risk and uncertainty, and coordination of production and processing were not included. There are other forces, such as federal and state tax laws, special regional federal assistance programs, and social traditions, that could have important influence over the type of organization used by a farm firm that were not considered.

Misspecification is often associated with equations that have estimated regression coefficients that are significantly different from zero but generate low R^2 values. The regional estimation of the first equation presented in Table C.2 may be an example. The Southeast region has the highest R^2 value at .72768. The estimated regression coefficients are significantly different from zero for all independent variables except Age and Smsa. The only difference observed in Appalachia is the fact that the estimated regression coefficient for Educ is not significantly different from zero, and yet the R^2 value for this region is only .30982. Specification error may be an appropriate conclusion. Specification errors in this analysis may result from variables that have been left out of the equations at the national level or because variables that may be significant in some regions but not in others were not considered.

The variables used in this analysis may not accurately define the concepts discussed in Chapter III. The variable Smsa is clearly a very crude measure of availability of legal information. State laws other than corporation laws may have restrictive influences on organizational choice by farm operators. Adjpc is not an accurate proxy for variable costs because it does not include the cost of labor. Educ is not a perfect measure of the managerial ability of a farm operator.

Another data problem considered briefly in Chapter III is multicollinearity. The results of the statistical procedures do not show evidence of multicollinearity, as identified by simple correlation coefficients or standard error of estimated regression coefficients.

Summary

The preceding analysis shows that most of the relationships concerning the corporate form of organization in American agriculture discussed in Chapter III are present in the data assembled by the 1969 Census of Agriculture and other sources. The analysis can be summarized by indicating that the variables Size, Fixcst, and Educ are positively related to the proportion of farms that are corporations. The variable Adjpc is negatively related to the proportion of farms that are corporations. The remaining variables, Age, Smsa, and Law, although statistically significant on the national level, prove to be of lesser importance when regional estimation is considered.

Summary of Tests of Null Hypotheses

This chapter concludes with a review of tests of the null hypotheses formulated in Chapter III. The hypotheses are tested using the F statistic computed for estimation on all 3040 observations. The .01 level of significance is used as the criterion for rejection of hypotheses. The results are as follows:

1. Null hypothesis (1) (there is no significant relationship between the proportion of farms that are corporations and the market value of agricultural products sold per farm) is rejected at the .01 level for all dependent variables.
2. Null hypothesis (2) (there is no significant relationship between the proportion of farms that are incorporated and the value of land, buildings, and equipment per dollar of sales of agricultural products) is rejected at the .01 level for all dependent variables except Part, Landlg, and Partld.
3. Null hypothesis (3) (there is no significant relationship between the proportion of farms that are incorporated and variable production expenses per dollar of sales of agricultural products) is rejected at the .01 level for all dependent variables.
4. Null hypothesis (4) (there is no significant relationship between the proportion of farm operators that are fifty-five years of age or older) is rejected at the .01 level for the dependent variables Corp, Corpsm, and Part, and not rejected for all other variables.

5. Null hypothesis (5) (there is no significant relationship between the proportion of farms that are corporations and the percent of farm operators with four or more years of college education) is rejected at the .01 level for all dependent variables except Part, Landsm, and Partld.
6. Null hypothesis (6) (there is no significant difference between the proportion of farms that are incorporated in counties located in an SMSA or having a city of 25,000-50,000, and those not in an SMSA) is rejected at the .01 level only for the variable Corpsm.
7. Null hypothesis (7) (there is no significant difference between the proportion of farms that are incorporated in Oklahoma, Kansas, or North Dakota, and all other states) is rejected at the .01 level for the dependent variables Corp, Corpsm, Corpart, Land, and Landcp.
8. Null hypothesis (8) (there are no significant differences in the proportion of farms that are incorporated in the ten regions of the country) is rejected for all dependent variables.
9. Null hypothesis (9) (there are no significant differences in the relationships defined by hypothesis one through seven due to regional classification) is rejected at the .01 level for all dependent variables.

CHAPTER V. SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Summary

This study has been an attempt to gain a better understanding of the reasons for the use of the corporation as a form of business organization in American agriculture. The first chapter outlined the perceived conflict between the owner-operatorship land tenure goal of American agriculture and the corporate form of organization. Chapter I also outlined the relative position of sole proprietorships, partnerships, and corporations in agriculture and in the economy at large. The purposes of and need for the study were outlined and certain terms were defined. Another section of Chapter I defined the scope of the study by limiting the investigation to operating corporations and eliminating consideration of landlord operations. The objectives of the study were given as follows:

1. To determine differences in characteristics of farm units organized as sole proprietorships, partnerships, or corporations;
2. To identify and measure factors influencing form of business organization used by farm units;
3. To develop an explanatory model of business organization in American agriculture using the factors identified in the second objective above;
4. To analyze policy measures that use form of business organization as the instrumental variable to close the gap between the norms of society and the existing situation.

The second chapter presented a review of the technical and popular literature concerning corporate farming. The articles were grouped into five categories for this review, early studies, incorporating the family farm, general explanatory literature, state empirical studies, and national empirical studies. The national empirical studies included the 1969 Census of Agriculture, which was the first attempt to study the whole population of corporate farms in the United States. Summary tables from the census were included in Appendix A.

The empirical studies reviewed in Chapter II fulfilled the first objective of the study. The studies emphasized different points, but taken as a whole, they present a fairly complete view of the differences that exist between farm units organized as sole proprietorships, partnerships, and corporations.

The third chapter used the literature reviewed in Chapter II to develop a set of factors that are thought to influence the form of business organization used by farm firms, with special emphasis on the use of the corporation. This section was in accordance with the second objective of the study stated in Chapter I. Using the identified factors, a series of null hypotheses were developed to guide the statistical analysis. Chapter III also included discussion of available data and definitions of variables to be used to represent the previously identified factors. The explanatory model of business organization in American agriculture outlined in the third objective is defined as a regression equation, where the variables defined to represent the previously identified factors are used as the independent variables and the proportion of farms organized

as corporations is the dependent variable. The third chapter concluded with a discussion of ordinary least squares regression and analysis of covariance which were the techniques that were used to estimate the equations.

The fourth chapter was a complete review of the findings of the statistical analysis. The summary tables of the ordinary least square estimation process are located in Appendices B and C. The chapter also included an analysis of the findings and a summary of tests of the null hypotheses presented in Chapter III.

Conclusions

The aggregate nature of the data used in this study limits the extent to which conclusions of the statistical analysis can be applied to individual farm businesses. However, the results allow some conclusions to be made that may be useful in future research on this topic.

The thesis that corporate farms are in some way larger than the average farm seems firmly established. The 1969 Census of Agriculture reports that corporate farms are on the average larger in terms of land, value of fixed assets, and sales of agricultural commodities than farms organized by other methods. The least squares regression results show that sales of agricultural commodities are positively related to the proportion of farms that are corporations. The statistical findings also indicate that the estimated dollar value of land, buildings, and equipment per dollar of sales of agricultural commodities is positively related to the proportion of farms that are corporations. The educational

level of farm operators is also positively related to the use of the corporate form of organization. The use of corporate form of organization is found to be negatively related to production expenses per dollar value of sales of agricultural commodities. The variable Adjpc that is used to estimate variable production expenses does not include labor costs. The exclusion of labor expenses may cause the estimated regression coefficient to differ from the true coefficient.

The age of farm operators, as identified by the variable Age, is positively associated with the use of the corporate form of organization for the nation as a whole. However, this relationship does not hold in all regions of the country when regions are considered separately.

The existence of state laws limiting the use of the corporation in agriculture has a significant impact on the use of the corporation by farm businesses in those states. This information is based on three states, North Dakota, Kansas, and Oklahoma, that have had such statutes for many years. Laws prohibiting corporations in agriculture apparently have had an effect in the past. Table A.6 shows that corporations make up .23, .48, and .39 percent of all commercial farms in North Dakota, Kansas, and Oklahoma respectively. The recent statutes in Oklahoma, Missouri, South Dakota, Minnesota and Wisconsin may have an effect on the use of the corporation in agriculture for the next generation; however, these recent statutes are not as restrictive and do allow the use of the corporate form of organization by farm businesses that meet certain requirements, such as having ten or fewer shareholders. The so-called "family" and

"authorized" corporations allowed by these states would probably include a majority of corporate farms in existence as of 1969.

The designation of counties as rural or urban by the variable Smsa had little impact on the analysis. Except for the Corn Belt, the location of a county in a statistical metropolitan statistical area or having an urban center of its own did not have a significant impact on the proportion of farms in the county were corporations. The variable was designed to measure the availability of legal and other professional information concerning incorporation. The variable did not prove significant, however, the concept of information availability is worth pursuing in a similar context in future research. A variable such as the number of lawyers per capita might be an alternative measurement for this concept.

It is also evident that many of the same variables that explain a significant portion of the variation in the existence of corporations with ten or fewer shareholders do not explain the variation in the existence of corporations with more than ten shareholders or partnerships. The variable Size (sales of agricultural commodities per farm) is an exception because it is significant for all three types of organizations.

Partnerships are distinctly different from corporations as stated earlier, and it is not surprising that use of the partnership results from different forces than those associated with corporations. It is interesting that the division of corporations into two classes based on the number of shareholders should result in dramatic differences in least squares regression coefficients. A large but unknown number of the

corporations with ten or fewer shareholders are Subchapter S corporations. If this is the case, the taxation motivation for incorporation applies principally to corporations with more than ten shareholders, which may cause the firms in the two classes to exhibit different characteristics. The variables Age, Adjpc, and Smsa are rarely significant for corporations with more than ten shareholders in the regional estimation of the regression equations while they are significant in several regions for corporations with ten or fewer shareholders. This information may give some support to the theory that there are two types of corporate farms, those that are family oriented and have incorporated for estate planning purposes, and those that are large farm businesses that are not family oriented but organized solely for commercial agricultural production. New state laws prohibiting corporations in agricultural production are aimed at this latter group. The only way to verify this supposition of two distinct types of farm corporations would be with data collected from individual farm businesses. Kansas [33, c. 17 § 5902], Minnesota [40, c. 500.24 (3)], South Dakota [63, c. 249], Missouri [41, § 3], Nebraska [49, § 3-6], and Iowa [32, § 5] now provide for annual reporting of agricultural corporations. This data may prove very helpful in future research.

The regional differences in agricultural production are very apparent from this analysis. For the characteristics under study, some regions exhibit great variability while other regions seem homogeneous. There are also great differences among regions in the use of the corporation by farm businesses. The Corn Belt, Lake States, and Appalachia regions

have few corporations, while the Southeast, Delta States, Southern Plains, Mountain States, Pacific States, and Northeast regions show a higher use of the corporate form of organization.

The set of independent variables explains a greater proportion of the variation in the existence of corporations in the Southeast and Delta States. One explanation of this phenomenon is that corporate farms in these regions exhibit different characteristics than most farms in the regions, and these differences are present in data aggregated to the county level, whereas any distinct characteristics of corporate farms in the three midwestern regions are neutralized by aggregation to the county level. When the independent variables exhibit relatively low variances, there is little chance that they will be able to explain a substantial proportion of the variation in the dependent variable.

The fourth objective of this study given in Chapter I was to analyze policy measures that use form of business organization as the instrumental variable to close the gap between the norm of society and the existing situation. This task centers on the analysis of state statutes that restrict the operation of farm businesses by corporations. The societal norm is usually defined as owner-operatorship of farm businesses.

The estimated regression coefficient for the variable Law was statistically significant in the two regions where it was relevant. This means that past statutes concerning corporate farms have had an influence on the use of the corporation in agriculture. The statutes that have been passed in the last decade apparently have been aimed at preventing farm operations by large, publicly owned corporations. These statutes

generally exempt so-called "family" and "authorized" corporations. The definition of a "family" or "authorized" corporation varies from state to state but usually include:

(1) a limit on the number of shareholders, usually 10 (Kansas, Minnesota, Oklahoma, South Dakota) or 15 (Wisconsin), which is sometimes waived in the case of shareholders related as lineal descendants or by marriage,

(2) limitation of shareholders to natural persons, estates, or trusts,

(3) a limit on the amount of income that can be earned from sources other than farming or ranching (Minnesota, Oklahoma, South Dakota, Missouri).

These statutes also differ with respect to the definition of farming activities and the number of classes of stock that can be issued by an authorized corporation. Earlier in this study it was concluded that corporations with more than ten shareholders have different characteristics than those with ten or fewer shareholders which may justify some of the differential treatment accorded corporations with ten or fewer shareholders by these statutes.

The owner-operatorship goal does not depend on form of business organization. By most definitions of an owner-operator, a corporate farm manager may be classified as an owner-operator if the resources necessary to carry out the farming operation are owned or controlled personally or indirectly through ownership of corporate stock. Only when the manager cannot exert control over and derive returns from essential resources is

the owner-operatorship goal not reached. It is not clear what portion of corporate stock a farm manager must own to be considered an owner-operator. The previously mentioned state statutes have attempted to draw this line at a number of points. This line is as difficult to draw conceptually as it is in the reality of the agricultural sector of the economy.

Remembering that the variable Size is positively related to the existence of corporations, if new technologies stimulate the need for larger optimal sized farms, the resulting trend toward larger farm units may cause an increasing proportion of farm businesses to turn to the corporate form of organization because of its unique features that can be used to attract capital from nontraditional sources and insure that returns to resource owners are distributed in proportion to resource contributed. If there are restrictions on the use of the corporation by farm businesses, optimal sized farms may not be forthcoming in certain segments of agriculture. Restrictions on the use of the corporation may force farm businesses to consider use of other multiple ownership forms of organization, such as the partnership, which may decrease firm efficiency because the mechanisms that distribute returns from production may not insure that resource owners are compensated in proportion to resources contributed to the firm. Any future legislative attempts to further the goal of owner-operatorship should take these findings into consideration.

Future Research

Future research efforts in the field should concentrate in two areas, data collection and model specification. One aspect of the data problem is the collection of data from individual farm businesses that can be used without aggregation. This thrust should keep the conceptual variables, namely, size, fixed cost of investment, variable production costs, education, risk, et cetera, clearly in mind so that many of the definitional compromises that were made in this study do not have to be made in the future. Future research should also seek to specify the regression equations more completely. With better specification, a more complete recognition of regional differences may be built into the equations.

The 1974 Census of Agriculture represents the second enumeration of farms, where farms are classified by form of organization. These data were not available at the time this study was completed. Some attempt should be made to examine the changes that have occurred from the 1969 Census. With more time series observations, attempts can be made to examine lagged effects of changes in the independent variables on the use of the corporation and other multiple ownership forms of organization. State time series data collected on a year by year basis, could be used to supplement and check national time series information generated by the census.

Another specification problem should be consideration of different forms of the basic linear equation. Transformation of the data should be tried to test the assumption of linearity of the relationships

represented in the model. Further efforts at a double-log transformation may be a promising alternative to the linear equation, although sample size would be sacrificed.

The corporation is less widely used in American agriculture than elsewhere in the economy, and yet it plays an important role in some segments of agricultural production, as evidenced by the data reported by the 1969 Census of Agriculture given in Tables A.6-A.10. This study has been an attempt to gain additional insight into this little understood phenomenon.

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APPENDIX A. MISCELLANEOUS TABLES

Table A.1. Farms and acres operated by corporations and commercial farms, by region, United States, 1968[a]

Region	Commercial farms[b]		Corporations[c]		Corporations as percentage of commercial farms		Average acres per farm	
	Farms	Land in Farms	Farms	Land in Farms	Farms	Land in Farms	Commercial farms	Corporations
	Number	1,000 acres	Number	1,000 acres	Percent	Percent	Acres	Acres
Northeast	118,900	26,300	1,178	769	1	3	221	653
Lake States	223,800	54,800	932	736	-[d]	1	245	790
Corn Belt	417,800	114,050	1,377	1,258	-[d]	1	273	914
Northern Plains	203,500	173,600	861	3,784	-[d]	2	853	4,395
Appalachian	219,300	40,250	749	974	-[d]	2	184	1,300
Southeast (excluding Fla.)	90,500	28,600	383	645	-[d]	2	316	1,684
Florida	13,500	12,500	1,215	3,864	9	31	926	3,180
Delta States	79,100	30,700	835	2,090	1	7	388	2,503
Southern Plains	115,500	146,100	490	4,533	-[d]	3	1,265	9,251
Mountain	82,000	209,650	2,860	32,669	3	16	2,557	11,423
Pacific (excluding Calif.)	36,200	33,800	673	1,776	2	5	934	2,639
California	39,000	33,100	1,673	6,153	4	19	849	3,678
48 States	1,639,100	903,450	13,226	59,251	1	7	551	4,480

[a]Source: U.S. Department of Agriculture [78, p. 4].

[b]All farms having gross sales of $2,500 or more. Estimates for 1968 projected from 1964 Census of Agriculture.

[c]County unit basis: i.e., corporations having operations in more than one county or State were counted at each such location. Number of corporations not strictly comparable with census number of farms.

[d]Less than 0.5 percent.

Table A.1. Continued

Region	Commercial farms[b]		Corporations[c]		Corporations as percentage of commercial farms		Average acres per farm	
	Farms	Land in Farms	Farms	Land in Farms	Farms	Land in Farms	Commercial farms	Corporations
	Number	1,000 acres	Number	1,000 acres	Percent	Percent	Acres	Acres
Alaska	213	1,722[e]	5	-[f]	2	--	8,084[e]	--
Hawaii	2,821	2,254[e]	82	805	3	36	799[e]	9,817
U.S. Total	1,642,134	907,426	13,313	60,056	1	7	553	4,511

[e]1964 Census of Agriculture.

[f]Only 2 reported acres so total not estimated.

Table A.2. Number of tax returns and business receipts of farms by form of business organization, United States, 1957-69[a]

Year	Number of tax returns				Business receipts			
	Sole proprietorships	Partnerships	Corporations	Total	Sole proprietorships	Partnerships	Corporations	Total
	Thousands				Billion dollars			
1957	3,343.2	136.6	8.2[b]	3,488.0	22.4	3.4	1.9[c]	27.7
1958	3,374.5	134.8	9.6[b]	3,518.9	24.7	3.5	2.3[c]	30.5
1959	3,386.9	131.5	10.8[b]	3,529.2	26.3	3.6	2.5[c]	32.4
1960	3,358.6	126.2	11.8[b]	3,496.6	25.5	3.6	2.8[c]	31.9
1961	3,362.1	126.9	13.1[b]	3,502.1	26.3	3.9	3.4[c]	33.6
1962	3,319.3	122.7	15.3[b]	3,457.3	28.3	4.1	4.0[c]	36.4
1963	3,208.1	119.7	16.2	3,344.0	28.3	3.8	4.9	37.0
1964	3,130.0	117.8	17.6	3,265.4	27.7	4.0	3.6	35.3
1965	3,063.6	116.3	18.5	3,198.4	29.9	4.1	4.4	38.4
1966	3,020.5	114.6	18.9	3,154.0	33.3	4.5	4.9	42.7
1967	3,030.1	114.3	21.8	3,166.2	33.1	4.6	5.3	43.0
1968	3,042.6	109.9	20.0	3,172.5	35.0	4.7	5.2	44.9
1969[d]	3,089.5	108.8	20.5	3,218.8	37.6	5.5	7.8	50.9

[a]Source: U.S. Department of Agriculture [83, p. 2].

