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Determinants of Farm Size and Structure

Proceedings of the program sponsored by the NC-181 Committee on Determinants of Farm Size and Structure in North Central Areas of the United States, held January 16, 18, and 19, 1988, in San Antonio, Texas.

*Robison/*Introduction and Overview

*Johnson/*Farm Managerial Inquiry: Past and Present Status and Implications for the Future

*Batte/*Question and Answer Session Following Glenn Johnson's Presentation

*Sonka/*Factors We Observe on Successful Midwest Farms Today

*Ruttan/*Scale, Size, Technology and Structure: A Personal Perspective

Batte/ Discussion Following Vernon Ruttan's Presentation

*Hallam/*Economies of Size: Theory, Measurement, and Related Issues

*Henderson/*Application of the Structure, Conduct, and Performance Paradigm to Research on the Structure of Agriculture

*Young, May, and Shetewi/*Farm Size Classifications and Economies of Size: Some Empirical Issues

*DeFrain and Stinnett/*Strong Families and Strong Farming Organizations: Is There A Connection?

*Richardson, Smith, and Knutson/*Who Benefits From Farm Programs: Size and Structure Issues?

*Headley/*The Effect of Government Policy on Farm Size and Structure

*Tweeten/*World Trade, Exchange Rates, and Comparative Advantage: Farm Size and Structure Implications

*Carlin/*Strong Communities - Strong Farms: What is the Connection?

*Baker/*Financial Stress in Agriculture: Likely Impact for Farm Structure

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WHO BENEFITS FROM FARM PROGRAMS: SIZE AND STRUCTURE ISSUES?*

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Edward G. Smith, and
Ronald D. Knutson**

Farm programs, as we know them, have been in existence since the 1930s. A wide array of programs has been implemented to support producer income, provide price stability, and create more orderly marketing for farm products. A question regularly asked by public policy makers is "Who benefits from these programs?" This is a particularly complex issue, one not easily answered from society's perspective. One part of the issue, however, which narrows the focus involves: "Which producers benefit?" and "What are the structural impacts of farm programs?" There is no consensus among agricultural economists on the answer to these questions.

Conventional wisdom holds that large-scale farms benefit more than small and mid-size farms (Knutson, Penn, and Boehm). Support for this view has been provided in numerous reports (e.g., Wilcox; A Time to Choose; Lin, Johnson, and Calvin; Johnson, Banker, and Morehart; and Raup). Others have held that whether large-scale farms benefit most from farm programs depends on how benefits are measured (e.g., Gardner; Gardner and Pope; Smith, Richardson, and Knutson).

As to the structural implications, some have argued that particular farm program provisions lead to more farms (e.g., Tweeten) while others have argued that farm programs, in general, lead to fewer but larger farms (e.g., Nelson and Cochrane; USDA, A Time to Choose; Schertz; Boehlje and Griffin; and Quance and Tweeten). Still other studies conclude that there is no discernible relationship between farm program benefits and farm structure (e.g., Sumner; Tweeten; Spitze, Ray, Walter, and West).

Much of the problem surrounding who benefits from farm programs is definitional. How do you define the "benefits" and how are they measured? The American Heritage Dictionary defines benefits broadly as anything that promotes or enhances well-being. The purposes of this paper are, therefore, to review farm program benefits, using this broader definition, and to draw inferences as to the impacts on farm structure.

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Who Benefits the Most?

Five approaches are used in this paper to address the question of what size of farm benefits the most from farm programs. The approaches are: (a) total receipts, (b) payment rate, (c) payment per unit of resource, (d) farm survival, and (e) wealth.

Total Receipts Approach

The total receipts approach is the most common of the four approaches used to describe benefits. This approach reports the average government payments received by each size group in either nominal or percentage terms. That is, analysts simply add up the total direct government payments to a specific size group and divide by the number of farms in the group.

One of the first studies which used the total receipts approach was Wilcox's 1970 Congressional testimony which reported on the distribution of direct payments under the 1965 farm program. He reported that the 19 largest farms received $19.1 million in government payments in a single year. Wilcox's report was a motivating force behind the establishment of payment limitations. USDA's A Time to Choose (p. 102), indicated that in 1978, the smallest 30 percent of the farms received less than 4 percent of government payments while the largest 10 percent of all farms participating in the farm program received 46 percent of the payments. A more recent study by Johnson, Banker, and Morehart reported that the largest 1 percent of farms participating in farm programs received 15 percent of the government payments in 1985 while the smallest 48 percent of the farms received only 2.2 percent of total payments.

Updating the total receipts approach for the latest figures on government payments under the 1985 Farm Bill reveals that the average farm program payment to large farms (those with more than $500,000 of sales) was $36,000 in 1986 while the average payment for farms with sales of $20,000 to $40,000 was only $5,600 (Figure 1). It is certainly not surprising that the results for 1986 are in agreement with previous farm program benefit studies which use the total receipts approach; namely, large farms receive the greatest payments.