[b]Estimated at 69 percent of agricultural, forestry and fisheries.

[c]Estimated at 67 percent of agricultural, forestry and fisheries.

[d]Data for 1969 became available after the analysis described in this report was completed.

Table A.2. Continued

Year	Number of tax returns				Business Receipts			
	Sole proprietorships	Partnerships	Corporations	Total	Sole proprietorships	Partnerships	Corporations	Total
	Percent				Percent			
1957	95.9	3.9	0.2	100.0	80.9	12.3	6.8	100.0
1958	95.9	3.8	.3	100.0	81.0	11.5	7.5	100.0
1959	96.0	3.7	.3	100.0	81.2	11.1	7.7	100.0
1960	96.0	3.6	.4	100.0	79.9	11.3	8.8	100.0
1961	96.0	3.6	.4	100.0	78.3	11.6	10.1	100.0
1962	96.0	3.6	.4	100.0	77.7	11.3	11.0	100.0
1963	95.9	3.6	.5	100.0	76.5	10.3	13.2	100.0
1964	95.9	3.6	.5	100.0	78.5	11.3	10.2	100.0
1965	95.8	3.6	.6	100.0	77.9	10.7	11.4	100.0
1966	95.8	3.6	.6	100.0	78.0	10.5	11.5	100.0
1967	95.7	3.6	.7	100.0	77.0	10.7	12.3	100.0
1968	95.9	3.5	.6	100.0	77.9	10.5	11.6	100.0
1969[d]	96.0	3.4	.6	100.0	73.9	10.8	15.3	100.0

Table A.3. Number and percentage of farm tax returns, by form of business organization and by business receipt class, United States, 1967[a]

Business Receipts	Number of tax returns			
	Proprietorships	Partnerships	Corporations	Total
		Number		
Less than $5,000	1,578,808	23,270	3,654	2,084,021
$5,000 - $9,999	461,556	13,733		
$10,000 - $24,999	593,145	22,351	2,476	617,972
$25,000 - $49,999	211,773	19,744	2,868	234,385
$50,000 - $99,999	71,253	14,350	3,043	88,616
$100,000 - $199,999	18,845	6,577	3,314	28,736
$200,000 - $499,999	5,313	2,860	3,158	11,331
$500,000 - $999,999	1,479	462	977	3,783
$1,000,000 or more			865	
Not reported	84,890	10,950	1,406	97,246
Total	3,030,062	114,297	21,761	3,166,120

[a]Source: U.S. Department of Agriculture [83, p. 4].

Table A.3. Continued

Business Receipts	Percentage of tax returns			
	Sole Proprietorships	Partnerships	Corporations	Total
	Percent			
Less than $5,000	52.1	20.4	16.8	65.8
$5,000 - $9,000	15.3	12.0		
$10,000 - $24,999	19.6	19.5	11.4	19.5
$25,000 - $49,999	7.0	17.3	13.2	7.4
$50,000 - $99,999	2.4	12.5	14.0	2.8
$100,000 - $199,999	.6	5.8	15.2	.9
$200,000 - $499,999	.2	2.5	14.5	.4
$500,000 - $999,999	-[b]	.4	1.5	.1
$1,000,000 or more			4.0	
Not reported	2.8	9.6	6.4	3.1
Total	100.0	100.0	100.0	100.0

[b]Less than 0.05 percent.

Table A.4. Amount and percentage of farm business receipts by form of business organization and by business receipt class, United States, 1967[a]

Business Receipts	Business receipts			
	Sole Proprietorships	Partnerships	Corporations	Total
	Million dollars			
Less than $5,000	2,841	55	15	6,374
$5,000 - $9,999	3,362	101		
$10,000 - $24,999	9,477	374	42	9,893
$25,000 - $49,999	7,128	706	105	7,939
$50,000 - $99,999	4,811	995	226	6,032
$100,000 - $199,999	2,556	912	472	3,910
$200,000 - $499,999	1,533	825	974	3,332
$500,000 - $999,999	1,428	597	656	5,473
$1,000,000 or more			2,792	
Total	33,136	4,565	5,282	42,983

[a]Source: U.S. Department of Agriculture [83, p. 4].

Table A.4. Continued

Business Receipts	Percentage of receipts			
	Sole Proprietorships	Partnerships	Corporations	Total
		Percent		
Less than $5,000	8.6	1.2		
			0.3	14.8
$5,000 - $9,999	10.2	2.2		
$10,000 - $24,999	28.6	8.2	.8	23.0
$25,000 - $49,999	21.5	15.4	2.0	18.5
$50,000 - $99,999	14.5	21.8	4.3	14.0
$100,000 - $199,999	7.7	20.0	8.9	9.2
$200,000 - $499,999	4.6	18.1	18.4	7.8
$500,000 - $999,999			12.4	
	4.3	13.1		12.7
$1,000,000 or more			52.9	
Total	100.0	100.0	100.0	100.0

Table A.5. Rate of return on equity for all farm corporations and those reporting net profit, and percentage of corporations reporting losses, by asset size group, United States, average 1963-68[a]

Asset size	All farm corporations				Farm corporations with profit	
	Return on equity[b]	Coefficient of variation[c]	Proportion reporting losses[b]	Coefficient of variation[c]	Return to equity[b]	Coefficient of variation[c]
	Percent					
Less than $50,000	15	192	60	8	43	40
$50,000 - $99,999	3	177	47	10	22	19
$100,000 - $499,999	4	36	39	6	16	19
$500,000 - $999,999	3	59	37	15	13	14
$1,000,000 - $4,999,999	5	43	35	7	15	12
$5,000,000 - $9,999,999	8	42	30	25	14	19
$10,000,000 - $24,999,999	6	85	32	38	13	25
$25,000,000 or more	12	22	21	[d]	13	21
Total	5	38	48	10	15	7

[a]Source: U.S. Department of Agriculture [83, p. 18].
[b]Average of the average annual rates.
[c](Standard deviation ÷ mean) x 100.
[d]Less than 5 years.

Table A.6. Percent of all class 1-5 farms, land in class 1-5 farms, and sales of agricultural products by class 1-5 farms that are corporations[a]

State	All corporations			Ten or fewer shareholders[b]			More than ten shareholders[c]		
	% Farms[d]	% Land[e]	% Sales[f]	% Farms	% Land	% Sales	% Farms	% Land	% Sales
Maine	2.37	7.52	12.87	2.29	6.99	10.98	.08	.53	1.89
New Hampshire	2.77	3.47	10.28	2.65	3.37	9.52	.12	.10	.76
Vermont	.97	1.64	2.40	.93	1.58	2.29	.04	.06	.11
Massachusetts	5.35	12.95	29.54	4.91	7.42	21.82	.44	5.53	7.72
Rhode Island	4.98	8.81	25.81	4.76	8.67	25.79	.22	.24	.02
Connecticut	4.10	10.16	30.88	3.79	6.96	18.05	.31	3.20	12.83
New York	1.56	2.67	9.72	1.51	2.50	8.65	.66	.17	1.07
New Jersey	4.45	9.56	19.77	4.27	9.18	18.19	.18	.38	1.58
Pennsylvania	1.02	2.57	9.23	.94	2.10	6.47	.08	.48	2.76
Delaware	1.92	8.44	13.41	1.78	6.61	8.32	.14	1.38	5.09
Maryland	1.78	4.74	8.53	1.63	3.80	7.27	.15	.94	1.26
Northeast	1.80	3.88	12.44	1.70	3.30	9.69	.10	.58	2.75
Michigan	.63	1.64	5.69	.57	1.47	5.19	.06	.17	.50
Wisconsin	.74	2.57	5.23	.66	1.97	4.04	.08	.60	1.19
Minnesota	.52	1.14	4.34	.46	.93	3.79	.06	.21	.55
Lake States	.62	1.67	4.94	.55	1.34	4.16	.07	.33	.77

[a]Source: U.S. Department of Commerce, Bureau of the Census, Census of Agriculture 1969 [87, Table 24] and [88, Tables 3, 4, and 9].

[b]Corporations having ten or fewer shareholders which would include all Subchapter S corporations.

[c]Corporations having more than ten shareholders.

[d]Percent of all class 1-5 farms.

[e]Percent of all land in class 1-5 farms.

[f]Percent of all sales of agricultural products by class 1-5 farms.

Table A.6. Continued

State	All corporations			Ten or fewer shareholders[b]			More than ten shareholders[c]		
	% Farms[d]	% Land[e]	% Sales[f]	% Farms	% Land	% Sales	% Farms	% Land	% Sales
Ohio	.86	1.64	6.15	.78	1.52	4.91	.08	.12	1.24
Indiana	.87	1.59	5.25	.81	1.50	4.39	.06	.09	.86
Illinois	.60	1.31	3.75	.53	1.06	3.11	.06	.25	.64
Iowa	.50	1.18	2.70	.45	1.00	2.00	.06	.18	.70
Missouri	.63	1.65	3.68	.59	1.55	3.39	.04	.09	.29
Corn Belt	.63	1.43	3.85	.57	1.27	3.15	.06	.10	.71
North Dakota	.23	.43	.97	.21	.41	.79	.02	.01	.18
South Dakota	.65	3.67	4.25	.61	3.57	3.58	.03	.10	.67
Nebraska	1.04	6.97	12.61	.97	5.93	11.47	.07	1.04	1.14
Kansas	.48	1.29	13.57	.42	1.13	9.87	.06	.16	4.70
Northern Plains	.63	3.11	10.30	.58	2.77	8.22	.05	.34	2.07
Virginia	1.46	4.65	8.88	1.35	3.95	7.39	.11	.71	1.49
West Virginia	1.04	1.93	8.09	.95	1.75	7.48	.09	.18	.61
North Carolina	1.57	4.26	5.83	1.46	3.45	5.07	.11	.81	.76
Kentucky	.64	1.51	2.76	.59	1.33	2.47	.04	.18	.29
Tennessee	.60	1.53	4.07	.56	1.14	3.12	.04	.39	.95
Appalachia	1.05	2.77	5.41	.98	2.29	4.60	.07	.48	.81
South Carolina	2.06	5.46	7.36	1.96	4.69	6.73	.09	.77	.63
Georgia	1.29	4.42	6.18	1.20	4.02	5.73	.09	.40	.45
Florida	8.31	31.90	44.86	7.66	20.28	34.16	.65	11.63	10.70
Alabama	.86	2.27	4.07	.78	11.97	3.17	.08	.30	.90
Southeast	2.64	12.66	19.78	2.45	8.91	15.53	.19	3.95	4.24

Table A.6. Continued

State	All corporations			Ten or fewer shareholders[b]			More than ten shareholders[c]		
	% Farms[d]	% Land[e]	% Sales[f]	% Farms	% Land	% Sales	% Farms	% Land	% Sales
Mississippi	1.55	6.38	11.57	1.46	5.66	10.22	.09	.73	1.35
Arkansas	1.38	5.61	10.81	1.22	4.88	9.69	.17	.73	1.12
Louisiana	2.33	9.89	9.47	1.86	5.89	6.23	.47	4.00	3.24
Delta	1.67	6.95	10.74	1.45	5.41	9.06	.22	1.54	1.68
Oklahoma	.39	1.52	12.21	.36	1.48	8.12	.03	.04	4.09
Texas	.99	6.91	24.03	.88	4.96	16.69	.11	1.95	6.34
Southern Plains	.81	5.85	20.58	.72	4.28	14.75	.09	1.57	5.83
Montana	3.60	16.35	15.64	3.48	15.42	14.11	.12	.93	1.53
Idaho	2.65	15.52	21.60	2.57	14.69	18.75	.08	.83	2.85
Wyoming	5.92	32.01	25.00	5.67	29.82	23.77	.25	2.19	1.23
Colorado	3.09	11.37	39.00	2.89	9.76	35.28	.20	1.61	3.82
New Mexico	2.97	20.78	33.53	2.66	17.32	31.90	.31	3.46	1.63
Arizona	8.87	31.45	54.50	7.95	19.74	49.42	.92	11.71	5.08
Utah	2.23	12.91	12.08	2.02	12.07	11.19	.21	.85	.89
Nevada	6.12	41.21	31.19	5.74	34.10	24.90	.38	7.10	6.29
Mountain States	3.58	20.79	31.95	3.37	17.96	28.92	.21	2.83	3.03
Washington	2.37	8.15	18.85	2.20	7.87	13.49	.17	.28	5.36
Oregon	2.51	15.51	15.61	2.41	14.49	14.86	.10	1.21	.75
California	3.58	15.06	31.55	3.18	10.52	25.39	.40	4.54	6.16
Pacific	3.09	13.62	28.09	2.80	10.88	22.59	.29	2.74	5.50
Alaska	6.08	34.08	8.24	4.73	30.86	8.20	1.35	3.21	.04
Hawaii	5.69	60.33	83.15	3.94	26.02	28.19	1.75	24.31	54.96
United States	1.22	8.81	14.13	1.12	7.25	11.24	.10	1.56	2.89

Table A.7. Percent distribution of farms within each source of farm sales by type of organization[a]

	All farms	Individual	Partnership
Total	100.0	67.8	17.4
Grains	100.0	78.6	17.6
Tobacco	100.0	76.7	16.9
Cotton and cottonseed	100.0	68.3	19.5
Field seeds, hay, forage, and silage	100.0	75.3	17.4
Other field crops	100.0	54.1	17.8
Vegetables, sweet corn, and melons	100.0	44.8	23.3
Fruits, nuts, and berries	100.0	53.2	19.2
Poultry and poultry products	100.0	70.6	11.3
Dairy products	100.0	77.8	18.2
Dairy cattle and calves	100.0	78.7	16.8
Other cattle and calves	100.0	58.8	18.0
Hogs, sheep, and goats	100.0	77.5	18.6
Other livestock and livestock products	100.0	73.7	13.4
Nursery and greenhouse products	100.0	37.2	12.4
Forest products	100.0	76.4	16.3

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, p. 133].

Corporation			
Total	10 shareholders or fewer	More than 10 shareholders	Other
14.1	11.2	2.9	0.6
3.3	2.8	0.5	0.6
5.8	3.3	2.5	0.7
11.7	9.6	2.1	0.5
6.8	5.9	0.8	0.6
27.7	15.0	12.7	0.4
31.7	25.9	5.9	0.2
24.2	18.0	6.2	3.5
17.8	15.1	2.7	0.4
3.7	3.4	0.3	0.4
4.1	3.8	0.3	0.4
22.8	18.1	4.6	0.4
3.4	2.9	0.4	0.5
12.4	11.1	1.3	0.5
50.0	42.2	7.8	0.3
6.3	4.9	1.5	1.0

Table A.8. Percent distribution of farms within each organizational classification by type of product sold[a]

	All farms	Individual	Partnership
Total	100.0	100.0	100.0
Grains	18.2	21.1	18.4
Tobacco	2.2	2.5	2.2
Cotton and cottonseed	2.4	2.4	2.6
Field seeds, hay, forage, and silage	2.0	2.2	2.0
Other field crops	3.4	2.8	3.5
Vegetables, sweet corn, and melons	2.9	1.9	3.8
Fruits, nuts, and berries	3.9	3.0	4.3
Poultry and poultry products	8.8	9.1	5.7
Dairy products	12.2	13.9	12.7
Dairy cattle and calves	2.1	2.4	2.0
Other cattle and calves	29.4	25.5	30.3
Hogs, sheep, and goats	9.8	11.2	10.4
Other livestock and livestock products	0.4	0.5	0.3
Nursery and greenhouse products	2.0	1.1	1.4
Forest products	0.3	0.4	0.3

[a]Source: U.S. Department of Commerce [88, p. 133].

Corporation			
Total	10 shareholders or fewer	More than 10 shareholders	Other
100.0	100.0	100.0	100.0
4.3	4.6	2.9	17.6
0.9	0.6	1.9	2.7
2.0	2.0	1.7	2.0
1.0	1.1	0.6	2.0
6.7	4.6	15.1	2.5
6.4	6.6	5.8	1.0
6.6	6.2	8.2	23.5
11.0	11.8	8.1	5.6
3.2	3.7	1.2	7.9
0.6	0.7	0.2	1.6
47.4	47.4	47.1	22.8
2.3	2.6	1.4	8.8
0.4	0.4	0.2	0.4
7.1	7.6	5.5	1.1
0.1	0.1	0.2	0.6

Table A.9. Characteristics of selected commodity production by type of organization[a]

	All farms	Sole Proprietorship[b]	Partner-ship	Corporation with 10 or fewer shareholders	Corporation with more than 10 shareholders	Other
Irish Potatoes						
percent acres in production	100.00	61.76	22.61	14.47	.91	.24
percent acres under irrigation	56.07	52.57	54.96	72.94	62.52	19.33
percent of all irrigated land in production	100.00	57.91	22.16	18.83	1.02	.08
percent of production (hundred weight)	100.00	59.94	22.67	16.39	.82	.18
Alfalfa Seed						
percent acres in production	100.00	66.29	17.45	13.58	2.20	.48
percent acres under irrigation	51.20	40.46	58.31	92.68	99.78	42.73
percent of all irrigated land in production	100.00	51.59	19.57	24.22	4.23	.38
percent of production (pounds)	100.00	55.53	18.28	23.14	2.80	.25

All Vegetables[c]						
percent acres in production	100.00	54.78	20.70	16.72	7.46	.34
percent acres under irrigation	49.83	40.13	57.59	77.33	38.15	43.93
percent of all irrigated land in production	100.00	44.12	23.93	25.95	5.71	.30
Tomatoes[c]						
percent acres in production	100.00	51.30	26.36	18.79	3.35	.20
percent acres under irrigation	67.44	54.95	77.81	85.92	74.45	52.39
percent of all irrigated land in production	100.00	41.80	30.41	23.36	3.70	.16
Sweet Corn[c]						
percent acres in production	100.00	63.95	14.84	9.00	11.84	.37
percent acres under irrigation	27.89	26.35	30.84	56.58	10.17	44.07
percent of all irrigated land in production	100.00	60.43	16.41	18.26	4.32	.59

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, part 2, Table 11].
[b]Defined as individual or family farm by the Census of Agriculture.
[c]Production information not published in this report.

Table A.9. Continued

	All farms	Sole Proprietorship[b]	Partner-ship	Corporation with 10 or fewer shareholders	Corporation with more than 10 shareholders	Other
Strawberries						
percent acres in production	100.00	70.67	17.80	7.26	4.01	.25
percent acres under irrigation	63.34	56.99	72.37	84.28	96.29	61.02
percent of all irrigated land in production	100.00	63.59	20.34	9.66	6.16	.24
percent of production (pounds)	100.00	57.28	24.40	12.75	5.33	.24
Land in Orchards[c,d]						
percent acres in production	100.00	56.51	18.78	15.55	6.00	3.15
percent acres under irrigation	57.45	53.03	62.01	63.76	75.52	44.74
percent of all irrigated land in production	100.00	52.15	20.27	17.26	7.86	2.46

Apples						
percent acres in production	100.00	62.82	17.31	16.86	2.46	.55
percent of production (pounds)	100	59.19	18.40	19.39	2.60	.43
Peaches						
percent acres in production	100.00	61.44	21.86	12.12	4.26	.32
percent of production (pounds)	100.00	58.91	23.03	12.02	5.80	.23
Pears						
percent acres in production	100.00	63.05	22.64	11.49	2.28	.55
percent of production (pounds)	100.00	55.83	26.04	13.20	4.31	.62
Cherries						
percent acres in production	100.00	73.12	17.66	7.26	1.50	.46
percent of production (pounds)	100.00	72.46	18.13	7.24	1.82	.35

[d]Land in orchards is defined by the census as "land in bearing and nonbearing fruit orchards, citrus or other groves, vineyards, and nut trees of all ages including land on which the fruit crop failed. It does not include acres in abandoned plantings or data for places with less than 20 fruit or nut trees."

Table A.9. Continued

	All farms	Sole Proprietorship[b]	Partner-	Corporation with 10 or fewer Shareholders	Corporation with more than 10 Shareholders	Other
Grapes						
percent acres in production	100.00	65.82	18.26	11.95	3.36	.61
percent of production (pounds)	100.00	64.74	20.58	10.59	3.58	.51

Table A.10. Selected commodity production by type of organization[a]

	All farms	Sole Proprietorship[b]	Partnership	Corporation with 10 or fewer shareholders	Corporation with more than 10 shareholders	Other
Soybeans for beans						
percent acres in production	100.00	78.86	18.02	2.27	.32	.53
percent acres under irrigation	1.86	1.81	1.71	4.84	1.31	1.89
percent of irrigated land in production	100.00	76.73	16.60	5.91	.22	.54
percent of production (bushels)	100.00	79.13	18.02	2.04	.27	.54
Field corn for grain						
percent acres in production	100.00	79.74	17.90	1.62	.18	.56
percent acres under irrigation	6.41	6.17	6.31	18.79	19.45	4.50
percent of irrigated land in production	100.00	76.72	17.59	4.76	.54	.39
percent of production (bushels)	100.00	79.22	18.33	1.72	.18	.55

Field corn for silage						
percent acres in production	100.00	76.60	19.55	3.17	.23	.44
percent acres under irrigation	12.91	11.53	14.70	34.29	26.63	13.29
percent of irrigated land in production	100.00	68.39	22.25	8.43	.47	.45
percent of production (tons gn. wt)	100.00	75.14	20.40	3.78	.27	.31
Sorghum for grain or seed						
percent acres in production	100.00	81.54	15.49	2.08	.33	.55
percent acres under irrigation	26.93	25.40	30.55	54.89	65.75	22.57
percent of irrigated land in production	100.00	65.23	23.59	9.40	1.15	.64
percent of production (bushels)	100.00	80.94	15.96	2.22	.38	.50

[a]Source: U.S. Department of Commerce, Bureau of the Census [88, part 2, Table 11].

[b]Defined by the Census of Agriculture as individual or family farms.

Table A.10. Continued

	All farms	Sole Proprietorship[b]	Partnership	Corporation with 10 or fewer shareholders	Corporation with more than 10 shareholders	Other
Wheat						
percent acres in production	100.00	81.29	15.83	2.21	.14	.53
percent acres under irrigation	4.52	4.12	5.10	13.83	31.61	3.53
percent of irrigated land in production	100.00	73.99	17.85	6.75	1.00	.41
percent of production (bushels)	100.00	80.80	16.10	2.43	.18	.50
Oats for grain						
percent acres in production	100.00	82.39	15.86	1.17	.08	.49
percent acres under irrigation	1.63	1.38	1.65	18.31	7.04	1.20
percent of irrigated land in production	100.00	70.01	16.10	13.18	.35	.36
percent of production (bushels)	100.00	82.12	16.19	1.18	.08	.42

Barley for grain						
percent acres in production	100.00	74.59	18.16	5.52	.98	.75
percent acres under irrigation	17.25	13.31	19.59	53.28	75.16	10.18
percent of irrigated land in production	100.00	57.59	20.63	17.05	4.29	.44
percent of production (bushels)	100.00	73.03	18.55	6.54	1.23	.65
Rye for grain						
percent acres in production	100.00	81.16	15.23	2.37	.32	.50
percent acres under irrigation	1.68	1.40	1.78	4.60	37.45	8.40
percent of irrigated land in production	100.00	67.24	16.09	6.47	7.08	2.52
percent of production (bushels)	100.00	81.70	15.12	2.32	.31	.55

APPENDIX B. COMMON STATISTICS AND CORRELATION MATRICES

The variables used in the regression models are referred to by name only in the following tables. The definitions of these variables are given below:

Corp: the proportion of class 1-5 farms in each county that are corporations

Corpsm: the proportion of class 1-5 farms in each county that are corporations with ten or fewer shareholders

Corplg: the proportion of class 1-5 farms in each county that are corporations with more than ten shareholders

Part: the proportion of class 1-5 farms in each county that are partnerships

Corpart: the proportion of class 1-5 farms in each county that are corporations or partnerships

Land: the proportion of land in class 1-5 farms in each county that is operated by corporations

Landsm: the proportion of land in class 1-5 farms in each county that is operated by corporations with ten or fewer shareholders

Landlg: the proportion of land in class 1-5 farms in each county that is operated by corporations with more than ten shareholders

Partld: the proportion of land in class 1-5 farms in each county that is operated by partnerships

Landcp: the proportion of land in class 1-5 farms in each county that is operated by corporations and partnerships

Size: average dollar value of all sales of agricultural commodities per class 1-5 farm

Fixcst: value of land, buildings, and equipment per dollar value of sales of agricultural commodities by class 1-5 farms

Vlbcst: total production expenses per dollar value of sales of agricultural commodities by class 1-5 farms

Adjpc: total production expenses less hired labor and miscellaneous expenses per dollar value of sales of agricultural commodities by class 1-5 farms

Age: proportion of farm operators in each county that are 55 years of age or older

Educ: percent of farm operators in each county that have four or more years of college or university education

Smsa: classification variable such that

Smsa = 1 if the county is in a standard metropolitan statistical area or has a city 25,000-50,000 in population

= 0 otherwise

Law: classification variable such that

Law = 1 if the county is in Oklahoma, Kansas, or North Dakota

= 0 otherwise

Region: classification variables dividing the country into ten geographic regions

Table B.1. Common statistics for the United States
Number of counties observed = 3040

Variable	Mean	Variance	Standard Deviation
Corp	.01722	.00073	.02699
Corpsm	.01577	.00062	.02500
Corplg	.00145	.00003	.00556
Corpart	.14053	.00234	.04834
Land	.04650	.00792	.08902
Landsm	.03435	.00476	.06900
Landlg	.00452	.00089	.02991
Landcp	.20653	.01363	.11675
Size	25,528	470,990,973	21,702
Fixcst	5.4025	1.0934	3.3067
Vlbcst	.81430	.01024	.10119
Adjpc	.47563	.01623	.12739
Age	.41415	.00550	.07416
Educ	5.0853	17.965	4.2385

Table B.2. Complete correlation matrix for the United States
Number of counties observed = 3040

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.0663 (.0005)[a]	.9800 (.0001)	.4475 (.0001)	.6100 (.0001)	.7117 (.0001)	.0060 (.7390)	.5780 (.0001)
Part		1.000	.0607 (.0012)	.0488 (.0072)	.8304 (.0001)	.0661 (.0005)	.6174 (.0001)	.0512 (.0050)
Corpsm			1.000	.2606 (.0001)	.5954 (.0001)	.6812 (.0001)	.0036 (.8379)	.6042 (.0001)
Corplg				1.000	.2886 (.0001)	.3914 (.0001)	.0132 (.5254)	.0890 (.0001)
Corpart					1.000	.4498 (.0001)	.4932 (.0001)	.3634 (.0001)
Land						1.000	-.0008 (.9644)	.7789 (.0001)
Partld							1.000	.0179 (.6760)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

[a]Numbers in parentheses are significance probabilities or probabilities that the computed correlation coefficients as large or larger than the ones presented occurred by chance assuming that the random variables are truly independent.

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.3489	.5466	.5169	.1638	.2539	-.1337	.0151	.4465
(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.5913)	(.0001)
.0322	.4502	.1448	.0625	-.1780	-.2263	-.1124	.0847
(.0721)	(.0001)	(.0001)	(.0009)	(.0001)	(.0001)	(.0001)	(.0001)
.2342	.5218	.5069	.1536	.2475	-.1359	.0161	.4278
(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.6225)	(.0001)
.6402	.3070	.2301	.1041	.1196	-.0382	.0010	.2434
(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0330)	(.9551)	(.0001)
.2204	.6624	.4035	.1410	.0005	-.2542	-.0807	.3165
(.0001)	(.0001)	(.0001)	(.0001)	(.9746)	(.0001)	(.0001)	(.0001)
.4487	.7620	.4180	.1554	.2532	-.0894	-.0074	.3252
(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.6862)	(.0001)
-.0175	.6470	.1095	.0496	-.0677	-.1300	-.0284	.1005
(.6631)	(.0001)	(.0001)	(.0064)	(.0004)	(.0001)	(.1128)	(.0001)
.1622	.6055	.3560	.1341	.2166	-.0696	-.0189	.2513
(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0003)	(.2976)	(.0001)
1.000	.3308	.2377	.0396	.0729	-.0667	.0072	.1823
	(.0001)	(.0001)	(.0272)	(.0002)	(.0005)	(.6930)	(.0001)
	1.000	.3897	.1506	.1493	-.1523	-.0241	.3131
		(.0001)	(.0001)	(.0001)	(.0001)	(.1812)	(.0001)
		1.000	-.1522	.2573	.1704	-.1600	.3838
			(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
			1.000	.1889	-.1788	.1695	.2322
				(.0001)	(.0001)	(.0001)	(.0001)
				1.000	.5995	.2236	.3146
					(.0001)	(.0001)	(.0001)
					1.000	.1185	.0175
						(.0001)	(.6627)
						1.000	.1995
							(.0001)
							1.000

Table B.3. Common statistics for the Northeast region
Number of counties observed = 237

Variable	Mean	Variance	Standard Deviation
Corp	.02725	.00125	.03540
Corpsm	.02532	.00110	.03320
Corplg	.00194	.00015	.01204
Corpart	.13263	.00264	.05140
Land	.05581	.00786	.08866
Landsm	.04541	.00415	.06440
Landlg	.00815	.00374	.06112
Landcp	.19345	.01074	.10364
Size	29,593	177,855,690	13,336
Fixcst	3.9302	7.7637	2.7863
Adjpc	.40908	.00944	.09714
Age	.40097	.00579	.07610
Educ	6.5430	20.898	4.5714

Table B.4. Complete correlation matrix for the Northeast region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.0596 (.6364)	.9404 (.0001)	.3474 (.0001)	.7296 (.0001)	.6607 (.0001)	.1022 (.1127)	.5861 (.0001)
Part		1.000	.1327 (.0388)	-.1903 (.0036)	.7262 (.0001)	.0440 (.5076)	.7186 (.0001)	.2279 (.0007)
Corpsm			1.000	.0077 (.9023)	.7385 (.0001)	.4713 (.0001)	.1461 (.0230)	.6334 (.0001)
Corplg				1.000	.1089 (.0905)	.6428 (.0001)	-.1025 (.1114)	-.0233 (.7223)
Corpart					1.000	.4852 (.0001)	.5626 (.0001)	.5598 (.0001)
Land						1.000	-.0418 (.5291)	.7092 (.0001)
Partld							1.000	.0825 (.2027)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.3263	.6218	.4283	.2563	.3846	-.2693	.4317	.4417
(.0001)	(.0001)	(.0001)	(.0002)	(.0001)	(.0001)	(.0001)	(.0001)
-.1701	.4363	.0939	.1614	.0708	-.2757	.0578	.0041
(.0086)	(.0001)	(.1456)	(.0123)	(.2773)	(.0001)	(.6205)	(.9486)
.0020	.4843	.4600	.2163	.3578	-.2523	.4062	.4267
(.9745)	(.0001)	(.0001)	(.0012)	(.0001)	(.0003)	(.0001)	(.0001)
.9536	.4930	-.0091	.1573	.1444	-.0960	.1494	.1221
(.0001)	(.0001)	(.8847)	(.0146)	(.0246)	(.1367)	(.0202)	(.0573)
.1082	.7272	.3593	.2871	.3134	-.3743	.3369	.3070
(.0925)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
.6869	.8323	.2952	.1652	.3911	-.2040	.3521	.2579
(.0001)	(.0001)	(.0001)	(.0105)	(.0001)	(.0020)	(.0001)	(.0002)
-.1420	.5191	.2275	.0095	.1107	-.1295	.0963	.0670
(.0271)	(.0001)	(.0007)	(.8793)	(.0852)	(.0436)	(.1355)	(.3052)
.0012	.6524	.3748	.1010	.3949	-.1808	.3542	.2502
(.9829)	(.0001)	(.0001)	(.1169)	(.0001)	(.0054)	(.0001)	(.0003)
1.000	.5088	-.0021	.1374	.1199	-.1013	.1447	.1079
	(.0001)	(.9728)	(.0324)	(.0618)	(.1156)	(.0243)	(.0935)
	1.000	.3787	.1466	.3959	-.2464	.3546	.2578
		(.0001)	(.0226)	(.0001)	(.0003)	(.0001)	(.0002)
		1.000	-.2906	.5302	.1590	.1307	.2948
			(.0001)	(.0001)	(.0136)	(.0418)	(.0001)
			1.000	-.0095	-.3022	.2937	.2276
				(.8788)	(.0001)	(.0001)	(.0007)
				1.000	.2732	.3205	.3626
					(.0001)	(.0001)	(.0001)
					1.000	-.1703	-.1392
						(.0085)	(.0302)
						1.000	.4154
							(.0001)
							1.000

Table B.5. Common statistics for the Lake States region
Number of counties observed = 238

Variable	Mean	Variance	Standard Deviation
Corp	.00898	.00026	.01614
Corpsm	.00825	.00025	.01567
Corplg	.00073	.00000	.00156
Corpart	.11851	.00122	.03499
Land	.02036	.00164	.04045
Landsm	.01399	.00045	.02132
Landlg	.00171	.00003	.00529
Landcp	.15581	.00331	.05755
Size	17,714	29,652,136	5,445.4
Fixcst	3.9786	1.4998	1.2247
Adjpc	.37915	.00574	.07573
Age	.37047	.00373	.06108
Educ	2.4418	4.0655	2.0163

Table B.6. Complete correlation matrix for the Lake States region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	-.1084 (.0912)	.9956 (.0001)	.3430 (.0001)	.3593 (.0001)	.5951 (.0001)	-.1483 (.0208)	.4390 (.0001)
Part		1.000	-.1013 (.1150)	-.1035 (.1072)	.8888 (.0001)	-.1149 (.0730)	.8403 (.0001)	-.1731 (.0075)
Corpsm			1.000	.2534 (.0002)	.3640 (.0001)	.5542 (.0001)	-.1414 (.0274)	.4446 (.0001)
Corplg				1.000	.0610 (.6488)	.5879 (.0001)	-.1137 (.0762)	.0759 (.2415)
Corpart					1.000	.1665 (.0098)	.7204 (.0001)	.0400 (.5466)
Land						1.000	-.1417 (.0271)	.4671 (.0001)
Partld							1.000	-.1580 (.0140)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.0643	.2971	.4367	.0616	.2608	-.1640	.2645	.3656
(.6756)	(.0001)	(.0001)	(.6539)	(.0002)	(.0109)	(.0001)	(.0001)
-.0291	.6064	.3367	.2628	-.0435	.0300	-.1132	.1281
(.6600)	(.0001)	(.0001)	(.0002)	(.5112)	(.6502)	(.0777)	(.0455)
.0278	.2740	.4342	.0668	.2548	-.1643	.2692	.3475
(.6732)	(.0001)	(.0001)	(.3053)	(.0002)	(.0108)	(.0001)	(.0001)
.3840	.3203	.1554	-.0339	.1381	-.0454	.0312	.2898
(.0001)	(.0001)	(.0156)	(.6094)	(.0312)	(.5068)	(.6375)	(.0001)
.0023	.7062	.5174	.2750	.0794	-.0474	.0157	.2889
(.9701)	(.0001)	(.0001)	(.0001)	(.2199)	(.5268)	(.8046)	(.0001)
.1576	.5871	.3018	-.0702	.2037	-.1043	.1087	.3353
(.0142)	(.0001)	(.0001)	(.2801)	(.0020)	(.1043)	(.0904)	(.0001)
-.0287	.7182	.2752	.2815	-.0560	-.0402	-.1354	.0658
(.6645)	(.0001)	(.0001)	(.0001)	(.6056)	(.5443)	(.0346)	(.3132)
.1214	.1991	.2205	-.0967	.1013	-.1435	.1288	.0682
(.0582)	(.0024)	(.0010)	(.1330)	(.1152)	(.0252)	(.0444)	(.2948)
1.000	.0874	.0817	-.0603	-.1232	-.1040	-.0537	-.0077
	(.1757)	(.2062)	(.6428)	(.0544)	(.1054)	(.5855)	(.9016)
	1.000	.4372	.1809	.0974	-.1062	-.0343	.2895
		(.0001)	(.0053)	(.1298)	(.0981)	(.6050)	(.0001)
		1.000	.0366	.2159	.1767	-.2492	.2050
			(.5814)	(.0012)	(.0064)	(.0003)	(.0019)
			1.000	.4661	.1552	.1264	.2722
				(.0001)	(.0157)	(.0485)	(.0001)
				1.000	.6480	.1644	.4521
					(.0001)	(.0107)	(.0001)
					1.000	-.1325	.1586
						(.0387)	(.0137)
						1.000	.2663
							(.0001)
							1.000