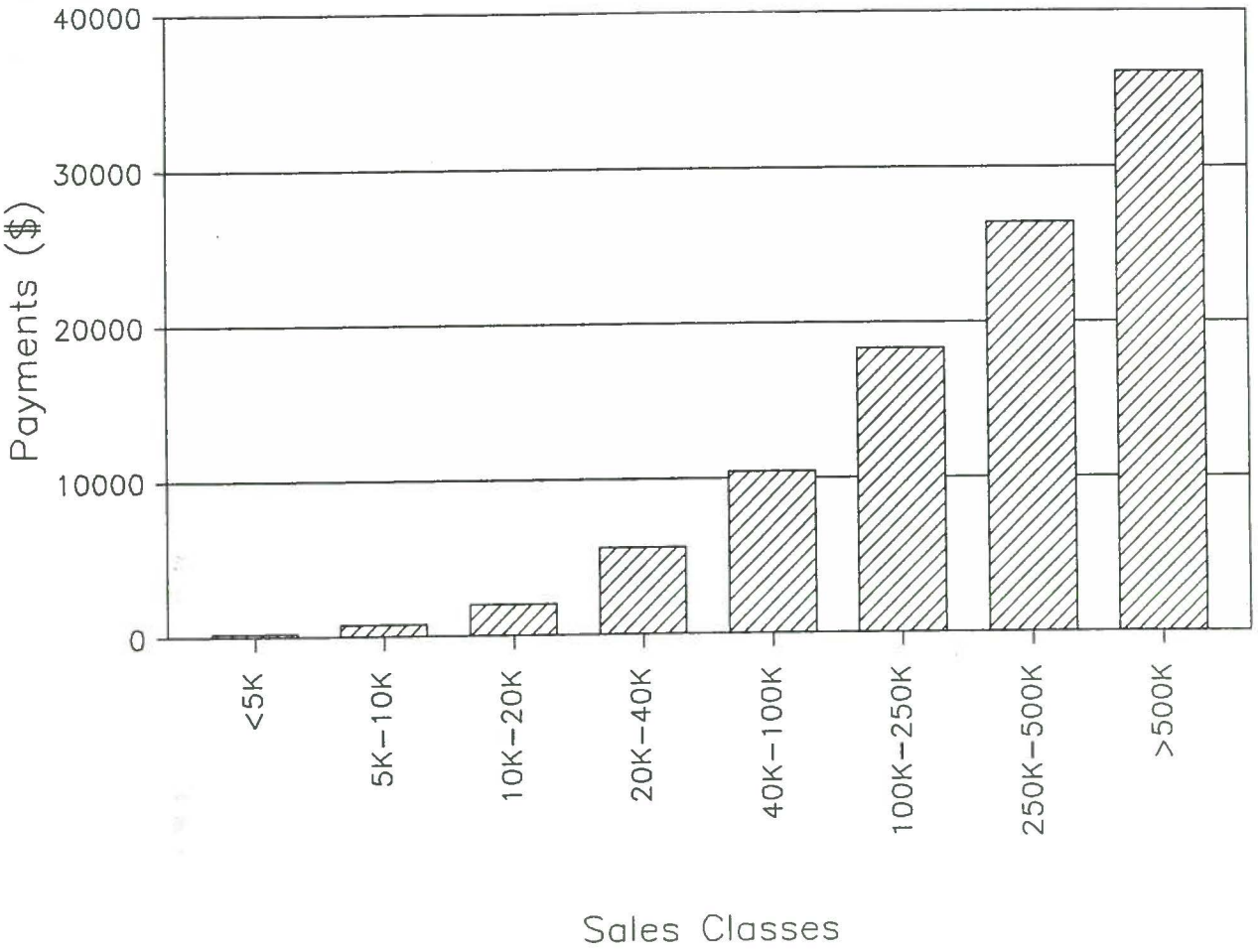
The total receipts approach only quantifies what should be obvious. Government payments, in most cases, are made per unit of production in a year. Therefore, payments tend to be a function of historical production (base and yield) and, because large farms produce more than small farms, total government payments must be greatest for large farms.

Other problems with the conventional cash receipts approach are:

(a) All farms (grain, cotton, fruits, vegetables, and livestock) are included in the number of farms in each sales class when computing average payment per farm.

(b) All farms in each size category are assumed to participate in the farm program.

(c) Restructuring of farms to comply with the payment limitation tends to overstate the number of mid-size farms and prevent one from truly reflecting incidence of payments.



Source: Economic Indicators of the Farm Sector: National Financial Summary, 1986. ECIFS 6-2, Economic Research Service, U.S. Department of Agriculture, 1987, p. 50.