Table B.7. Common statistics for the Corn Belt region
Number of counties observed = 495

Variable	Mean	Variance	Standard Deviation
Corp	.00753	.00011	.01050
Corpsm	.00694	.00010	.00991
Corplg	.00060	.00000	.00126
Corpart	.11851	.00122	.03499
Land	.01481	.00042	.02061
Landsm	.01306	.00032	.01788
Landlg	.00142	.00004	.00640
Landcp	.18902	.00268	.05179
Size	21,209	73,121,974	8,551.1
Fixcst	5.1515	2.4449	1.5636
Adjpc	.46710	.00758	.08709
Age	.38618	.00320	.05658
Educ	3.6545	3.5095	1.8734

Table B.8. Complete correlation matrix for the Corn Belt region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.0035 (.9351)	.9940 (.0001)	.5116 (.0001)	.2914 (.0001)	.7321 (.0001)	.0539 (.2295)	.6176 (.0001)
Part		1.000	.0084 (.8459)	-.0368 (.5814)	.9576 (.0001)	.0347 (.5521)	.9055 (.0001)	.0446 (.6768)
Corpsm			1.000	.4149 (.0001)	.2943 (.0001)	.7254 (.0001)	.0602 (.1779)	.6179 (.0001)
Corplg				1.000	.1121 (.0121)	.3935 (.0001)	-.0247 (.5897)	.2840 (.0001)
Corpart					1.000	.2440 (.0001)	.8817 (.0001)	.2205 (.0001)
Land						1.000	.0642 (.1498)	.9284 (.0001)
Partld							1.000	.0852 (.0548)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.6051	.3395	.3156	.1365	.1459	-.3315	.1893	.3088
(.0001)	(.0001)	(.0001)	(.0027)	(.0015)	(.0001)	(.0001)	(.0001)
-.0207	.8216	.2868	.0571	-.3761	-.2279	-.2938	.1704
(.6517)	(.0001)	(.0001)	(.2018)	(.0001)	(.0001)	(.0001)	(.0003)
.5851	.3424	.3030	.1243	.1454	-.3205	.1953	.3005
(.0001)	(.0001)	(.0001)	(.0058)	(.0016)	(.0001)	(.0001)	(.0001)
.4387	.1345	.2460	.1594	.0722	-.2407	.0405	.2088
(.0001)	(.0031)	(.0001)	(.0007)	(.1047)	(.0001)	(.6278)	(.0001)
.1545	.8837	.3653	.0939	-.3178	-.3135	-.2266	.2519
(.0009)	(.0001)	(.0001)	(.0344)	(.0001)	(.0001)	(.0001)	(.0001)
.5132	.4553	.2707	.1043	.2040	-.1810	.1008	.2581
(.0001)	(.0001)	(.0001)	(.0192)	(.0001)	(.0002)	(.0234)	(.0001)
-.0421	.9177	.2137	.0804	-.2897	-.2270	-.1758	.2023
(.6481)	(.0001)	(.0001)	(.0702)	(.0001)	(.0001)	(.0003)	(.0001)
.2380	.4456	.2121	.1353	.2136	-.1513	.1015	.2547
(.0001)	(.0001)	(.0001)	(.0029)	(.0001)	(.0011)	(.0225)	(.0001)
1.000	.1667	.2563	-.0521	.0508	-.1472	.0577	.1647
	(.0004)	(.0001)	(.2460)	(.2586)	(.0014)	(.1967)	(.0005)
	1.000	.2984	.1132	-.1772	-.2746	-.1168	.2832
		(.0001)	(.0113)	(.0002)	(.0001)	(.0092)	(.0001)
		1.000	-.1305	-.2011	-.0734	-.4093	.1934
			(.0040)	(.0001)	(.0986)	(.0001)	(.0001)
			1.000	-.2065	-.5215	.0608	.1879
				(.0001)	(.0001)	(.1730)	(.0001)
				1.000	.6509	.2710	-.0615
					(.0001)	(.0001)	(.1683)
					1.000	.0226	-.2431
						(.6216)	(.0001)
						1.000	.2786
							(.0001)
							1.000

Table B.9. Common statistics for the Northern Plains region
Number of counties observed = 318

Variable	Mean	Variance	Standard Deviation
Corp	.00876	.00022	.01489
Corpsm	.00806	.00017	.01310
Corplg	.00070	.00001	.00249
Corpart	.13176	.00098	.03133
Land	.02310	.00267	.05165
Landsm	.01773	.00120	.03466
Landlg	.00053	.00001	.00274
Landcp	.00493	.00010	.01025
Size	27,844	242,170,678	15,562
Fixcst	5.0256	2.2618	1.5039
Adjpc	.47694	.01683	.12974
Age	.38341	.00261	.05110
Educ	3.4574	5.0004	2.2362

Table B.10. Complete correlation matrix for the Northern Plains region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.1406 (.0117)	.9923 (.0001)	.7578 (.0001)	.5898 (.0001)	.8842 (.0001)	-.0014 (.9779)	.4444 (.0001)
Part		1.000	.1478 (.0082)	.0627 (.2640)	.8825 (.0001)	.1473 (.0084)	.5984 (.0001)	.0733 (.1894)
Corpsm			1.000	.6711 (.0001)	.5920 (.0001)	.8881 (.0001)	.0076 (.8879)	.5098 (.0001)
Corplg				1.000	.4112 (.0001)	.6137 (.0001)	-.0485 (.6072)	-.0255 (.6548)
Corpart					1.000	.5402 (.0001)	.4874 (.0001)	.2709 (.0001)
Land						1.000	.0319 (.5778)	.6310 (.0001)
Partld							1.000	.0693 (.2155)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.1916	.6494	.4292	.0469	.1236	.0181	.0033	.1499
(.0009)	(.0001)	(.0001)	(.5905)	(.0258)	(.7467)	(.9527)	(.0074)
.0065	.5000	.0665	.1272	-.1967	-.2274	-.1830	-.0343
(.9046)	(.0001)	(.2351)	(.0219)	(.0007)	(.0002)	(.0014)	(.5491)
.1739	.6582	.4315	.0438	.1200	.0179	.0030	.1436
(.0023)	(.0001)	(.0001)	(.5575)	(.0304)	(.7498)	(.9567)	(.0101)
.2305	.4196	.2956	.0500	.1079	.0143	.0038	.1407
(.0001)	(.0001)	(.0001)	(.6218)	(.0516)	(.7956)	(.9448)	(.0116)
.0963	.7163	.2581	.1260	-.1017	-.1749	-.1477	.0432
(.0825)	(.0001)	(.0001)	(.0232)	(.0665)	(.0019)	(.0083)	(.5510)
.1503	.7563	.2981	.0630	.0702	-.0183	.0050	.0545
(.0073)	(.0001)	(.0001)	(.2614)	(.2090)	(.7440)	(.9263)	(.6663)
.0457	.6780	-.0049	.0569	-.1143	-.0842	.0383	.0385
(.5781)	(.0001)	(.9274)	(.3124)	(.0391)	(.1302)	(.5037)	(.5016)
.1701	.5094	.2054	-.0923	.1083	.0975	.0340	-.0195
(.0027)	(.0001)	(.0005)	(.0964)	(.0505)	(.0787)	(.5532)	(.7290)
1.000	.1405	.0599	-.0082	.0024	-.0060	.0890	.0146
	(.0117)	(.2869)	(.8793)	(.9647)	(.9109)	(.1091)	(.7909)
	1.000	.2160	.0836	-.0232	-.0685	.0287	.0653
		(.0003)	(.1327)	(.6840)	(.2205)	(.6160)	(.2441)
		1.000	-.5444	.4788	.6203	-.0827	.2873
			(.0001)	(.0001)	(.0001)	(.1370)	(.0001)
			1.000	-.3805	-.7310	.2014	.0290
				(.0001)	(.0001)	(.0006)	(.6129)
				1.000	.8141	.1672	.3502
					(.0001)	(.0031)	(.0001)
					1.000	.1217	.3053
						(.0281)	(.0001)
						1.000	.3786
							(.0001)
							1.000

Table B.11. Common statistics for the Appalachia region
Number of counties observed = 462

Variables	Mean	Variance	Standard Deviation
Corp	.01081	.00017	.01292
Corpsm	.00992	.00015	.01220
Corplg	.00088	.00001	.00358
Corpart	.14249	.00201	.04480
Land	.02292	.00149	.03817
Landsm	.01837	.00095	.03076
Landlg	.00262	.00035	.01860
Landcp	.18285	.00774	.08799
Size	14,563	59,506,796	7,714
Fixcst	4.9078	4.2287	2.0564
Adjpc	.44169	.01193	.10925
Age	.44282	.00602	.07759
Educ	3.8506	10.315	3.2116

Table B.12. Complete correlation matrix for the Appalachia region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	-.0277 (.5592)	.9610 (.0001)	.3339 (.0001)	.2620 (.0001)	.6436 (.0001)	-.0157 (.7366)	.6051 (.0001)
Part		1.0000	-.0171 (.7150)	-.0418 (.6266)	.9574 (.0001)	.0562 (.2259)	.7409 (.0001)	.0814 (.0765)
Corpsm			1.000	.0600 (.1947)	.2610 (.0001)	.6104 (.0001)	-.0066 (.8819)	.6381 (.0001)
Corplg				1.000	.0561 (.2270)	.2423 (.0001)	-.0339 (.5263)	.0090 (.8409)
Corpart					1.000	.2401 (.0001)	.7108 (.0001)	.2534 (.0001)
Land						1.000	.0369 (.5653)	.8087 (.0001)
Partld							1.000	.0587 (.2053)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.2227	.2653	.4538	.1267	.1817	-.0845	.0462	.2668
(.0001)	(.0001)	(.0001)	(.0065)	(.0003)	(.0660)	(.6773)	(.0001)
-.0105	.6802	.0696	-.0032	-.2578	-.2578	-.1562	-.0906
(.8167)	(.0001)	(.1313)	(.9437)	(.0001)	(.0001)	(.0011)	(.0487)
.1232	.2589	.4549	.0879	.1719	-.0920	.0236	.2436
(.0080)	(.0001)	(.0001)	(.0558)	(.0004)	(.0452)	(.6188)	(.0001)
.3836	.0751	.0876	.1576	.0697	.0087	.0861	.1328
(.0001)	(.1029)	(.0565)	(.0010)	(.1306)	(.8462)	(.0609)	(.0045)
.0542	.7333	.1982	.0335	-.1964	-.2733	-.1375	-.0104
(.2436)	(.0001)	(.0001)	(.5202)	(.0001)	(.0001)	(.0034)	(.8183)
.5348	.4665	.4516	-.0263	.1834	.0066	-.0276	.2544
(.0001)	(.0001)	(.0001)	(.5796)	(.0002)	(.8822)	(.5617)	(.0001)
-.0216	.9012	.0689	.0130	-.2474	-.2638	-.1559	-.0438
(.6489)	(.0001)	(.1350)	(.7768)	(.0001)	(.0001)	(.0011)	(.6500)
.0677	.4027	.3596	-.0250	.1125	-.0257	-.0153	.1101
(.1424)	(.0001)	(.0001)	(.5981)	(.0148)	(.5893)	(.7423)	(.0170)
1.000	.2129	.1445	-.0249	.1060	.0370	-.0465	.2093
	(.0001)	(.0023)	(.6008)	(.0214)	(.5662)	(.6805)	(.0001)
	1.000	.2569	.0001	-.1394	-.2307	-.1499	.0716
		(.0001)	(.9933)	(.0031)	(.0001)	(.0016)	(.1203)
		1.000	-.2336	.4389	.2935	-.0935	.3251
			(.0001)	(.0001)	(.0001)	(.0418)	(.0001)
			1.000	.1442	-.1638	.2213	.4001
				(.0023)	(.0007)	(.0001)	(.0001)
				1.000	.7217	.1873	.3622
					(.0001)	(.0002)	(.0001)
					1.000	.0604	.0691
						(.1916)	(.1341)
						1.000	.1607
							(.0009)
							1.000

Table B.13. Common statistics for the Southeast region
Number of counties observed = 337

Variables	Mean	Variance	Standard Deviation
Corp	.02645	.00175	.04179
Corpsm	.02448	.00151	.03881
Corplg	.00197	.00002	.00467
Corpart	.13939	.00327	.05715
Land	.06397	.01370	.11705
Landsm	.04291	.00660	.08124
Landlg	.00715	.00115	.03390
Landcp	.20830	.01853	.13614
Size	30,983	919,564,531	30,324
Fixcst	4.4374	6.2046	2.4909
Adjpc	.57643	.01220	.11045
Age	.43677	.00726	.08520
Educ	5.5112	23.792	4.8777

Table B.14. Complete correlation matrix for the Southeast region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.1072 (.0463)	.9960 (.0001)	.6724 .0001)	.7965 (.0001)	.7813 (.0001)	-.0843 (.1183)	.6722 (.0001)
Part		1.000	.1001 (.0630)	.1279 (.0178)	.6854 (.0001)	.0694 (.2009)	.5121 (.0001)	.0494 (.6309)
Corpsm			1.000	.6039 (.0001)	.7893 (.0001)	.7599 (.0001)	-.0871 (.1065)	.6856 (.0001)
Corplg				1.000	.5695 (.0001)	.6777 (.0001)	-.0310 (.5771)	.3191 (.0001)
Corpart					1.000	.6136 (.0001)	.2498 (.0001)	.5217 (.0001)
Land						1.000	-.1433 (.0084)	.7372 (.0001)
Partld							1.000	-.0974 (.0706)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.5471	.6171	.7551	.1072	.1421	-.3707	-.0548	.5814
(.0001)	(.0001)	(.0001)	(.0464)	(.0089)	(.0001)	(.3168)	(.0001)
.1134	.3917	.0628	-.0220	-.0573	-.2491	-.0157	.0871
(.0352)	(.0001)	(.2486)	(.6901)	(.2947)	(.0001)	(.7718)	(.1062)
.5112	.5969	.7419	.0927	.1365	-.3730	-.0548	.5746
(.0001)	(.0001)	(.0001)	(.0852)	(.0117)	(.0001)	(.3168)	(.0001)
.6481	.5626	.5924	.1884	.1369	-.2181	-.0351	.4290
(.0001)	(.0001)	(.0001)	(.0008)	(.0115)	(.0002)	(.5281)	(.0001)
.4690	.6895	.5904	.0650	.0691	-.4226	-.0496	.4782
(.0001)	(.0001)	(.0001)	(.2321)	(.2030)	(.0001)	(.6330)	(.0001)
.5321	.7669	.5991	.1863	.1803	-.2745	-.0052	.5142
(.0001)	(.0001)	(.0001)	(.0009)	(.0013)	(.0001)	(.9211)	(.0001)
-.0854	.5252	-.0536	.0184	-.1149	-.1105	-.0093	.0021
(.1135)	(.0001)	(.6725)	(.7358)	(.0328)	(.0400)	(.8586)	(.9676)
.3857	.5707	.5153	.0233	.0912	-.2485	-.0333	.4765
(.0001)	(.0001)	(.0001)	(.6738)	(.0905)	(.0001)	(.5493)	(.0001)
1.000	.4022	.5842	.0880	-.0479	-.1979	.0122	.3646
	(.0001)	(.0001)	(.1029)	(.6152)	(.0005)	(.8178)	(.0001)
	1.000	.4804	.1721	.0805	-.3077	-.0105	.4435
		(.0001)	(.0019)	(.1362)	(.0001)	(.8415)	(.0001)
		1.000	-.2045	.0560	-.1534	-.1782	.3935
			(.0004)	(.3059)	(.0050)	(.0014)	(.0001)
			1.000	.2356	-.3080	.3293	.1998
				(.0001)	(.0001)	(.0001)	(.0005)
				1.000	.3777	.0787	.1702
					(.0001)	(.1457)	(.0021)
					1.000	-.0293	-.1996
						(.5993)	(.0005)
						1.000	.1583
							(.0039)
							1.000

Table B.15. Common statistics for the Delta States region
Number of counties observed = 220

Variables	Mean	Variance	Standard Deviation
Corp	.01826	.00048	.02193
Corpsm	.01538	.00036	.01909
Corplg	.00287	.00005	.00686
Corpart	.13377	.00310	.05567
Land	.05514	.00778	.08821
Landsm	.03278	.00335	.05784
Landlg	.01267	.00187	.04319
Landcp	.21580	.02039	.14280
Size	24,445	153,842,696	12,403
Fixcst	5.5169	7.1092	2.6663
Adjpc	.52975	.02504	.15824
Age	.42105	.00436	.06605
Educ	4.00732	4.3858	2.0942

Table B.16. Complete correlation matrix for the Delta States region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.4723 (.0001)	.9534 (.0001)	.5442 (.0001)	.7490 (.0001)	.8180 (.0001)	.2119 (.0020)	.7034 (.0001)
Part		1.000	.4052 (.0001)	.3824 (.0001)	.9378 (.0001)	.4300 (.0001)	.5923 (.0001)	.3598 (.0001)
Corpsm			1.000	.2658 (.0002)	.6802 (.0001)	.7495 (.0001)	.1709 (.0108)	.7542 (.0001)
Corplg				1.000	.5018 (.0001)	.5299 (.0001)	.2020 (.0030)	.1506 (.0239)
Corpart					1.000	.6455 (.0001)	.5287 (.0001)	.5476 (.0001)
Land						1.000	.1538 (.0212)	.7077 (.0001)
Partld							1.000	.1393 (.0365)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.4713	.6530	.5461	.3376	.1893	-.5509	-.2517	.2975
(.0001)	(.0001)	(.0001)	(.0001)	(.0051)	(.0001)	(.0004)	(.0001)
.3029	.6785	.3033	.4670	-.0073	-.6646	-.1089	.1004
(.0001)	(.0001)	(.0001)	(.0001)	(.9103)	(.0001)	(.1032)	(.1337)
.2778	.5821	.5288	.2683	.2122	-.5151	-.2284	.3604
(.0001)	(.0001)	(.0001)	(.0002)	(.0020)	(.0001)	(.0010)	(.0001)
.7335	.4681	.2747	.3328	.0148	-.3280	-.1693	-.0517
(.0001)	(.0001)	(.0001)	(.0001)	(.8219)	(.0001)	(.0115)	(.5479)
.4134	.7673	.4431	.4841	.0691	-.7166	-.1810	.1926
(.0001)	(.0001)	(.0001)	(.0001)	(.3087)	(.0001)	(.0071)	(.0044)
.6107	.7249	.4439	.3289	.1473	-.5106	-.2133	.2420
(.0001)	(.0001)	(.0001)	(.0001)	(.0272)	(.0001)	(.0019)	(.0006)
.1257	.7921	.2234	.3075	.0323	-.4500	.1145	-.0399
(.0593)	(.0001)	(.0012)	(.0001)	(.6389)	(.0001)	(.0863)	(.5635)
.2340	.5343	.4088	.1548	.1115	-.4161	-.1862	.2455
(.0008)	(.0001)	(.0001)	(.0204)	(.0950)	(.0001)	(.0058)	(.0005)
1.000	.4649	.1990	.2609	.0347	-.3075	-.1542	-.0181
	(.0001)	(.0034)	(.0003)	(.6149)	(.0001)	(.0208)	(.7860)
	1.000	.4299	.4176	.1135	-.6291	-.0519	.1217
		(.0001)	(.0001)	(.0891)	(.0001)	(.5501)	(.0680)
		1.000	-.1925	.1674	-.1848	-.2584	.2336
			(.0044)	(.0124)	(.0061)	(.0003)	(.0008)
			1.000	.1497	-.6339	.0049	.1355
				(.0248)	(.0001)	(.9401)	(.0420)
				1.000	.2575	.2496	.3660
					(.0003)	(.0004)	(.0001)
					1.000	.2315	-.0678
						(.0009)	(.3175)
						1.000	.0805
							(.2322)
							1.000

Table B.17. Common statistics for the Southern Plains region
Number of counties observed = 331

Variables	Mean	Variance	Standard Deviation
Corp	.01038	.00016	.01252
Corpsm	.00917	.00012	.01083
Corplg	.00121	.00001	.00331
Corpart	.12991	.00197	.04439
Land	.02615	.00334	.05783
Landsm	.01757	.00209	.04568
Landlg	.00081	.00005	.00700
Landcp	.19897	.01173	.10829
Size	26,677	743,293,685	27,263
Fixcst	7.9981	13.027	3.6093
Adjpc	.55820	.01356	.11645
Age	.46337	.00454	.06739
Educ	8.10426	32.015	5.6582

Table B.18. Complete correlation matrix for the Southern Plains region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.5234 (.0001)	.9703 (.0001)	.6100 (.0001)	.7129 (.0001)	.4501 (.0001)	.2629 (.0001)	.2617 (.0001)
Part		1.000	.4518 (.0001)	.5026 (.0001)	.9707 (.0001)	.2025 (.0004)	.4816 (.0001)	.0926 (.0885)
Corpsm			1.000	.4000 (.0001)	.6456 (.0001)	.4497 (.0001)	.2671 (.0001)	.2924 (.0001)
Corplg				1.000	.5857 (.0001)	.2321 (.0001)	.1210 (.0260)	.0335 (.5513)
Corpart					1.000	.2937 (.0001)	.4705 (.0001)	.1500 (.0064)
Land						1.000	.0699 (.2020)	.7158 (.0001)
Partld							1.000	.0619 (.2602)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.2225	.4530	.3978	.0935	.1430	-.0782	-.2201	.4946
(.0002)	(.0001)	(.0001)	(.0854)	(.0090)	(.1521)	(.0002)	(.0001)
.0302	.4978	.3406	.0617	-.1601	-.3060	-.1651	.4706
(.5904)	(.0001)	(.0001)	(.2622)	(.0038)	(.0001)	(.0030)	(.0001)
.1820	.4562	.3774	.0937	.1539	-.0685	-.2233	.4708
(.0013)	(.0001)	(.0001)	(.0848)	(.0052)	(.2114)	(.0002)	(.0001)
.2466	.2218	.2706	.0473	.0374	-.0718	-.1024	.3313
(.0001)	(.0002)	(.0001)	(.6044)	(.5054)	(.1897)	(.0593)	(.0001)
.0876	.5375	.3925	.0771	-.0915	-.2739	-.1980	.5269
(.1073)	(.0001)	(.0001)	(.1577)	(.0927)	(.0001)	(.0006)	(.0001)
.1506	.5906	.1789	-.0300	.0125	-.0665	-.0743	.2044
(.0062)	(.0001)	(.0015)	(.5932)	(.8155)	(.2256)	(.0739)	(.0004)
.0289	.8463	.2012	-.0668	-.0319	-.0949	-.0939	.2286
(.6067)	(.0001)	(.0005)	(.2235)	(.5699)	(.0809)	(.0842)	(.0001)
.0573	.4323	.1276	-.0652	.0437	.0644	-.0358	.0205
(.2989)	(.0001)	(.0191)	(.2346)	(.5656)	(.2411)	(.5240)	(.7122)
1.000	.1038	.0624	.0264	.0542	.0034	-.0421	.1760
	(.0559)	(.2562)	(.6373)	(.6736)	(.9496)	(.5482)	(.0017)
	1.000	.2583	-.0700	-.0191	-.1122	-.1156	.2940
		(.0001)	(.2009)	(.7287)	(.0387)	(.0333)	(.0001)
		1.000	-.3369	.0438	.2275	-.4576	.4193
			(.0001)	(.5666)	(.0001)	(.0001)	(.0001)
			1.000	.1376	-.4143	.2274	.1133
				(.0118)	(.0001)	(.0001)	(.0369)
				1.000	.5888	-.0572	-.1236
					(.0001)	(.2998)	(.0230)
					1.000	-.0293	-.2193
						(.6015)	(.0002)
						1.000	-.0838
							(.1240)
							1.000

Table B.19. Common statistics for the Mountain States region
Number of counties observed = 271

Variables	Mean	Variance	Standard Deviation
Corp	.04402	.00167	.04082
Corpsm	.04096	.00144	.03801
Corplg	.00306	.00009	.00940
Corpart	.17435	.00332	.05763
Land	.15789	.02191	.14801
Landsm	.11836	.01799	.13413
Landlg	.00694	.00174	.04169
Landcp	.33415	.02764	.16624
Size	36,166	952,034,154	30,855
Fixcst	7.0994	46.950	6.8520
Adjpc	.45565	.01746	.13215
Age	.39797	.00422	.06499
Educ	7.4122	23.240	4.8208

Table B.20. Complete correlation matrix for the Mountain States region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.0261 (.6730)	.9741 (.0001)	.4039 (.0001)	.7262 (.0001)	.5390 (.0001)	-.1516 (.0120)	.3516 (.0001)
Part		1.000	.0283 (.6479)	-.0012 (.9820)	.7062 (.0001)	-.0358 (.5641)	.4495 (.0001)	-.0447 (.5295)
Corpsm			1.000	.1864 (.0025)	.7094 (.0001)	.5463 (.0001)	-.1444 (.0164)	.3920 (.0001)
Corplg				1.000	.2852 (.0001)	.1319 (.0281)	-.0742 (.2209)	-.0581 (.6578)
Corpart					1.000	.3572 (.0001)	.2017 (.0012)	.2183 (.0006)
Land						1.000	-.1186 (.0482)	.7121 (.0001)
Partld							1.000	-.0842 (.1633)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.3068	.3931	.3851	.2224	.2037	.0370	-.1788	.4843
(.0001)	(.0001)	(.0001)	(.0005)	(.0011)	(.5510)	(.0035)	(.0001)
-.0091	.2256	.1965	-.1154	-.0001	-.0252	-.0496	.0493
(.8760)	(.0004)	(.0015)	(.0546)	(.9935)	(.6828)	(.5790)	(.5757)
.2330	.4036	.3751	.2300	.1987	-.0007	-.1615	.4082
(.0003)	(.0001)	(.0001)	(.0003)	(.0014)	(.9877)	(.0077)	(.0001)
.3767	.0749	.1554	.0358	.0813	.1636	-.1234	.4528
(.0001)	(.2167)	(.0101)	(.5642)	(.1785)	(.0070)	(.0398)	(.0001)
.2088	.4336	.4078	.0782	.1442	.0089	-.1608	.3770
(.0009)	(.0001)	(.0001)	(.1964)	(.0166)	(.8789)	(.0080)	(.0001)
.3083	.8224	.3033	.1544	.2106	.0775	-.1500	.1788
(.0001)	(.0001)	(.0001)	(.0106)	(.0008)	(.2007)	(.0129)	(.0035)
-.0444	.4674	.0651	-.1125	-.1244	-.0448	-.0315	.0140
(.5261)	(.0001)	(.2857)	(.0610)	(.0382)	(.5304)	(.6125)	(.8133)
.0700	.5857	.2423	.1987	.2237	.0529	-.1812	.0900
(.2494)	(.0001)	(.0002)	(.0014)	(.0004)	(.6101)	(.0031)	(.1357)
1.000	.2491	.1889	-.0159	.0244	.0590	-.0824	.2349
	(.0001)	(.0022)	(.7910)	(.6916)	(.6650)	(.1727)	(.0003)
	1.000	.3073	.0730	.1162	.0433	-.1515	.1673
		(.0001)	(.2286)	(.0529)	(.5152)	(.0120)	(.0059)
		1.000	-.2000	.2453	.4219	-.2385	.2315
			(.0013)	(.0002)	(.0001)	(.0002)	(.0003)
			1.000	.1249	-.1994	-.1060	.0421
				(.0375)	(.0013)	(.0778)	(.5022)
				1.000	.7101	.0219	.1256
					(.0001)	(.7207)	(.0365)
					1.000	.0226	.0415
						(.7123)	(.5034)
						1.000	-.1125
							(.0610)
							1.000

Table B.21. Common statistics for the Pacific States region
Number of counties observed = 131

Variables	Mean	Variance	Standard Deviation
Corp	.03027	.00055	.02339
Corpsm	.02770	.00043	.02074
Corplg			
Corpart	.15432	.00315	.05612
Land	.09847	.01310	.11444
Landsm	.07751	.00826	.09090
Landlg	.01514	.00241	.04913
Landcp	.28413	.02303	.15176
Size	44,602	1,715,603,828	41,419
Fixcst	6.4834	14.502	3.80811
Adjpc	.40258	.01082	.10403
Age	.43579	.00435	.06594
Educ	9.2370	23.420	4.83945

Table B.22. Complete correlation matrix for the Pacific States region

	Corp	Part	Corpsm	Corplg	Corpart	Land	Partld	Landsm
Corp	1.000	.3727 (.0001)	.9820 (.0001)	.6102 (.0001)	.7026 (.0001)	.5713 (.0001)	.1545 (.0743)	.5006 (.0001)
Part		1.000	.3074 (.0006)	.4732 (.0001)	.9222 (.0001)	.2837 (.0014)	.5777 (.0001)	.1318 (.1294)
Corpsm			1.000	.4495 (.0001)	.6450 (.0001)	.5802 (.0001)	.1018 (.2459)	.5576 (.0001)
Corplg				1.000	.6172 (.0001)	.2680 (.0024)	.3038 (.0007)	.0288 (.7435)
Corpart					1.000	.4556 (.0001)	.5074 (.0001)	.3097 (.0006)
Land						1.000	.0721 (.5817)	.8591 (.0001)
Partld							1.000	.0271 (.7569)
Landsm								1.000
Landlg								
Landcp								
Size								
Fixcst								
Vlbcst								
Adjpc								
Age								
Educ								

Landlg	Landcp	Size	Fixcst	Vlbcst	Adjpc	Age	Educ
.2476	.5243	.5652	.0524	.2339	.0060	-.2653	.2672
(.0046)	(.0001)	(.0001)	(.5595)	(.0072)	(.9438)	(.0026)	(.0024)
.3422	.5632	.4872	-.0169	.1880	-.1135	-.0093	.4258
(.0002)	(.0001)	(.0001)	(.8426)	(.0296)	(.1936)	(.9122)	(.0001)
.2045	.4991	.5389	.0590	.2340	.0206	-.2380	.2489
(.0181)	(.0001)	(.0001)	(.5101)	(.0072)	(.8107)	(.0063)	(.0044)
.3132	.3858	.4123	.0001	.1249	-.0576	-.2563	.2193
(.0005)	(.0001)	(.0001)	(1.000)	(.1513)	(.5204)	(.0035)	(.0114)
.3656	.6504	.6092	.0089	.2416	-.0845	-.1177	.4379
(.0001)	(.0001)	(.0001)	(.9164)	(.0056)	(.6614)	(.1771)	(.0001)
.6161	.7977	.3353	-.0146	.2966	.0662	-.0964	.1282
(.0001)	(.0001)	(.0003)	(.8627)	(.0009)	(.5408)	(.2730)	(.1405)
.0399	.6590	.2654	-.1466	.1852	.0685	-.0830	.2279
(.6554)	(.0001)	(.0026)	(.0908)	(.0321)	(.5568)	(.6522)	(.0087)
.2549	.6642	.2264	-.0382	.2563	.1023	-.0843	-.0284
(.0036)	(.0001)	(.0091)	(.6689)	(.0035)	(.2435)	(.6602)	(.7467)
1.000	.4887	.3772	-.0270	.1817	-.0170	-.0102	.3561
	(.0001)	(.0001)	(.7579)	(.0355)	(.8418)	(.9039)	(.0001)
	1.000	.4133	-.0997	.3356	.0913	-.1229	.2345
		(.0001)	(.2561)	(.0003)	(.3001)	(.1584)	(.0071)
		1.000	-.2897	.2331	.2872	-.1940	.3402
			(.0011)	(.0074)	(.0012)	(.0248)	(.0002)
			1.000	.1541	-.1372	.1728	.1162
				(.0751)	(.1141)	(.0456)	(.1829)
				1.000	.5378	.0243	.2246
					(.0001)	(.7798)	(.0097)
					1.000	-.0671	.0797
						(.5471)	(.6315)
						1.000	.0671
							(.5473)
							1.000

Table B.23. Correlation matrix for Iowa

	Corp	Part	Corpsm	Corplg	Corpart
Corp	1.000	.129723 (.1977)	.973369 (.0001)	.463941 (.0001)	.266762 (.0076)
Part		1.000	.134486 (.1812)	.028427 (.7768)	.990224 (.0001)
Corpsm			1.000	.248505 (.0126)	.267645 (.0074)
Corplg				1.000	.092895 (.6367)
Corpart					1.000
Size					
Fixcst					
Adjpc					
Age					
Educ					

Size	Fixcst	Adjpc	Age	Educ
.083290 (.5824)	.317300 (.0018)	-.022170 (.8222)	.08788 (.6089)	.334571 (.0011)
.027710 (.7819)	-.186081 (.0618)	-.116739 (.2484)	.079651 (.5608)	.084630 (.5902)
.053296 (.6068)	.323905 (.0014)	-.055321 (.5933)	.103070 (.3108)	.354222 (.0006)
.145977 (.1456)	.089030 (.6153)	.120101 (.2345)	-.026937 (.7874)	.044853 (.6636)
.038651 (.7058)	-.136230 (.1754)	-.116586 (.2490)	.089782 (.6195)	.129324 (.1992)
1.000	-.435544 (.0001)	.799602 (.0001)	-.450477 (.0001)	.073744 (.5249)
	1.000	-.587000 (.0001)	.253484 (.0110)	.340984 (.0009)
		1.000	-.227411 (.0222)	-.022672 (.8185)
			1.000	.275971 (.0058)
				1.000

APPENDIX C. REGRESSION RESULTS

The variables used in the regression models are referred to by name only in the following tables. The definitions of these variables are given below:

Corp: the proportion of class 1-5 farms in each county that are corporations

Corpsm: the proportion of class 1-5 farms in each county that are corporations with ten or fewer shareholders

Corplg: the proportion of class 1-5 farms in each county that are corporations with more than ten shareholders

Part: the proportion of class 1-5 farms in each county that are partnerships

Corpart: the proportion of class 1-5 farms in each county that are corporations or partnerships

Land: the proportion of land in class 1-5 farms in each county that is operated by corporations

Landsm: the proportion of land in class 1-5 farms in each county that is operated by corporations with ten or fewer shareholders

Landlg: the proportion of land in class 1-5 farms in each county that is operated by corporations with more than ten shareholders

Partld: the proportion of land in class 1-5 farms in each county that is operated by partnerships

Landcp: the proportion of land in class 1-5 farms in each county that is operated by corporations and partnerships

Size: average dollar value of all sales of agricultural commodities per class 1-5 farm

Fixcst: value of land, buildings, and equipment per dollar value of sales of agricultural commodities by class 1-5 farms

Vlbcst: total production expenses per dollar value of sales of agricultural commodities by class 1-5 farms

Adjpc: total production expenses less hired labor and miscellaneous expenses per dollar value of sales of agricultural commodities by class 1-5 farms

Age: proportion of farm operators in each county that are 55 years of age or older

Educ: percent of farm operators in each county that have four or more years of college or university education

Smsa: classification variable such that

Smsa = 1 if the county is in a standard metropolitan statistical area or has a city 25,000-50,000 in population

= 0 otherwise

Law: classification variable such that

Law = 1 if the county is in Oklahoma, Kansas, or North Dakota

= 0 otherwise

Region: classification variables dividing the country into ten geographic regions

Table C.1. National regression results using CORP as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test: Computed F-value	F-Test: Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	1.0920	184.54	.0001	
Error	3022	1.1176			
Corrected Total	3038	2.2096			
Intercept					-.00192452
Regions	9	.16613	49.912	.0001	
Size	1	.33525	906.50	.0001	.00000059
Fixcst	1	.04858	131.35	.0001	.00142784
Adjpc	1	.05746	155.37	.0001	-.04115178
Age	1	.00533	14.420	.0004	.02038909
Educ	1	.05596	151.31	.0001	.00128538
Smsa	1	.00282	7.6159	.0060	-.00128101
Law	1	.00246	6.6588	.0097	.00211810
Without Regional Classification					
Regression	7	.92588	312.29	.0001	
Error	3031	1.2838			
Corrected Total	3038	2.2096			
Intercept					-.00436079
Regions					
Size	1	.39190	925.28	.0001	-.00000062
Fixcst	1	.04408	104.07	.0001	.00125090
Adjpc	1	.07353	173.60	.0001	-.04077352
Age	1	.00475	11.207	.0012	.01817151
Educ	1	.06364	150.26	.0001	.00130150
Smsa	1	.00165	3.8924	.0457	-.00095247
Law	1	.02894	68.328	.0001	.00580396

R^2 with regions = .49429
R^2 without regions = .41902
F-value for regional slope differences[a] = 15.759
df = (54,2977)

[a] Johnston, 1972 [31, p. 198].