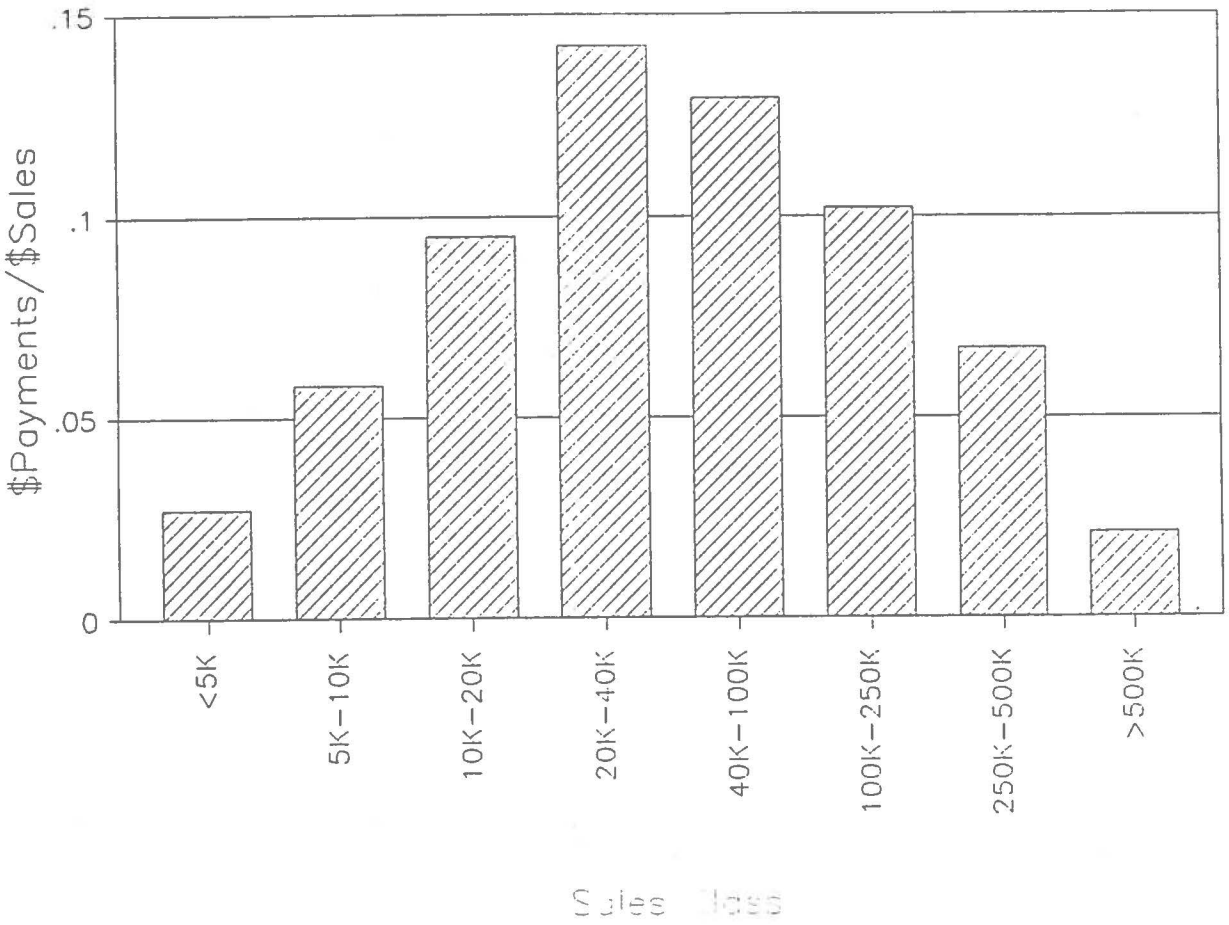
Figure 1.

Average Direct Government Payments Per Agricultural Operation, by Sales Class, 1986

Payment Rate Approach

The payment rate approach has not been published elsewhere to the authors' knowledge. This approach is based on the determination of farm program payments. If payments are based on volume of production (i.e., bushels, pounds, etc.) and each unit of production receives the same payment rate, then there can be no structural bias in farm program payments because each unit of output is paid the same regardless if it is produced on a small- or a large-scale farm.

An extension of the payment rate approach involves dividing total farm program payments for each farm size category by average sales for the size category. Expressing 1986 farm program payments as a percent of sales reveals that farms with sales of $20,000-$100,000 receive 13-14 cents of direct government support for each $1 of sales. Direct payments per dollar of sales is the least for those farms with sales exceeding $500,000 (Figure 2). These results suggest that the conventional cash receipts approach grossly errs in concluding that large-scale farms receive the greatest benefits from farm programs.



Source: Economic Indicators of the Farm Sector: National Financial Summary, 1986. ECIFS 6-2, Economic Research Service, U.S. Department of Agriculture, 1987, pp. 46 and 50.

Figure 2.

Dollars of Direct Government Payments Per Dollar of Gross Farm Income Before Inventory Adjustment Per Agricultural Operation, by Sales Class, 1986

The payment per unit approach has many of the same problems as the total receipts approach. That is, there is a mix of program and nonprogram crops in any size category, all farms are assumed to participate in the program, and farm numbers may have adjusted due to the payment limitation.

Payment Per Unit of Resource

A further extension of the payment rate approach is to calculate the farm program payments to resources used to produce a unit of output. In the presence of economies to size, small farms receive lower payments per dollar of resources used to produce a crop than more efficient, mid-size, and large-scale farms. Mid-size farms receive greater payments per dollar of resources used to produce a crop than large-scale farms who may be affected by the payment limitation. These results were obtained by calculating the dollar of program payments per dollar of average total cost for different size wheat farms in Texas and Kansas (Knutson, et al.). Payments per unit of resources has the advantage of relating farm subsidies to the efficiency with which resources are used. It provides an indication of the extent to which government payments are used to reward efficient utilization of resources. The alternative is to reward the inefficient.