Table C.2. Regional regression results using CORP as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.03420703	-2.60410	.0096
Size	.00000123	8.17973	.0001
Fixcst	.00295683	4.08629	.0002
Adjpc	-.07938244	-4.11412	.0002
Age	.09754547	3.82653	.0004
Educ	.00104058	2.34627	.0187
Smsa	-.00004427	- .02346	.9793
R^2 = .46694			
	Lake States		
Intercept	-.03073784	-3.78364	.0004
Size	.00000151	9.17542	.0001
Fixcst	-.00024219	- .33414	.7381
Adjpc	-.05258028	-4.60144	.0001
Age	.07959442	5.40794	.0001
Educ	.00179849	3.96944	.0003
Smsa	-.00002583	- .02388	.9790
R^2 = .42400			
	Corn Belt		
Intercept	-.01160238	-2.25114	.0233
Size	.00000051	9.42858	.0001
Fixcst	-.00018696	- .61942	.5432
Adjpc	-.03236520	-6.05578	.0001
Age	.06567756	8.03188	.0001
Educ	.00004252	.17379	.8564
Smsa	-.00221341	-4.46903	.0001
R^2 = .34447			

Table C.2. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.03385789	-4.38545	.0001
Size	.00000068	12.43285	.0001
Fixcst	.00401760	5.41943	.0001
Adjpc	-.02482712	-2.79885	.0056
Age	.03251618	2.22413	.0252
Educ	.00050288	1.44283	.1462
Smsa	.00115163	.089470	.6249
Law	.00601503	8.33944	.0001
R^2 = .44556			
	Appalachia		
Intercept	-.00234346	- .60047	.5557
Size	.00000095	12.01365	.0001
Fixcst	.00129369	4.31441	.0001
Adjpc	-.02603918	-5.31053	.0001
Age	.01074429	1.58613	.1093
Educ	-.00000617	- .03150	.9735
Smsa	-.00047082	- .65130	.5224
R^2 = .30982			
	Southeast		
Intercept	.02271766	2.22908	.0249
Size	.00000089	19.00346	.0001
Fixcst	.00239140	4.22728	.0001
Adjpc	-.06421681	-5.41287	.0001
Age	-.01843672	-1.20277	.2278
Educ	.00219213	7.35662	.0001
Smsa	-.00239222	-1.44375	.1458
R^2 = .72768			

Table C.2. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.01023434	.96695	.6638
Size	.00000086	9.01224	.0001
Fixcst	.00195933	3.50525	.0009
Adjpc	-.03950421	-4.27470	.0001
Age	-.02305042	-1.42503	.1518
Educ	.00150365	2.93509	.0040
Smsa	.00096705	.65444	.5208
R^2 = .56246			
	Southern Plains		
Intercept	.01121465	2.04452	.0392
Size	.00000010	3.38722	.0012
Fixcst	.00039007	2.17810	.0282
Adjpc	.00075044	.13984	.8839
Age	-.02833096	-3.00946	.0032
Educ	.00068346	5.87393	.0001
Smsa	-.00133739	-1.88271	.0573
Law	.00249405	3.67938	.0005
R^2 = .35388			
	Mountain States		
Intercept	.00445792	.28325	.7742
Size	.00000051	6.67405	.0001
Fixcst	.00155986	5.21905	.0001
Adjpc	-.02636441	-1.58283	.1106
Age	-.00964708	- .30417	.7592
Educ	.00333959	7.57751	.0001
Smsa	.00154812	.47575	.6401
R^2 = .39279			

Table C.2. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.04906329	3.73767	.0005
Size	.00000035	7.72504	.0001
Fixcst	.00155432	3.30622	.0016
Adjpc	-.03582417	-2.25055	.0246
Age	-.07202183	-2.89364	.0047
Educ	.00018091	.47284	.6425
Smsa	-.00113671	- .60326	.5546
R^2 = .43264			

Table C.3. National regression results using CORPSM as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	.90603	172.39	.0001	
Error	3022	.99266			
Corrected Total	3038	1.8987			
Intercept					-.00114768
Regions	9	.14577	49.308	.0001	
Size	1	.27814	846.75	.0001	.00000054
Fixcst	1	.03666	111.62	.0001	.00124046
Adjpc	1	.05052	153.80	.0001	-.03858743
Age	1	.00559	17.032	.0002	.02088294
Educ	1	.03869	117.79	.0001	.00106884
Smsa	1	.00374	11.379	.0011	-.00147566
Law	1	.00227	6.9134	.0085	.00203398
Without Regional Classification					
Regression	7	.76026	289.16	.0001	
Error	3031	1.1384			
Corrected Total	3038	1.8987			
Intercept					-.00360920
Region					
Size	1	.32955	877.40	.0001	.00000057
Fixcst	1	.03390	90.27	.0001	.00109706
Adjpc	1	.06478	172.47	.0001	-.03827030
Age	1	.00502	13.366	.0005	.01868823
Educ	1	.04655	123.94	.0001	.00111310
Smsa	1	.00235	6.2589	.0120	-.00113737
Law	1	.02448	65.167	.0001	.00533763

R_2^2 with regions = .47719
R^2 without regions = .40041
F-value for regional slope differences[a] = 14.615
df = (54,2977)

[a]Johnston, 1972 [31, p. 198].

Table C.4. Regional regression results using CORPSM as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.03002874	-2.42086	.0155
Size	.00000121	8.49970	.0001
Fixcst	.00242423	3.54787	.0008
Adjpc	-.07081816	-3.88677	.0003
Age	.08370827	3.47742	.0009
Educ	.00085231	2.03513	.0404
Smsa	-.00135790	-0.76217	.5468
R^2 = .45946			
	Lake States		
Intercept	-.03197756	-4.02854	.0002
Size	.00000148	9.21628	.0001
Fixcst	-.00009556	- .13494	.8879
Adjpc	-.05061353	-4.53318	.0001
Age	.08024629	5.58007	.0001
Educ	.00155210	3.50596	.0009
Smsa	.00003190	.03019	.9745
R^2 = .41678			
	Corn Belt		
Intercept	-.01088217	-2.20825	.0260
Size	.00000047	9.06261	.0001
Fixcst	-.00023723	- .82200	.5833
Adjpc	-.03034296	-5.93781	.0001
Age	.06254144	7.99918	.0001
Educ	.00003293	.14075	.8831
Smsa	-.00197864	-4.17826	.0001
R^2 = .32799			

Table C.4. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.03068153	-4.60522	.0001
Size	.00000061	12.76270	.0001
Fixcst	.00359902	5.62587	.0001
Adjpc	-.02206817	-2.88296	.0045
Age	.03103664	2.46011	.0138
Educ	.00042939	1.42763	.1506
Smsa	.00104474	.94057	.6501
Law	.00568509	9.13390	.0001
R^2 = .46694			
	Appalachia		
Intercept	.00080289	.21616	.8236
Size	.00000089	11.73723	.0001
Fixcst	.00098392	3.44772	.0010
Adjpc	-.02554358	-5.47363	.0001
Age	.00766301	1.18862	.2332
Educ	-.00003246	- .17417	.8561
Smsa	-.00089157	-1.29590	.1926
R^2 = .29894			
	Southeast		
Intercept	.02541607	2.58023	.0100
Size	.00000080	17.68573	.0001
Fixcst	.00184446	3.37338	.0012
Adjpc	-.06355216	-5.54240	.0001
Age	-.01580107	-1.06653	.2868
Educ	.00203935	7.08096	.0001
Smsa	-.00263788	-1.64715	.0964
R^2 = .70498			

Table C.4. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.01657365	1.71973	.0830
Size	.00000064	7.29646	.0001
Fixcst	.00070805	1.39116	.1620
Adjpc	-.04180368	-4.96793	.0001
Age	-.01720307	-1.16802	.2424
Educ	.00212794	4.56177	.0001
Smsa	.00026396	.19618	.8390
R^2 = .52100			
	Southern Plains		
Intercept	.01024947	2.03395	.0402
Size	.00000007	2.61990	.0091
Fixcst	.00033098	2.01173	.0424
Adjpc	.00135214	.27427	.7806
Age	-.02551593	-2.95033	.0037
Educ	.00062248	5.82335	.0001
Smsa	-.00125116	-1.91722	.0529
Law	.00227304	3.65015	.0006
R^2 = .32235			
	Mountain States		
Intercept	.00998293	.65530	.5201
Size	.00000051	6.96617	.0001
Fixcst	.00151841	5.24854	.0001
Adjpc	-.03865047	-2.39726	.0163
Age	.00251419	.08190	.9325
Educ	.00242606	5.68694	.0001
Smsa	.00028719	.09118	.9247
R^2 = .34382			

Table C.4. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.03943953	3.25728	.0018
Size	.00000030	7.15058	.0001
Fixcst	.00134035	3.09093	.0028
Adjpc	-.02677824	-1.82378	.0670
Age	-.05541033	-2.41352	.0164
Educ	.00013841	.39218	.6979
Smsa	-.00045132	- .25967	.7915
R^2 = .38623			

Table C.5. National regression results using CORPLG as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	.01011	23.161	.0001	
Error	3022	.08245			
Corrected Total	3038	.09256			
Intercept					-.00077683
Regions	9	.00146	5.9620	.0001	
Size	1	.00266	97.670	.0001	.00000005
Fixcst	1	.00837	30.665	.0001	.00018738
Adjpc	1	.00022	8.1782	.0046	-.00256434
Age	1	.00000	.11468	.7347	-.00049385
Educ	1	.00159	58.212	.0001	.00021654
Smsa	1	.00007	2.3837	.1186	.00019465
Law	1	.00000	.14238	.7077	.00008412
Without Regional Classification					
Regression	7	.00865	44.616	.0001	
Error	3031	.08391			
Corrected Total	3038	.09256			
Intercept					-.00075159
Size	1	.00270	97.497	.0001	.00000005
Fixcst	1	.00067	24.082	.0001	.00015384
Adjpc	1	.00028	10.011	.0020	-.00250323
Age	1	.00000	.13863	.7112	-.00051672
Educ	1	.00133	48.171	.0001	.00018840
Smsa	1	.00006	2.2440	.1301	..00018490
Law	1	.00019	6.7484	.0093	.00046633

R_2^2 with regions = .10923
R^2 without regions = .09431
F-value for regional slope differences[a] = 5.9880
df = (54,2977)

[a]Johnston, 1972 [31, p. 198].

Table C.6. Regional regression results using CORPLG as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.00417830	- .70047	.5085
Size	.00000002	.33800	.7354
Fixcst	.00053260	1.62087	.1023
Adjpc	-.00856428	- .97744	.6694
Age	.01383720	1.19534	.2311
Educ	.00018827	.93482	.6467
Smsa	.00131363	1.53324	.1225
R^2 = .05032			
	Lake States		
Intercept	.00123973	1.27128	.2021
Size	.00000003	1.41862	.1536
Fixcst	-.00014663	-1.68522	.0893
Adjpc	-.00196675	-1.43383	.1491
Age	-.00065186	- .36896	.7138
Educ	.00024639	4.53025	.0001
Smsa	-.00005772	- .44467	.6615
R^2 = .11729			
	Corn Belt		
Intercept	-.00072021	-1.03340	.3024
Size	.00000004	5.64572	.0001
Fixcst	.00005027	1.23157	.2162
Adjpc	-.00202224	-2.79819	.0055
Age	.00313612	2.83626	.0050
Educ	.00000959	.29000	.7693
Smsa	-.00023477	-3.50547	.0008
R^2 = .16443			

Table C.6. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.00317636	-2.01398	.0422
Size	.00000008	6.94831	.0001
Fixcst	.00041858	2.76401	.0062
Adjpc	-.00275895	-1.52254	.1248
Age	.00147954	.49540	.6267
Educ	.00007349	1.03223	.3033
Smsa	.00010690	.40653	.6877
Law	.00032993	2.23922	.0243
R^2 = .17247			
	Appalachia		
Intercept	-.00314634	-2.48106	.0129
Size	.00000007	2.59403	.0096
Fixcst	.00030977	3.17934	.0020
Adjpc	-.00049561	- .31106	.7543
Age	.00308128	1.39988	.1585
Educ	.00002629	.41319	.6830
Smsa	.00042075	1.79125	.0702
R^2 = .05147			
	Southeast		
Intercept	-.00269841	-1.69802	.0865
Size	.00000009	12.24791	.0001
Fixcst	.00054694	6.20045	.0001
Adjpc	-.00066465	- .35929	.7204
Age	-.00263564	-1.10270	.2702
Educ	.00015378	3.28817	.0015
Smsa	.00024566	.95081	.6557
R^2 = .46924			

Table C.6. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	-.00633931	-1.48900	.1340
Size	.00000023	5.88818	.0001
Fixcst	.00125128	5.56512	.0001
Adjpc	.00229947	.61858	.5441
Age	-.00584735	- .89870	.6268
Educ	-.00062429	-3.02950	.0031
Smsa	.00070309	1.18287	.2363
R^2 = .27697			
	Southern Plains		
Intercept	.00096517	.73849	.5324
Size	.00000003	4.11449	.0002
Fixcst	.00005909	1.38481	.1634
Adjpc	-.00060171	- .47059	.6436
Age	-.00281504	-1.25500	.2077
Educ	.00006098	2.19965	.0268
Smsa	-.00008623	- .50948	.6171
Law	.00022101	1.36839	.1686
R^2 = .18136			
	Mountain States		
Intercept	-.00552500	-1.36320	.1704
Size	-.00000001	- .26757	.7855
Fixcst	.00004145	.53853	.5974
Adjpc	.01228606	2.86429	.0048
Age	-.01216127	-1.48898	.1337
Educ	.00091353	8.04904	.0001
Smsa	.00126093	1.50472	.1295
R^2 = .24064			

Table C.6. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.00962376	3.06570	.0030
Size	.00000005	4.72239	.0001
Fixcst	.00021397	1.90320	.0561
Adjpc	-.00904593	-2.37633	.0180
Age	-.01661150	-2.79080	.0062
Educ	.00004251	.46454	.6482
Smsa	-.00068538	-1.52101	.1268
R^2 = .27559			

Table C.7. National regression results using PART as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	.88105	46.399	.0001	
Error	3023	3.5877			
Corrected Total	3039	4.4688			
Intercept					.16557107
Regions	9	.46034	43.099	.0001	
Size	1	.12762	107.54	.0001	.00000037
Fixcst	1	.00007	.06211	.7988	.00005562
Adjpc	1	.28871	243.27	.0001	-.09222232
Age	1	.02228	18.772	.0001	-.04167093
Educ	1	.01230	10.364	.0017	.00060044
Smsa	1	.00032	.26938	.6103	.00043142
Law	1	.00414	3.4861	.0586	.00274473
Without Regional Classification					
Regression	7	.42071	45.016	.0001	
Error	3032	4.0480			
Corrected Total	3039	4.4688			
Intercept					.15727924
Regions					
Size	1	.09712	72.745	.0001	.00000031
Fixcst	1	.01089	8.158	.0046	.00062183
Adjpc	1	.23319	174.66	.0001	-.07260600
Age	1	.01863	13.953	.0004	-.03599741
Educ	1	.00288	2.1560	.1381	.00027575
Smsa	1	.00469	3.5109	.0577	.00160538
Law	1	.00441	3.3037	.0656	.00226579

R^2 with regions = .19716
R^2 without regions = .09414
F-value for regional slope differences[a] = 5.2455
df = (54,2978)

[a]Johnston, 1972 [31, p 1[illegible].

Table C.8. Regional regression results using PART as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	.12944206	7.74738	.0001
Size	.00000059	3.09288	.0026
Fixcst	.00220298	2.39360	.0166
Adjpc	-.09751924	-3.97357	.0003
Age	-.00738395	- .22773	.8149
Educ	-.00111554	-1.97755	.0463
Smsa	-.00153928	- .64143	.5291
R^2 = .12848			
	Lake States		
Intercept	.07500794	3.83113	.0004
Size	.00000201	5.07121	.0001
Fixcst	.00786897	4.50470	.0001
Adjpc	-.04436104	-1.61085	.1045
Age	-.05122294	-1.44410	.1462
Educ	.00059715	.54688	.5919
Smsa	.00340366	1.30598	.1897
R^2 = .19289			
	Corn Belt		
Intercept	.22859859	12.02612	.0001
Size	.00000044	2.21117	.0258
Fixcst	-.00100924	- .90661	.6318
Adjpc	-.07650278	-3.88119	.0003
Age	-.18296633	-6.06691	.0001
Educ	.00365893	4.05492	.0002
Smsa	.00026891	.14721	.8778
R^2 = .19206			

Table C.8. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	.16809227	10.15777	.0001
Size	.00000049	4.19478	.0001
Fixcst	.00044826	.28211	.7750
Adjpc	-.07665622	-4.03178	.0002
Age	-.06929910	-2.21149	.0260
Educ	.00051902	.69475	.5051
Smsa	.00027556	.09988	.9173
Law	-.00047431	- .30680	.7573
R^2 = .13573			
	Appalachia		
Intercept	.18948478	12.87377	.0001
Size	.00000123	4.11848	.0002
Fixcst	.00191169	1.69047	.0876
Adjpc	-.11535889	-6.23824	.0001
Age	-.06144623	-2.40522	.0157
Educ	-.00208618	-2.82508	.0052
Smsa	.00154854	.56801	.5774
R^2 = .12177			
	Southeast		
Intercept	.16932693	10.85227	.0001
Size	-.00000004	- .55588	.5857
Fixcst	-.00181063	-2.09060	.0350
Adjpc	-.08893824	-4.89666	.0001
Age	.00126203	.05378	.9560
Educ	.00054684	1.19869	.2294
Smsa	.00093537	.36873	.7138
R^2 = .07699			

Table C.8. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.11635496	5.43597	.0001
Size	.00000097	4.98911	.0001
Fixcst	.00359420	3.17953	.0021
Adjpc	-.12992993	-6.95218	.0001
Age	.05469549	1.67204	.0920
Educ	-.00044190	- .42653	.6740
Smsa	.00457179	1.52987	.1235
R^2 = .50859			
	Southern Plains		
Intercept	.16067862	9.49767	.0001
Size	.00000032	3.63888	.0006
Fixcst	-.00016577	- .29982	.7623
Adjpc	-.09623031	-5.81026	.0001
Age	-.03012658	-1.03798	.3005
Educ	.00182624	5.15000	.0001
Smsa	.00301561	1.37551	.1663
Law	.00489512	2.33919	.0188
R^2 = .34238			
	Mountain States		
Intercept	.13612689	7.19656	.0001
Size	.00000032	3.50830	.0009
Fixcst	-.00059833	-1.66565	.0929
Adjpc	-.04139117	-2.06760	.0372
Age	-.00208097	- .05459	.9553
Educ	.00027790	.52465	.6068
Smsa	.00587714	1.50274	.1301
R^2 = .06960			

Table C.8. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.11020725	4.39112	.0001
Size	.00000051	5.90775	.0001
Fixcst	.00074387	.82758	.5854
Adjpc	-.11136932	-3.65931	.0007
Age	.02518778	.52929	.6041
Educ	.00224733	3.07207	.0030
Smsa	-.00225488	- .62590	.5397
R^2 = .38725			

Table C.9. National regression results using CORPART as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	2.7281	117.87	.0001	
Error	3022	4.3714			
Corrected Total	3038	7.0995			
Intercept					.16357103
Regions	9	.48372	37.156	.0001	
Size	1	.87499	604.90	.0001	.00000096
Fixcst	1	.05241	36.232	.0001	.00148342
Adjpc	1	.60513	418.34	.0001	-.13351471
Age	1	.00575	3.9766	.0434	-.02117389
Educ	1	.12357	85.426	.0001	.00190318
Smsa	1	.00117	.80715	.6276	-.00082448
Law	1	.01317	9.1076	.0030	.00489785
Without Regional Classification					
Regression	7	2.2444	200.17	.0001	
Error	3031	4.8551			
Corrected Total	3038	7.0995			
Intercept					.15286888
Regions					
Size	1	.87820	548.26	.0001	.00000092
Fixcst	1	.09878	61.668	.0001	.00187280
Adjpc	1	.56903	355.24	.0001	-.11342102
Age	1	.00454	2.8342	.0883	-.01777114
Educ	1	.09562	59.692	.0001	.00158938
Smsa	1	.00082	.50886	.5172	.00066947
Law	1	.05601	34.964	.0001	.00807401

R_2^2 with regions = .38427
R^2 without regions = .31614
F-value for regional slope differences[a] = 5.2612
df = (54,2977)

[a]Johnston, 1972 [31, p. 198].