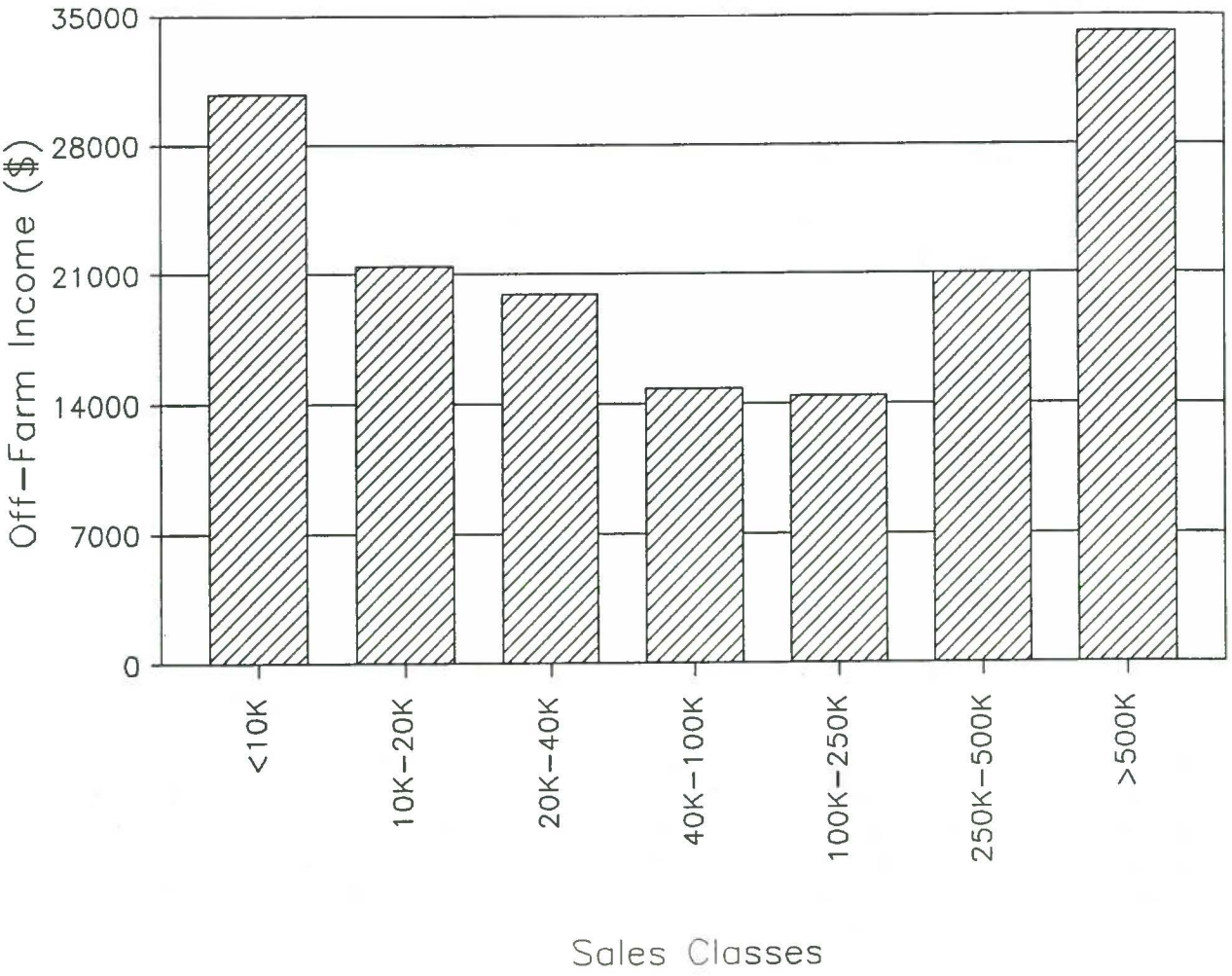
Farm Survival Approach

To the extent that price and income supports reduce the risk of low cash flows, it is held that farm programs benefit larger, more leveraged farms relative to their smaller counterparts (Schertz; Nelson and Cochrane; Raup; Lin, Johnson, and Calvin; Quance and Tweeten; Boehlje and Griffin). The argument is that reduced cash flow variance encourages farm growth and increases the value of land, thus resulting in fewer but larger farms. Gardner disagrees with this commonly accepted belief and hypothesizes that the farmers who benefit most by farm programs are those who would otherwise go out of business, i.e., those who need farm programs to survive. Three of the reasons farm firms may go out of business are because they are inefficient from an input/output perspective, or they are inadequately financed, or because they are unable to manage risk. Each of these reasons are considered in the farm survival approach.

Using farm survival as a measure of farm program benefits is based on Gardner's hypothesis. It attempts to determine which size or class of farms would most likely fail without farm programs. Several factors have been shown to affect farm survival; namely, level of off-farm income, leverage, tenure, and economies of size. Each determinant of survival is discussed in an effort to determine what type of farms benefit (survive) the most from farm programs.

Level of Off-Farm Income. Farms with high levels of off-farm income are better able to survive than farms with low off-farm income due to cross-subsidization and the reduced burden of family living expenses (Smith). Applying the farm survival approach to this determinant of survival, one would argue that farms having low off-farm incomes benefit most from farm programs which allow them to survive.

Off-farm income by sales class reveals that farms in the $40,000-$250,000 categories had the lowest average annual off-farm incomes in 1986 (Figure 3). Small-scale farms and large farms had off-farm incomes in excess of $30,000 per year while farms in the $40,000 to $250,000 sales categories had off-farm incomes of less than $15,000 per year. Farms in these middle size categories would benefit more from farm programs than either larger or smaller farms, to the extent that farm programs increase the survival of farms with low off-farm incomes.