Table C.10. Regional regression results using CORPART as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	.09523502	4.81657	.0001
Size	.00000182	8.04776	.0001
Fixcst	.00515982	4.73736	.0001
Adjpc	-.17690167	-6.09094	.0001
Age	.09016152	2.34974	.0185
Educ	-.00007496	- .11229	.9068
Smsa	-.00158355	- .55760	.5846
R^2 = .42711			
	Lake States		
Intercept	.04427011	2.44888	.0144
Size	.00000352	9.61555	.0001
Fixcst	.00762678	4.72854	.0001
Adjpc	-.09694132	-3.81241	.0004
Age	.02837149	.86627	.6086
Educ	.00239564	2.37609	.0173
Smsa	.00337783	1.40367	.1580
R^2 = .39361			
	Corn Belt		
Intercept	.21699621	11.37943	.0001
Size	.00000095	4.75248	.0001
Fixcst	-.00119620	-1.07115	.2844
Adjpc	-.10886797	-5.50560	.0001
Age	-.11728877	-3.87677	.0003
Educ	.00370145	4.08900	.0002
Smsa	-.00194451	-1.06114	.2891
R^2 = .25591			

Table C.10. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	.13423438	7.28631	.0001
Size	.00000118	8.97820	.0001
Fixcst	.00446586	2.52454	.0117
Adjpc	-.10148334	-4.79444	.0001
Age	-.03678292	-1.05438	.2926
Educ	.00102190	1.22871	.2177
Smsa	.00142720	.46466	.6477
Law	.00554072	3.21925	.0018
R^2 = .28735			
	Appalachia		
Intercept	.18702310	12.73182	.0001
Size	.00000219	7.32670	.0001
Fixcst	.00323608	2.85462	.0048
Adjpc	-.14141831	-7.66588	.0001
Age	-.05075282	-1.99140	.0442
Educ	-.00210360	-2.85118	.0048
Smsa	.00109975	.40419	.6892
R^2 = .18714			
	Southeast		
Intercept	.19204458	10.27647	.0001
Size	.00000085	9.89953	.0001
Fixcst	.00058077	.55988	.5830
Adjpc	-.15315505	-7.04028	.0001
Age	-.01717469	- .61104	.5489
Educ	.00273898	5.01279	.0001
Smsa	-.00145685	- .47950	.6375
R^2 = .51032			

Table C.10. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.12658930	5.29492	.0001
Size	.00000183	8.45658	.0001
Fixcst	.00555353	4.39845	.0001
Adjpc	-.16943414	-8.11677	.0001
Age	.03164507	.86611	.6084
Educ	.00106175	.91752	.6372
Smsa	.00553884	1.65942	.0945
R^2 = .65356			
	Southern Plains		
Intercept	.17043294	8.65096	.0001
Size	.00000041	3.98567	.0002
Fixcst	.00022039	.34229	.7323
Adjpc	-.09629076	-4.99253	.0001
Age	-.05551638	-1.64253	.0974
Educ	.00262156	6.34836	.0001
Smsa	.00178444	.69894	.5077
Law	.00740973	3.04058	.0029
R^2 = .39592			
	Mountain States		
Intercept	.14058481	5.87901	.0001
Size	.00000083	7.16766	.0001
Fixc	.00096154	2.11737	.0330
Adjpc	-.06775558	-2.67724	.0078
Age	-.01172804	- .24337	.8033
Educ	.00361749	5.40216	.0001
Smsa	.00742527	1.50181	.1303
R^2 = .29677			

Table C.10. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.15927054	5.51314	.0001
Size	.00000087	8.64251	.0001
Fixcst	.00229818	2.22125	.0264
Adjpc	-.14719349	-4.20166	.0002
Age	-.04683405	- .85499	.6013
Educ	.00242824	2.88373	.0049
Smsa	-.00339159	- .81786	.5797
R^2 = .52261			

Table C.11. National regression results using LAND as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test: Computed F-value	F-Test: Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	8.8535	109.84	.0001	
Error	3023	15.229			
Corrected Total	3039	24.083			
Intercept					.00034573
Regions	9	2.4285	53.562	.0001	
Size	1	2.1641	429.58	.0001	.00000151
Fixcst	1	.35445	70.357	.0001	.00385689
Adjpc	1	.28647	56.865	.0001	-.09186449
Age	1	.02187	4.3403	.0350	.04128215
Educ	1	.13534	26.865	.0001	.00199169
Smsa	1	.00107	.21267	.6498	-.00078978
Law	1	.03624	7.1945	.0074	.00812387
Without Regional Classification					
Regression	7	6.4250	157.61	.0001	
Error	3032	17.658			
Corrected Total	3039	24.083			
Intercept					-.02033918
Regions					
Size	1	3.0827	529.33	.0001	.00000173
Fixcst	1	.58540	100.52	.0001	.00455862
Adjpc	1	.39190	67.292	.0001	-.09412390
Age	1	.01227	2.1077	.1427	.02922097
Educ	1	.26226	45.032	.0001	.00263210
Smsa	1	.01470	2.5237	.1081	.00284268
Law	1	.29616	50.853	.0001	.01856627

R^2 with regions = .36763
R^2 without regions = .26679
F-value for regional slope differences[a] = 6.2109
df = (54,2978)

[a] Johnston, 1972 [31, p. 198].

Table C.12. Regional regression results using LAND as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.07219621	-1.83997	.0636
Size	.00000225	5.01343	.0001
Fixcst	.00456753	2.11319	.0334
Adjpc	-.16753410	-2.90677	.0043
Age	.27477453	3.60853	.0007
Educ	.00034886	.18785	.8454
Smsa	.00342976	.60857	.5506
R^2 = .24417			
	Lake States		
Intercept	-.00705743	- .30377	.7595
Size	.00000243	5.15963	.0001
Fixcst	-.00367716	-1.77392	.0736
Adjpc	-.10806410	-3.30681	.0015
Age	.05347309	1.27040	.2024
Educ	.00669558	5.16734	.0001
Smsa	.00680967	2.20186	.0269
R^2 = .25053			
	Corn Belt		
Intercept	-.02463727	-2.17563	.0282
Size	.00000079	6.63103	.0001
Fixcst	.00044834	.67604	.5066
Adjpc	-.02090760	-1.78046	.0719
Age	.07619711	4.24106	.0001
Educ	.00067098	1.24818	.2099
Smsa	-.00333771	-3.06715	.0027
R^2 = .17930			

Table C.12. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.12395738	-4.18766	.0002
Size	.00000183	8.66800	.0001
Fixcst	.01349181	4.74681	.0001
Adjpc	-.05726738	-1.68386	.0892
Age	.12901339	2.30166	.0207
Educ	.00019400	.14518	.8795
Smsa	.00627731	1.27199	.2015
Law	.02187682	7.91095	.0001
R^2 = .32309			
	Appalachia		
Intercept	.00080658	.06646	.9455
Size	.00000231	9.34611	.0001
Fixcst	.00037404	.40115	.6913
Adjpc	-.04797090	-3.14623	.0022
Age	.00306089	.14531	.8793
Educ	.00132561	2.17719	.0281
Smsa	.00203590	.90571	.6313
R^2 = .23496			
	Southeast		
Intercept	-.02647120	- .69409	.5047
Size	.00000205	11.66964	.0001
Fixcst	.01095260	5.17379	.0001
Adjpc	-.08483059	-1.91079	.0537
Age	-.03296719	- .57473	.5730
Educ	.00643489	5.77079	.0001
Smsa	.00982398	1.58439	.1099
R^2 = .51392			

Table C.12. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.06682883	1.37716	.1663
Size	.00000273	6.20528	.0001
Fixcst	.00614880	2.39927	.0164
Adjpc	-.16618720	-3.92227	.0003
Age	-.08052070	-1.08575	.2784
Educ	.00406151	1.72918	.0813
Smsa	-.00939464	-1.38668	.1633
R^2 = .43149			
	Southern Plains		
Intercept	.04902731	1.54954	.1181
Size	.00000021	1.25470	.2078
Fixcst	-.00133071	-1.28692	.1960
Adjpc	-.04682452	-1.51169	.1275
Age	-.00208973	- .03850	.9682
Educ	.00132338	1.99544	.0440
Smsa	-.00871084	-2.12448	.0322
Law	.00800143	2.04444	.0392
R^2 = .08187			
	Mountain States		
Intercept	.10601694	1.57178	.1131
Size	.00000152	4.65077	.0001
Fixcst	.00451982	3.52861	.0008
Adjpc	-.02556722	- .356	.7212
Age	-.08863292	- .65207	.5222
Educ	.00246555	1.30534	.1898
Smsa	-.00866880	- .62160	.5420
R^2 = .15182			

Table C.12. Continued

Source of variation	Estimated regression coefficient	T Statistics	T Test Prob
	Pacific States		
Intercept	.08410485	1.05312	.2945
Size	.00000100	3.61345	.0007
Fixcst	.00301910	1.05556	.2934
Adjpc	-.03147089	- .32496	.7447
Age	-.07907655	- .52221	.6089
Educ	-.00019259	- .08273	.9319
Smsa	-.00257006	- .22419	.8177
R^2 = .12274			

Table C.13. National regression results using LANDSM as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	4.2150	77.687	.0001	
Error	3022	10.248			
Corrected Total	3038	14.463			
Intercept					.00382596
Regions	9	1.4811	48.531	.0001	
Size	1	.91526	269.90	.0001	.00000098
Fixcst	1	.18173	53.591	.0001	.00276169
Adjpc	1	.06453	19.029	.0001	-.04361017
Age	1	.00610	1.8001	.1763	.02181344
Educ	1	.00624	1.8404	.1714	.00042926
Smsa	1	.00829	2.4442	.1139	-.00219748
Law	1	.01483	4.3725	.0343	.00519735
Without Regional Classification					
Regression	7	2.7339	100.93	.0001	
Error	3031	11.723			
Corrected Total	3038	14.463			
Intercept					-.00907640
Regions					
Size	1	1.4151	365.68	.0001	.00000117
Fixcst	1	.30991	80.087	.0001	.00331686
Adjpc	1	.13964	36.086	.0001	-.05618921
Age	1	.00202	.52237	.5231	.01185856
Educ	1	.05324	13.759	.0005	.00119044
Smsa	1	.00026	.06829	.7899	.00038135
Law	1	.14963	38.668	.0001	.01319738

R_2^2 with regions = .29144
R^2 without regions = .18903
F-value for regional slope differences[a] = 4.9494
df = (54,2977)

[a]Johnston, 1972 [31, p. 198].

Table C.14. Region regression results using LANDSM as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.05681662	-2.04149	.0398
Size	.00000194	6.08415	.0001
Fixcst	.00217810	1.42073	.1529
Adjpc	-.11513961	-2.81649	.0055
Age	.21285636	3.94107	.0003
Educ	-.00029240	- .31118	.7543
Smsa	-.00058120	- .14539	.8793
R^2 = .27694			
	Lake States		
Intercept	-.00794706	- .60038	.5561
Size	.00000117	4.38077	.0001
Fixcst	-.00188589	-1.59687	.1076
Adjpc	-.04414843	-2.37122	.0175
Age	.06738193	2.80982	.0056
Educ	.00011754	.15921	.8681
Smsa	.00021415	.12154	.8991
R^2 = .12441			
	Corn Belt		
Intercept	-.02323569	-2.31091	.0200
Size	.00000054	5.15091	.0001
Fixcst	.00100490	1.70657	.0846
Adjpc	-.00679873	- .65207	.5219
Age	.05391235	3.37956	.0012
Educ	.00087361	1.83029	.0643
Smsa	-.00247389	-2.56037	.0105
R^2 = .13981			

Table C.14. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.06139377	-2.80674	.0055
Size	.00000060	3.87559	.0003
Fixcst	.00389688	1.85536	.0610
Adjpc	-.00064815	- .02579	.9777
Age	.11596661	2.79974	.0056
Educ	-.00081754	- .82791	.5865
Smsa	.00152239	.41746	.6801
Law	.01366773	6.68835	.0001
R^2 = .17902			
	Appalachia		
Intercept	.00398116	.38701	.7011
Size	.00000173	8.24878	.0001
Fixcst	.00100093	1.26641	.2032
Adjpc	-.03876264	-2.99919	.0032
Age	.00991174	.55512	.5861
Educ	-.00055396	-1.07335	.2834
Smsa	-.00115686	- .60714	.5513
R^2 = .15344			
	Southeast		
Intercept	.04748607	1.57684	.1117
Size	.00000100	7.20184	.0001
Fixcst	.00017145	.10257	.9150
Adjpc	-.09396077	-2.68080	.0077
Age	-.02085062	- .46034	.6506
Educ	.00504412	5.72869	.0001
Smsa	-.00125580	- .25649	.7936
R^2 = .37085			

Table C.14. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.08431229	2.41033	.0159
Size	.00000128	4.05216	.0002
Fixcst	-.00143308	- .77575	.5550
Adjpc	-.14057981	-4.60287	.0001
Age	-.03693195	- .69086	.5024
Educ	.00437568	2.58442	.0101
Smsa	-.00358599	- .73430	.5296
R^2 = .31292			
	Southern Plains		
Intercept	.00649879	.25270	.7964
Size	.00000022	1.66602	.0926
Fixcst	-.00051012	- .60753	.5512
Adjpc	.00382233	.15192	.8740
Age	.02381016	.53945	.5967
Educ	-.00029513	- .54099	.5957
Smsa	-.00529438	-1.58966	.1088
Law	.00345235	1.08630	.2777
R^2 = .02989			
	Mountain States		
Intercept	.12006971	1.93979	.0504
Size	.00000118	3.94931	.0003
Fixcst	.00471871	4.01431	.0002
Adjpc	-.01264569	- .19304	.8414
Age	-.18476897	-1.48126	.1357
Educ	.00018941	.10927	.9094
Smsa	-.00022271	- .01740	.9835
R^2 = .13021			

Table C.14. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.06782819	1.03825	.3016
Size	.00000060	2.63473	.0093
Fixcst	.00161986	.69234	.5029
Adjpc	.03620708	.45704	.6533
Age	-.04394441	- .35476	.7239
Educ	-.00246121	-1.29253	.1956
Smsa	-.00033621	- .03585	.9702
R^2 = .06963			

Table C.15. National regression results using LANDLG as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	.26105	20.068	.0001	
Error	3023	2.4577			
Corrected Total	3039	2.7188			
Intercept					-.00200228
Regions	9	.04317	5.8998	.0001	
Size	1	.10808	132.93	.0001	.00000034
Fixcst	1	.00638	7.8460	.0053	.00051741
Adjpc	1	.02178	26.794	.0001	-.02533233
Age	1	.00161	1.9774	.1559	.01119385
Educ	1	.01637	20.136	.0001	.00069270
Smsa	1	.00003	.03591	.8440	-.00013037
Law	1	.00042	.51086	.5181	-.00086965
Without Regional Classification					
Regression	7	.21788	37.736	.0001	
Error	3032	2.5009			
Corrected Total	3039	2.7188			
Intercept					-.00365527
Regions					
Size	1	.10846	131.49	.0001	.00000032
Fixcst	1	.00269	3.2606	.0674	.00030899
Adjpc	1	.02633	31.917	.0001	-.02439537
Age	1	.00305	3.6948	.0515	.01456022
Educ	1	.01085	13.157	.0006	.00053544
Smsa	1	.00030	.36643	.5523	-.00040765
Law	1	.00213	2.5827	.1040	.00157465

R^2 with regions = .09602
R^2 without regions = .08014
F-value for regional slope differences[a] = 4.2676
df = (54,2978)

[a]Johnston, 1972 [31, p. 198].