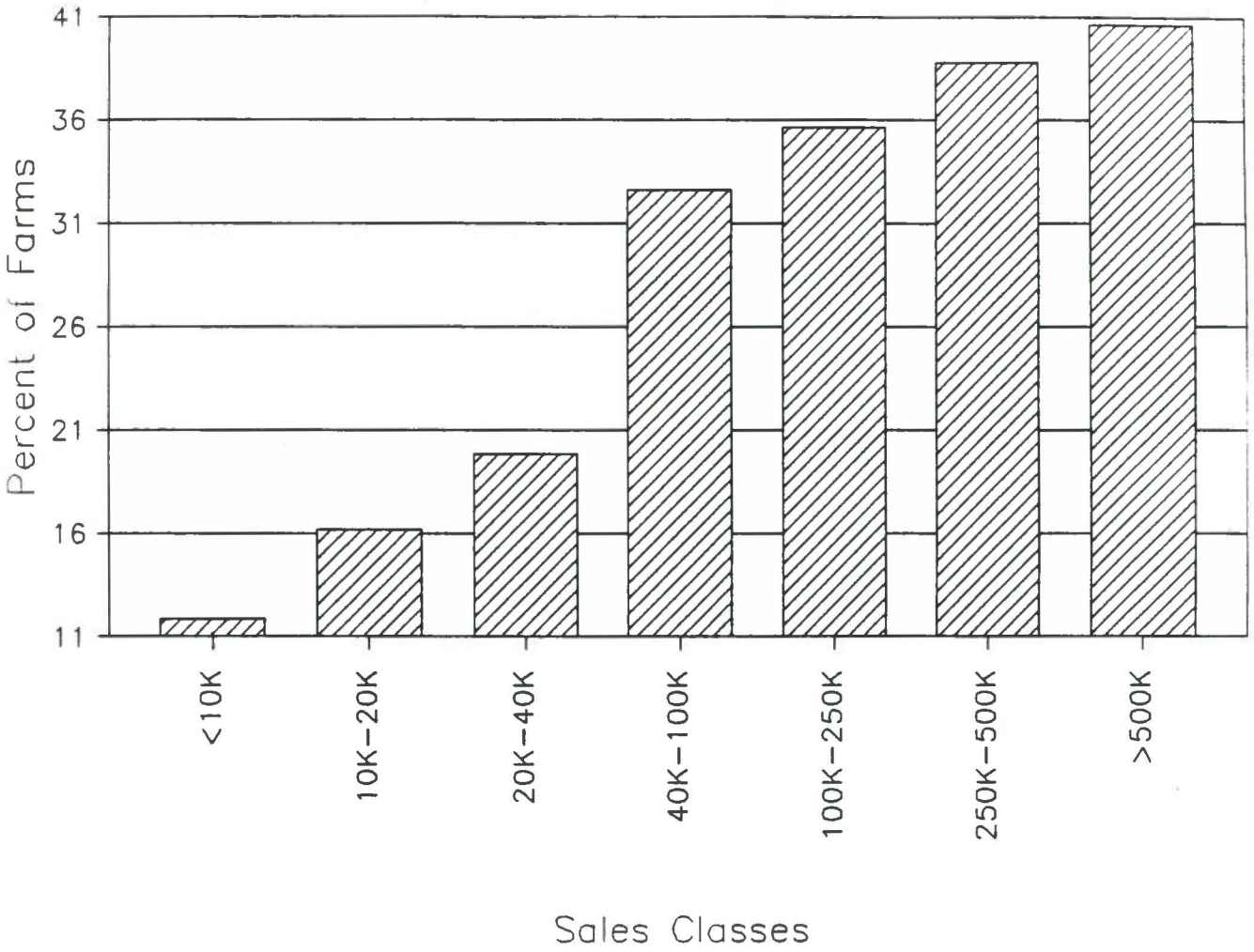
Source: Financial Characteristics of U.S. Farms, January 1, 1987. Agr. Inf. Bulletin No. 525, Economic Research Service, U.S. Department of Agriculture, 1987, pp. 76-82.

Figure 3.

Average Off-Farm Income by Sales Class, January 1, 1987

Leverage. Firm-level simulation results have indicated that low and moderate debt producers are better able to survive than high debt farmers given the current economic environment and projections for the near future (Leatham, Perry, Rister, and Richardson). These results hold across different levels of price and income variability, tenure arrangements, and levels of off-farm income. Financial ratios for farms, by sales class, indicate that about the same proportion (36 to 40 percent) of farms in the $100,000 to greater than $500,000 sales classes have debt-to-asset ratios of 40 percent or greater (Figure 4). Because large farms are likely better able to handle risk and to

service high debt levels, the high debt producers who benefit most from farm programs are those mid-size commercial farms less able to manage risk, i.e., those in the $40,000 to $250,000 sales classes.

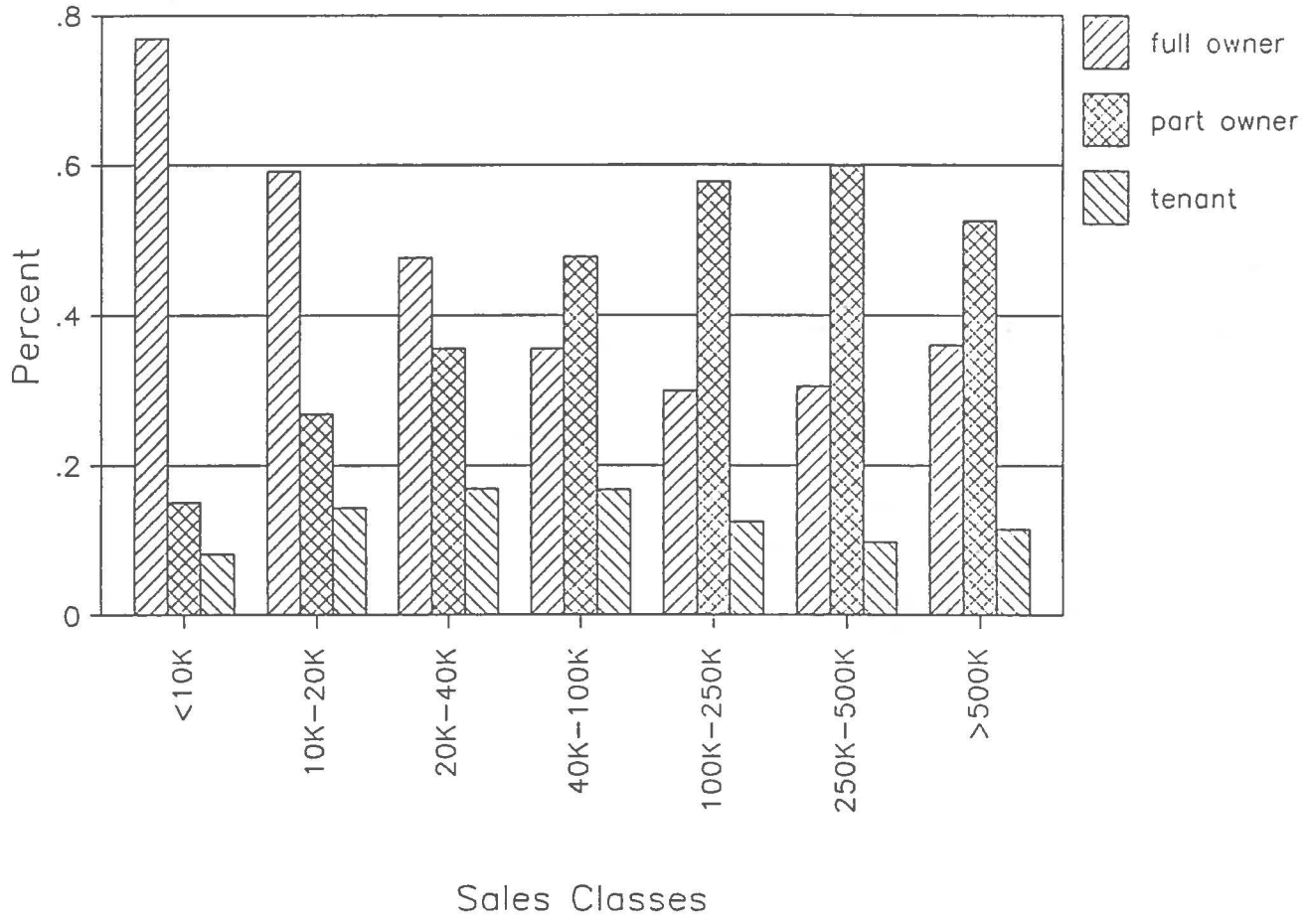


Source: Financial Characteristics of U.S. Farms, January 1, 1987. Agr. Inf. Bulletin No. 525, Economic Research Service, U.S. Department of Agriculture, 1987, pp. 110-113.

Figure 4.

Percent of Farms With Debt-to-Asset Ratios of 40 Percent or Greater, by Sales Class, January 1, 1987

Tenure Arrangements. Firm-level simulation analyses have shown that tenant operators, generally, are less able to survive than part or full owners (Perry, et al.). Tenants are unable to borrow against equity in land to meet cash flow deficits. The greatest proportion of farms operated by tenants was in the $20,000 to $100,000 sales categories during 1982 and the greatest proportion of farms operated by part owners was in the $100,000 to $500,000 sales categories (Figure 5). Of the commercial farm categories (greater than $40,000 sales), the largest size category had the largest proportion of full owners. These statistics suggest that farm programs which help tenant farms survive benefit mid-size farms more than small, large, and very large farms.



Source: 1982 Census of Agriculture: United States Summary and State Data. Vol. 1, Geographical Area Series, Part 51, AC82-A-51, U.S. Department of Commerce, 1984, p. 28.

Figure 5.

Percent of Full Owners, Part Owners, and Tenants, by Sales Class, 1982

Economies of Size. Farm-level simulation of different size farms indicates that farms with lower costs of production are better able to survive even without farm program benefits (Smith, Richardson, and Knutson; Richardson and Smith). To the extent that economies to size exist, large, low-cost farms benefit less in terms of survival from the presence of farm programs than small and mid-size farms who need farm program benefits to offset their high costs of production. Based on unit cost curves for corn and wheat, developed from a special tabulation of the 1982 Agricultural Census, Knutson, et al. reported significant economies of size for corn and wheat producers in the major corn and wheat producing states.

The resulting cost curves for corn and wheat (Figures 6 and 7) reveal that the greatest benefits from farm programs accrue to small and mid-size farms who have relatively high costs of production. This incidence of farm program benefits is consistent across the other farm program crops (cotton, rice, and sorghum) analyzed by Knutson, et al.

Summarizing the farm survival approach, one concludes that mid-size farms having high costs of production, moderate to high debt, high proportion of rented land, and low levels of off-farm income benefit the most from farm programs. Large farms with high levels of off-farm income, moderate debt, and low costs of production tend to benefit less from farm program provisions because they are better able to survive without them. These characteristics are consistent with whole-farm simulation studies which have tried to estimate the effects on survival of not participating in the farm program for different size crop farms (Richardson and Smith; OTA; Smith, Richardson, and Knutson). The results of these simulation studies show that all sizes of farms are benefitted by farm programs, but mid-size farms experience the greatest increase in their probability of survival as a result of participating in the farm program.