Table C.16. Regional regression results using LANDLG as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	-.01878197	- .61622	.5456
Size	.00000014	.39054	.6988
Fixcst	.00222195	1.32693	.1826
Adjpc	-.04983853	-1.11617	.2646
Age	.07371633	1.24961	.2101
Educ	.00071670	.69832	.5072
Smsa	.00575363	1.31779	.1857
R^2 = .04285			
	Lake States		
Intercept	.00604801	1.75751	.0764
Size	.00000006	.86597	.6084
Fixcst	-.00034683	-1.12961	.2587
Adjpc	-.00658328	-1.36007	.1716
Age	-.00300585	- .48213	.6358
Educ	.00001022	.05327	.9564
Smsa	-.00078558	-1.71492	.0838
R^2 = .03728			
	Corn Belt		
Intercept	-.00164660	- .45474	.6544
Size	.00000021	5.62808	.0001
Fixcst	-.00058930	-2.77896	.0058
Adjpc	-.01330586	-3.54366	.0007
Age	.02012066	3.50235	.0008
Educ	.00006961	.40496	.6887
Smsa	-.00048862	-1.40425	.1571
R^2 = .12923			

Table C.16. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	-.00044229	- .23627	.8085
Size	.00000002	1.62220	.1017
Fixcst	-.00010887	- .60568	.5524
Adjpc	-.00308843	-1.43595	.1481
Age	.00793994	2.23989	.0242
Educ	-.00003762	- .44521	.6610
Smsa	-.00060807	-1.94835	.0492
Law	.00016715	.95575	.6583
R^2 = .03640			
	Appalachia		
Intercept	.00493647	.75556	.5431
Size	.00000011	.83143	.5888
Fixcst	-.00087124	-1.73561	.0794
Adjpc	-.00180793	- .22025	.8205
Age	-.01298659	-1.14519	.2513
Educ	.00148758	4.53822	.0001
Smsa	.00170672	1.41031	.1553
R^2 = .06657			
	Southeast		
Intercept	-.02933658	-2.38858	.0166
Size	.00000065	11.55548	.0001
Fixcst	.00221714	3.25216	.0017
Adjpc	-.01406470	- .98374	.6730
Age	.02069624	1.12036	.2628
Educ	.00071608	1.99409	.0442
Smsa	.00241814	1.21099	.2245
R^2 = .39910			

Table C.16. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.01114386	.38543	.7023
Size	.00000084	3.21324	.0019
Fixcst	.00421342	2.75943	.0064
Adjpc	-.02431820	- .96331	.6619
Age	-.04314584	- .97646	.6688
Educ	-.00242818	-1.73511	.0803
Smsa	-.00214910	- .53241	.6017
R^2 = .15816			
	Southern Plains		
Intercept	-.00053212	- .13565	.8873
Size	-.00000002	- .84570	.5970
Fixcst	.00002551	.19903	.8367
Adjpc	.00407102	1.06012	.2899
Age	-.00589951	- .87665	.6148
Educ	.00025546	3.10703	.0025
Smsa	-.00024087	- .47386	.6414
Law	.00026830	.55296	.5867
R^2 = .03783			
	Mountain States		
Intercept	.00406020	.20610	.8313
Size	.00000017	1.73233	.0805
Fixcst	.00004569	.12214	.8986
Adjpc	-.00515260	- .28714	.8005
Age	-.01390593	- .35028	.7267
Educ	.00140678	2.55010	.0110
Smsa	-.00789360	-1.93798	.0506
R^2 = .08802			

Table C.16. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	-.00564085	- .17540	.8553
Size	.00000041	3.63298	.0007
Fixcst	.00070312	.61048	.5498
Adjpc	-.06342602	-1.62641	.1024
Age	.01488594	.24412	.8029
Educ	.00209256	2.23240	.0257
Smsa	-.00591576	-1.28150	.1995
R^2 = .22825			

Table C.17. National regression results using PARTLD as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	1.5015	17.878	.0001	
Error	3023	15.868			
Corrected Total	3039	17.370			
Intercept					.22052762
Regions	9	.81842	17.324	.0001	
Size	1	.13432	25.588	.0001	.00000038
Fixcst	1	.02703	5.1485	.0219	-.00106501
Adjpc	1	.53649	102.20	.0001	-.12571443
Age	1	.01112	2.1183	.1417	-.02943893
Educ	1	.01267	2.4142	.1162	.00060946
Smsa	1	.02104	4.0073	.0426	-.00349946
Law	1	.01739	3.3133	.0652	.00562754
Without Regional Classification					
Regression	7	.68309	17.731	.0001	
Error	3032	16.687			
Corrected Total	3039	17.370			
Intercept					.18259514
Regions					
Size	1	.16908	30.722	.0001	.00000040
Fixcst	1	.01571	2.8548	.0872	.00074682
Adjpc	1	.31292	56.857	.0001	-.08410636
Age	1	.00113	.20620	.6547	-.00888479
Educ	1	.02998	5.4474	.0186	.00088993
Smsa	1	.00171	.31150	.5839	-.00097088
Law	1	.00951	1.72849	.1854	.00332751

R^2 with regions = .08644
R^2 without regions = .03933
F-value for regional slope differences[a] = 3.9871
df = (54,2978)

[a]Johnston [31, p. 198].

Table C.18. Regional regression results using PARTLD as the dependent variable

Source of variation	Estimated regression coefficient	T Statistics	T Test Prob
Northeast			
Intercept	.12859578	4.60435	.0001
Size	.00000116	3.62718	.0006
Fixcst	.00074288	.48286	.6353
Adjpc	-.08900862	-2.16962	.0291
Age	.03608818	.66583	.5134
Educ	-.00093695	- .99362	.6778
Smsa	-.00268494	- .66931	.5112
R^2 = .08686			
Lake States			
Intercept	.11814385	4.18759	.0002
Size	.00000231	4.04059	.0002
Fixcst	.01238073	4.91845	.0001
Adjpc	-.09598453	-2.41874	.0155
Age	-.09813944	-1.92003	.0529
Educ	-.00033552	- .21324	.8259
Smsa	.00126185	.33599	.7368
R^2 = .18328			
Corn Belt			
Intercept	.26084961	9.99023	.0001
Size	.00000040	1.47220	.1376
Fixcst	-.00110925	- .72542	.5245
Adjpc	-.09606072	-3.54787	.0007
Age	-.15934265	-3.84647	.0003
Educ	.00483284	3.89910	.0003
Smsa	-.00146009	- .58192	.5681
R^2 = .13159			

Table C.18. Continued

Source of variation	Estimated regression coefficient	T Statistics	T Test Prob
	Northern Plains		
Intercept	.17387399	5.48466	.0001
Size	.00000022	.97115	.6664
Fixcst	-.00259026	- .85092	.6000
Adjpc	-.07332627	-2.01314	.0423
Age	.04628608	.77103	.5524
Educ	.00096654	.67535	.5072
Smsa	-.00157670	- .29831	.7634
Law	-.00223940	- .75612	.5433
R^2 = .01961			
	Appalachia		
Intercept	.27614775	10.37143	.0001
Size	.00000191	3.52777	.0008
Fixcst	.00276518	1.35170	.1736
Adjpc	-.20801106	-6.21817	.0001
Age	-.12367479	-2.67613	.0077
Educ	-.00241291	-1.80629	.0679
Smsa	-.00244259	- .49528	.6267
R^2 = .11551			
	Southeast		
Intercept	.22668161	5.54944	.0001
Size	-.00000028	-1.48894	.1334
Fixcst	-.00142189	.62711	.5383
Adjpc	-.10783408	-2.26781	.0225
Age	-.02075392	- .33781	.7354
Educ	.00052067	.43596	.6674
Smsa	.00156287	.23533	.8092
R^2 = .01954			

Table C.18. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.09236203	1.56941	.1139
Size	.00000227	4.24787	.0001
Fixcst	.00372355	1.19803	.2302
Adjpc	-.25649617	-4.99164	.0001
Age	.42929544	4.77311	.0001
Educ	-.00948933	-3.33127	.0014
Smsa	-.02042279	-2.48562	.0131
R^2 = .34342			
	Southern Plains		
Intercept	.24102700	5.09225	.0001
Size	.00000024	.96421	.6628
Fixcst	-.00307729	-1.98938	.0447
Adjpc	-.09930156	-2.14301	.0308
Age	-.05456756	- .67198	.5093
Educ	.00236634	2.38513	.0167
Smsa	.00428462	.69853	.5075
Law	.01661783	2.83832	.0051
R^2 = .10464			
	Mountain States		
Intercept	.21889953	4.70401	.0001
Size	.00000026	1.13926	.2543
Fixcst	-.00170211	-1.92609	.0520
Adjpc	-.07070897	-1.43574	.1484
Age	-.03617486	- .38575	.7021
Educ	.00029903	.22948	.8136
Smsa	.00601007	.62465	.5400
R^2 = .02524			

Table C.18. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.19930039	3.10612	.0027
Size	.00000036	1.60046	.1080
Fixcst	-.00188422	- .81996	.5809
Adjpc	-.01473335	- .18936	.8444
Age	-.07449222	- .61229	.5486
Educ	.00276521	1.47856	.1379
Smsa	-.01239814	-1.34611	.1774
R^2 = .11907			

Table C.19. National regression results using LANDCP as the dependent variable

Source of variation	df	Total (or partial) sum of squares	F-Test Computed F-value	F-Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	13.614	92.499	.0001	
Error	3023	27.807			
Corrected Total	3039	41.421			
Intercept					.22087335
Regions	9	2.9771	35.962	.0001	
Size	1	3.3767	367.10	.0001	.00000188
Fixcst	1	.18572	20.191	.0001	.00279188
Adjpc	1	1.6070	174.71	.0001	-.21757892
Age	1	.00180	.19564	.6628	.01184322
Educ	1	.23084	25.09530	.0001	.00260115
Smsa	1	.03160	3.43548	.0604	-.00428924
Law	1	.10385	11.290	.0012	.01375140
Without Regional Classification					
Regression	7	10.636	149.66	.0001	
Error	3032	30.784			
Corrected Total	3039	41.421			
Intercept					-.16225596
Regions					
Size	1	4.6957	462.50	.0001	.00000213
Fixcst	1	.79292	78.097	.0001	.00530544
Adjpc	1	1.4052	138.40	.0001	-.17823026
Age	1	.00595	.58556	.5494	.02033618
Educ	1	.46958	46.250	.0001	.00352203
Smsa	1	.00637	.62763	.5658	.00187181
Law	1	.41183	40.562	.0001	.02189378

R^2 with regions = .32867
R^2 without regions = .25679
F-value for regional slope differences[a] = 4.9489
df = (54,2978)

[a]Johnston, 1972 [31, p. 198].

Table C.20. Regional regression results using LANDCP as the dependent variable

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northeast		
Intercept	.05639958	1.29664	.1930
Size	.00000341	6.85155	.0001
Fixcst	.00531042	2.21632	.0259
Adjpc	-.25654271	-4.01527	.0002
Age	.31086271	3.68272	.0006
Educ	-.00068809	- .46854	.6451
Smsa	.00074482	.11922	.9010
R^2 = .31808			
	Lake States		
Intercept	.11108641	3.50452	.0009
Size	.00000474	7.37807	.0001
Fixcst	.00870357	3.07747	.0027
Adjpc	-.20404863	-4.57652	.0001
Age	-.04466635	- .77779	.5563
Educ	.00636006	3.59761	.0007
Smsa	.00807152	1.91290	.0538
R^2 = .31057			
	Corn Belt		
Intercept	.23621234	8.38151	.0001
Size	.00000119	4.02841	.0002
Fixcst	-.00066091	- .40044	.6918
Adjpc	-.11696832	-4.00243	.0002
Age	-.08314555	-1.85953	.0601
Educ	.00550383	4.11396	.0002
Smsa	-.00479780	-1.77156	.0733
R^2 = .19472			

Table C.20. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Northern Plains		
Intercept	.04991661	1.13441	.2562
Size	.00000205	6.53068	.0001
Fixcst	.01090156	2.58015	.0101
Adjpc	-.13059365	-2.58312	.0100
Age	.17529946	2.10383	.0339
Educ	.00116054	.58422	.5667
Smsa	.00470061	.64075	.5294
Law	.01963742	4.77698	.0001
R^2 = .19090			
	Appalachia		
Intercept	.27695433	9.57195	.0001
Size	.00000422	7.16639	.0001
Fixcst	.00313921	1.41212	.1548
Adjpc	-.25598196	-7.04176	.0001
Age	-.12061390	-2.40170	.0159
Educ	-.00108730	- .74902	.5391
Smsa	-.00040670	- .07589	.9376
R^2 = .18166			
	Southeast		
Intercept	.20021041	3.97039	.0003
Size	.00000177	7.61978	.0001
Fixcst	.00953072	3.40501	.0011
Adjpc	-.19266467	-3.28220	.0015
Age	-.05372111	- .70831	.5136
Educ	.00695556	4.71767	.0001
Smsa	.01138685	1.38892	.1621
R^2 = .37176			

Table C.20. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Delta States		
Intercept	.15919086	2.33638	.0192
Size	.00000499	8.08848	.0001
Fixcst	.00987235	2.74356	.0067
Adjpc	-.42268337	-7.10493	.0001
Age	.34877474	3.34944	.0013
Educ	-.00542782	-1.64582	.0972
Smsa	-.02981744	-3.13452	.0024
R^2 = .57233			
	Southern Plains		
Intercept	.29005431	5.11876	.0001
Size	.00000044	1.50599	.1290
Fixcst	-.00440800	-2.38030	.0169
Adjpc	-.14612608	-2.63414	.0087
Age	-.05665728	- .58280	.5676
Educ	.00368972	3.10649	.0025
Smsa	-.00442622	- .60276	.5543
Law	.02461927	3.51240	.0008
R^2 = .16018			
	Mountain States		
Intercept	.32491646	4.23097	.0001
Size	.00000178	4.77519	.0001
Fixcst	.00281770	1.93210	.0513
Adjpc	-.09627619	-1.18458	.2353
Age	-.12480778	- .80647	.5737
Educ	.00276458	1.28556	.1967
Smsa	-.00265873	- .16745	.8615
R^2 = .12846			

Table C.20. Continued

Source of variation	Estimated regression coefficient	T Statistic	T Test Prob
	Pacific States		
Intercept	.28340524	2.78808	.0062
Size	.00000136	3.84924	.0004
Fixcst	.00113488	.31174	.7541
Adjpc	-.04620423	- .37484	.7099
Age	-.15356877	- .79678	.5671
Educ	.00257263	.86831	.6090
Smsa	-.01496821	-1.02584	.3077
R^2 = .19180			

Table C.21. National regression results using CORP as the dependent variable, and Vlbcst as the measure of production costs

Source of variation	df	Total (or partial) sum of squares	F Test Computed F-value	F Test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	1.0385	166.97	.0001	
Error	3023	1.1751			
Corrected Total	3039	2.2136			
Intercept					-.02667153
Region	9	.18063	51.631	.0001	
Size	1	.28752	739.65	.0001	.00000055
Fixcst	1	.08162	209.98	.0001	.00179847
Vlbcst	1	.00182	4.6786	.0287	.00962838
Age	1	.00195	5.0277	.0235	.01243146
Educ	1	.06313	162.41	.0001	.00136091
Smsa	1	.00464	11.930	.0009	-.00163961
Law	1	.00176	4.5345	.0312	.00179197
Without Regional Classification					
Regression	7	.85785	274.07	.0001	
Error	3032	1.3557			
Corrected Total	3039	2.2136			
Intercept					-.02466410
Region					
Size	1	.30890	690.84	.0001	.00000056
Fixcst	1	.06098	136.39	.0001	.00147127
Vlbcst	1	.00244	5.4557	.0185	.00983049
Age	1	.00006	.13688	.7128	.00207674
Educ	1	.06465	144.59	.0001	.00131712
1 Smsa	1	.00594	13.287	.0005	-.00179286
Law	1	.03362	75.197	.0001	.00624923

R_2^2 with regions .46914
R^2 without regions .38754

Table C.22. Iowa regression results

Source of variation	Estimated coefficient	T-test: Calculated T-value	T-test: Prob
	Dependent variable CORP		
Intercept	-.00528718	-1.0251	.3088
Size	.00000009	1.1380	.2569
Fixcst	.00118449	2.3884	.0179
Adjpc	.00073906	.08393	.9309
Age	.00684995	.75384	.5406
Educ	.00039710	1.5224	.1274
Smsa	-.00122294	-2.8990	.0049
R^2 = .26447			
	Dependent variable CORPSM		
Intercept	-.00361264	- .75883	.5437
Size	.00000008	1.0705	.2871
Fixcst	.00097938	2.1394	.0329
Adjpc	-.00125535	- .15445	.8722
Age	.00599331	.71456	.5163
Educ	.00044022	1.8284	.0672
Smsa	-.00099149	-2.5464	.0121
R^2 = .25077			
	Dependent variable CORPLG		
Intercept	-.00167454	-1.2426	.2147
Size	.00000001	.57377	.5745
Fixcst	.00020511	1.5829	.1129
Adjpc	.00199442	.86685	.6075
Age	.00085664	.36081	.7198
Educ	-.00004312	- .63266	.5357
Smsa	-.00023144	-2.0998	.0362
R^2 = .10354			

Table C.22. Continued

Source of variation	Estimated coefficient	T-test: Calculated T-value	T-test: Prob
	Dependent variable PART		
Intercept	.24551281	6.7663	.0001
Size	.00000153	2.8094	.0062
Fixcst	-.01509997	-4.3280	.0001
Adjpc	-.27289545	-4.4053	.0001
Age	.12884317	2.0156	.0440
Educ	.00244128	1.3304	.1835
Smsa	-.00149177	- .50268	.6224
R^2 = .23750			
	Dependent variable CORPART		
Intercept	.24022563	6.3718	.0001
Size	.00000161	2.8596	.0054
Fixcst	-.01391548	-3.8386	.0005
Adjpc	-.27215639	-4.2283	.0002
Age	.13569313	2.0430	.0413
Educ	.00283839	1.4887	.1361
Smsa	-.00271471	- .88040	.6152
R^2 = .2223			

Table C.23. National regression results using CORP as the dependent variable with the variable SMSA and LAW constructed without the "class" statement

Source of variation	df	Total (or partial) sum of squares	F Test: Computed F-value	F Test: Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	1.0945	184.80	.0001	
Error	3023	1.1190			
Corrected Total	3039	2.2136			
Intercept					-.00110194
Region	9	.16541	49.650	.0001	
Size	1	.33429	903.05	.0001	.00000059
Fixcst	1	.04856	131.17	.0001	.00142753
Adjpc	1	.05788	156.36	.0001	-.04129236
Age	1	.00539	14.561	.0003	.02049702
Educ	1	.05791	156.44	.0001	.00130282
Smsa	1	.00271	7.3234	.0069	.00251257
Law	1	.00255	6.8780	.0087	-.00430635
Without Regional Classification					
Regression	7	.92913	313.12	.0001	
Error	3032	1.2845			
Corrected Total	3039	2.2136			
Intercept					.00046130
Region					
Size	1	.39123	923.51	.0001	.00000062
Fixcst	1	.04413	104.17	.0001	.00125160
Adjpc	1	.07372	174.01	.0001	-.04082243
Age	1	.00478	11.290	.0012	.01823982
Educ	1	.06529	154.11	.0001	.00131325
Smsa	1	.00159	3.7498	.0498	.00186911
Law	1	.02900	68.454	.0001	-.01161955

R^2 with regions = .49447
R^2 without regions = .41974

Table C.24. National regression results using CORP as the dependent variable and the natural-logarithmic transformation of Size, Fixcst, Adjpc, Age, and Educ as dependent variables

Source of Variation	df	Total (or partial) sum of squares	F-test Computed F-value	F-test Prob	Estimated regression coefficient
With Regional Classification					
Regression	16	.97011	148.74	.0001	
Error	2973	1.2119			
Corrected Total	2989	2.1820			
Intercept					-.28181
Regions	9	.17015	46.378	.0001	
L Size	1	.31784	779.70	.0001	.02708
L Fixcst	1	.05278	129.47	.0001	.01220
L Adjpc	1	.04573	112.18	.0001	-.01784
L Age	1	.00733	17.992	.0001	.01065
L Educ	1	.01359	33.349	.0001	.00383
Smsa	1	.00157	3.8514	.0468	.00194
Law	1	.00121	2.9759	.0807	-.00300

R^2 = .44459