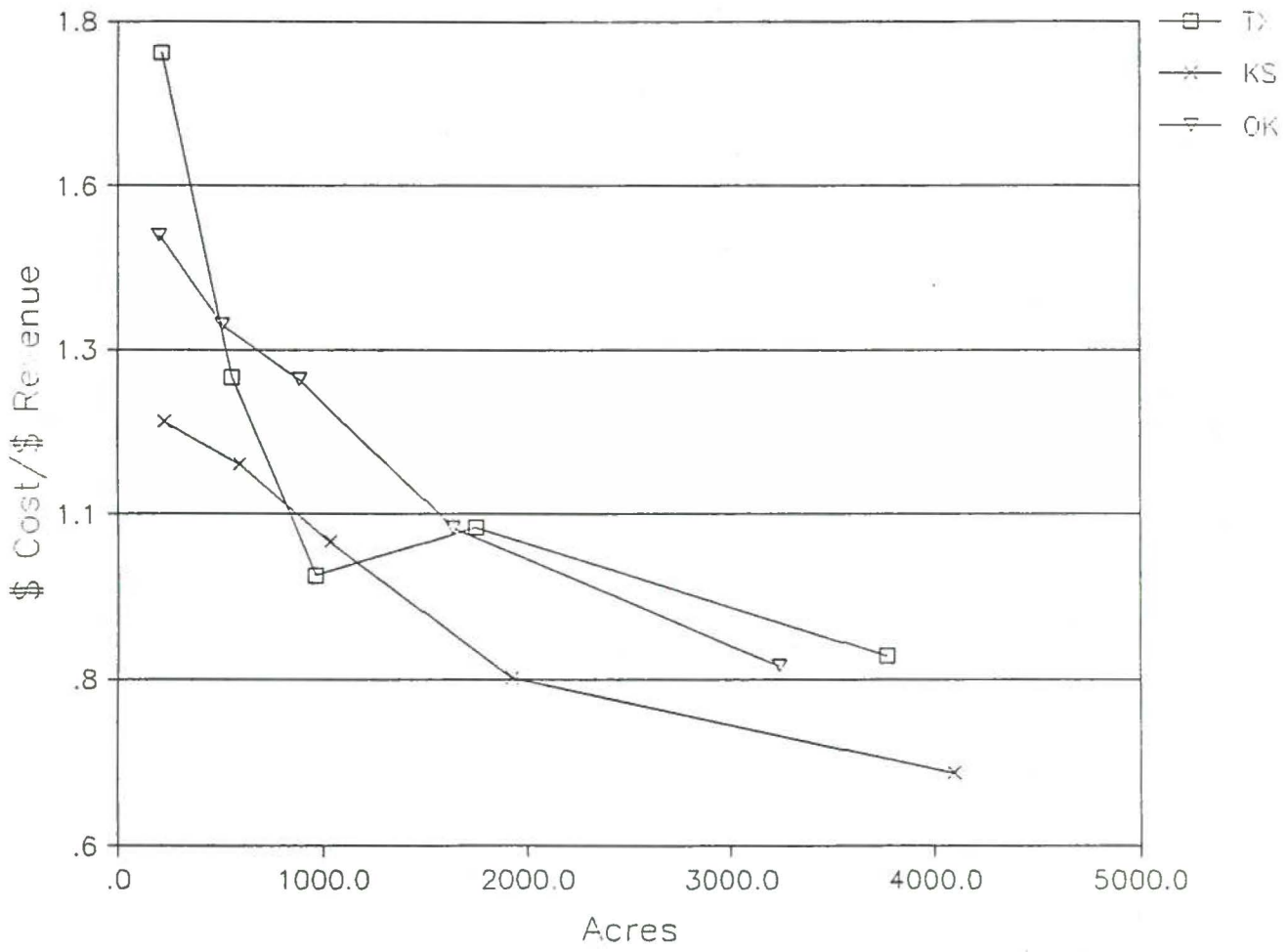
Wealth Approach

Using the wealth approach, the farms which benefit the most from farm programs are those that experience the greatest percentage change in net worth. One method to estimate the wealth effects of farm programs on different size farms is to use whole-farm simulation. Smith simulated eight Texas High Plains cotton farms and reported that participation in the farm program increased the present value of ending net worth 66 to 102 percent for mid-size farms, 12 to 37 percent for small farms, 50 percent for large farms, and 39 percent for very large farms. Similar results were observed for mid-size and very large farms in Iowa, Nebraska, and Mississippi and in the Texas Northern High Plains (OTA). These results suggest that farm programs, as measured by wealth, benefit mid-size farms more than small and very large farms.

Changing Who Benefits

It is possible to pass laws which target farm program benefits to a certain class of farms. Rhetoric abounds for such laws. One justification is to stop the spiral of farm program costs and another is to reduce the level of payments to large-scale farms (Total Receipts Approach). If such action is taken, however, it will not be without cost to society. The potential costs to society of targeting farm program benefits to small or mid-size farms are:

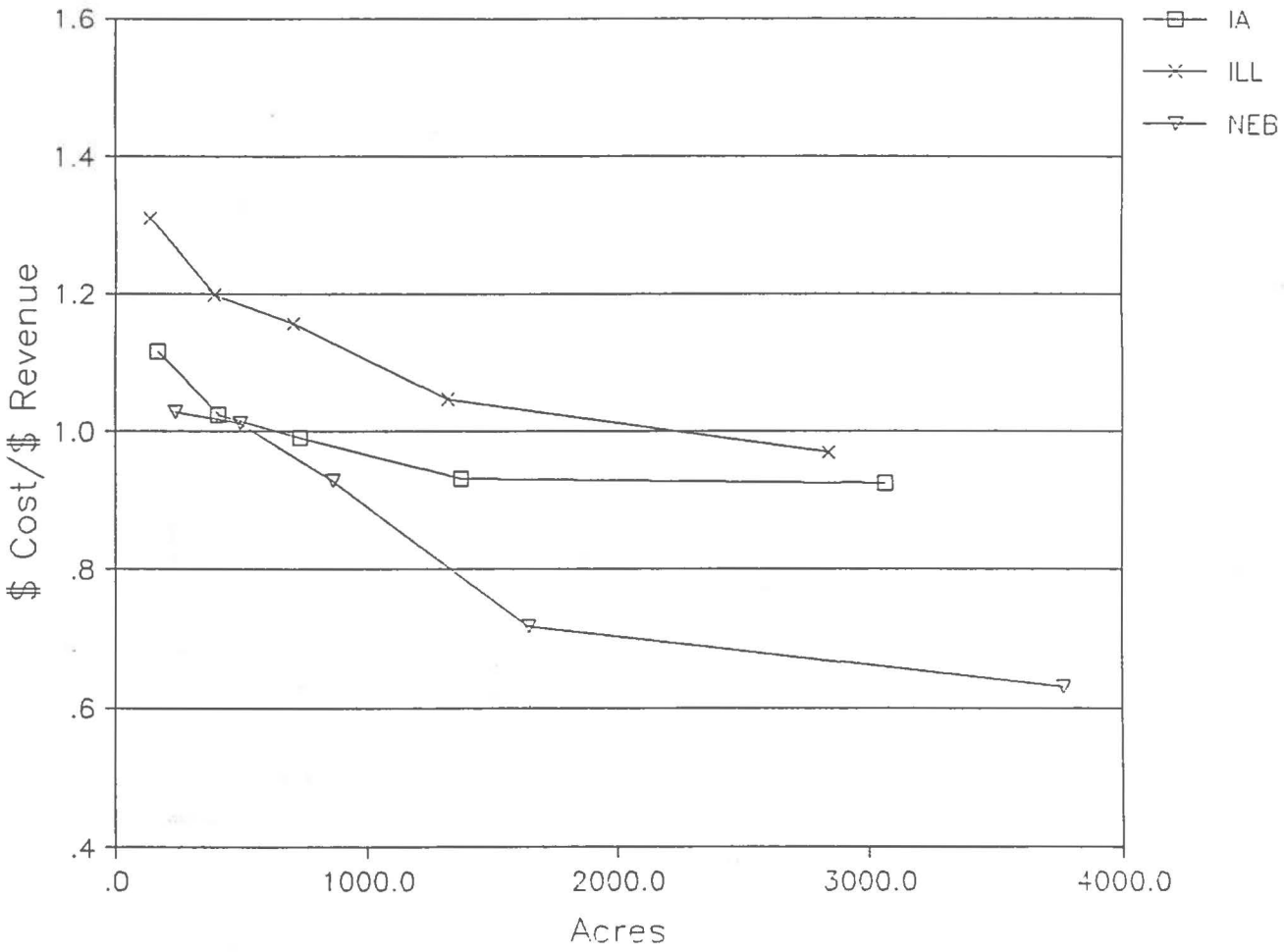
(a) Loss of the benefits of substantial economies to size for farm program crops, as large farms reorganize in an attempt to gain the farm program benefits offered to smaller farms;



Source: Knutson, et al.

Figure 6.

Economies of Farm Size on Wheat Farms



Source: Knutson, et al.

Figure 7.

Economies of Farm Size on Corn Farms

(b) Increased price of food and fiber for consumers in the United States;

(c) Loss of efficiency in a world market could lead to reduced exports of food and fiber; and

(d) No real reduction in farm program costs if maintaining the smaller inefficient farms warrant further political request for aid.

These costs create substantial incentives for farm operators to attempt to avoid their incidence. As a result, substantial increases in commodity credit corporation farm numbers have occurred (GAO). If Congress is successful at preventing such reorganizations, through devices such as utilizing tax I.D. numbers (rather than ASCS farm program numbers), a different type of farm structure will probably occur. An example could be a larger proportion of tenant farming which, as noted previously, is more fragile from a survival perspective. The costs of such organizational changes are difficult to evaluate.

Summary and Conclusions

Considerable debate exists among agricultural economists as to which size of farm benefits the most from farm programs. The total receipts approach indicates that the largest farms receive the greatest benefits but is potentially misleading. Correcting this procedure to a dollar of government payment per dollar of sales shows the greatest benefits accrue to mid-size farms.

The payment rate approach indicates there should be no bias in program benefits because each unit of output is paid the same, regardless of the size of farm where it was produced. Mid-size farms, however, receive the greatest farm program benefits per dollar of resources used to produce a unit of output. Small-scale farms receive lower benefits per dollar of resources used because they have high costs of production. Although large-scale farms have low costs of production, they receive lower benefits per dollar of resources due to the presence of payment limitations.

Based on the farm survival approach, mid-size farms having low off-farm incomes, high debts, and a high proportion of rented land benefit the most from farm programs. Without farm program benefits, it is this class of farms that is most likely to be forced out of business. Larger farms are better able to survive because of high off-farm incomes, low costs of production, and their ability to handle risk. Based on simulation studies for different size crop farms, mid-size farms experience greater percentage increases in net worth from farm program participation than small or very large farms.

Attempts to change the pattern of who benefits from farm programs will likely be met with failure. Costs to society from such changes will likely be large. Prices of food and fiber will increase domestically, costs of production will rise, reorganization of farms will result in fewer large farms, and more mid-size farms eligible for farm program benefits. As a result, consumers will pay more for food and fiber, U.S. exports will be less competitive, and government costs for the farm program in the long run may actually increase.

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