ECONOMIC AND SOCIAL FACTORS INFLUENCING AGGREGATE UNDERGRADUATE ENROLLMENT IN COLLEGES OF AGRICULTURE

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Abstract

The purpose of this paper is to explain changes in aggregate undergraduate enrollment in land-grant colleges of agriculture by various social and economic measures of our society during the 1920 through 1965 time period. Multiple regression procedures were used to quantify the relationship of the various factors to agricultural enrollments for the prewar, war, postwar, and entire periods.

The significant explanatory factors found in the analysis were (1) civilian male population, (2) rural population, (3) gross national product per capita, (4) net farm income per capita, (5) parity price ratio, and (6) the differential between United States disposable income per capita and net farm income per capita. These factors explained eighty percent of the variance in prewar enrollment, eighty-six percent of enrollment changes during the war and postwar time periods, and eighty-two percent of the fluctuations in enrollment during the entire period of analysis.

The indicators of profitability in agriculture were inversely related to enrollment during the prewar period and positively associated with agricultural enrollment after the second world war. These substantial differences seem to indicate that major changes have occurred in the attitude of rural people toward higher education. An attempt is made to explicate some of these changes and to draw logical implications from them.

Introduction

An extensive effort has been made in recent years to measure the effect of education upon national economic development. T. W. Schultz (3) found that education contributed twenty-one percent of the economic growth in the United States during the time period from 1929 to 1957. Zvi Griliches (2) discovered that the level of education was just as important as the number of farm workers in his aggregate production function of United States agriculture. The correlation between the national level of education and economic development is not necessarily a simple cause-effect relationship, but the level of both factors is determined simultaneously within the system. The level of economic development may have a greater influence on the national demand for education than the educational level of its people has upon the economic growth of a country.

This paper will quantify some relationships between various social and economic factors and the aggregate level of undergraduate enrollment in land-grant colleges of agriculture. An attempt will be made to form reasonable explanations of these relationships and to draw logical implications from them. A multiple regression analysis was used to develop the demand equations for agricultural education. The elasticity of supply of education by colleges of agriculture was assumed to be infinite; therefore, the level of undergraduate enrollment was a simple function of the demand for education. This assumption is essentially true for short-run changes in enrollment, but loses some degree of validity when used in a long-run analysis.

The availability of data limited the analysis to the 1920 through 1965 time period. Enrollments in colleges of agriculture varied from a low of 4,500 in 1944 to a peak of 47,500 students in 1950 while the nation experienced periods of depression, war, prosperity and rapid change from an agrarian-based society to an industrialized, urban society. The time series data on undergraduate enrollments

were compiled by Dr. Henry S. Brunner (1). All exogenous variables were computed from annual issues of Agricultural Statistics (4) and the Statistical Abstract of the United States (5).

Analysis

For the initial analysis, the time period under study was divided into three segments: prewar, war and postwar. An equation was also computed for the entire 1920 to 1965 period. The four final regression equations investigating the effect of social and economic phenomena upon the level of enrollment in colleges of agriculture are in Table 1. All equations were computed in natural logarithms so the regression coefficients also measure the elasticity of demand for agricultural education with respect to the appropriate exogenous variables.

The Prewar Period

The equation developed from 1920 through 1940 data explains approximately eighty percent of the variance in enrollments during this period. Rural population and gross national product per capita are positively correlated to agricultural enrollments which agrees with one's logic and expectations. The rural population forms the principal source of young people who enroll in colleges of agriculture and gross national product per capita is an accepted measure of the economic welfare of a nation.

The surprising result is that the economic indicators of the agricultural sector, net farm income and parity price ratio, are inversely related to the dependent variable. This means that the effect of a one percent increase in net farm income per capita will be associated with a decrease in the number of students in colleges of agriculture by 1.49 percent. There are several plausible explanations for this phenomena occurring at this time. Rural people were not convinced that a college education was necessary or even advantageous to a practical farmer. Also the opportunity cost of college education is directly proportional to the level of farm income, therefore, a high income and favorable parity price ratio could easily persuade a boy to remain on the farm. Another possible reason was in the attitude of rural people toward the urban society and their own communities. Strong community and family ties, a belief that farming is the best way of life and a distaste for the industrialized, urban way of life combined to induce people to remain on the farm regardless of the level of income.

A negative coefficient for the difference between disposable income per capita and net farm income per capita seems even more illogical than for the previous two factors measuring the economic welfare of the agricultural sector. One possible explanation for this depends on the method of financing a college education and the absolute values of disposable income and net farm income. At this time, education was primarily financed by parental support or by the student's working himself to pay for his education. Scholarships, grants and educational loans of any kind were almost nonexistent. Therefore, when farm income was low relative to disposable income, the financial capability of farm parents to send their children to college was lowered to a great extent. The absolute level of both income factors was low and the number of unemployed workers was high during the depression of the thirties which would tend to limit the number of young people who could work their way through college.

Education is generally viewed by economists as an investment to increase future production and therefore future consumption, or as a present consumer good. This concept seems to have little application for the agricultural society during the prewar period. The low absolute levels of income in the rural sector during the depression of the thirties prohibited any significant consumption of luxury

Table 1. Explanatory Equations for the Aggregate Level of Undergraduate Enrollment in Land-Grant Colleges of Agriculture[a/]

Time Period	Constant Term	Regression Coefficients of the Exogenous Variables[b/]						R^2
		X_2	X_3	X_4	X_5	X_6	X_7	
1920-40	-58.11		6.0667	5.1132	-1.4912	-1.1308	-1.2782	.80
			(3.53)	(4.30)	(1.90)	(2.14)	(1.95)	
1941-51	-19.54	3.3065						.86
		(7.79)						
1952-65	-29.7587		1.5076		2.4764		1.0590	.86
			(6.66)		(7.82)		(6.68)	
1920-65	-23.28	2.9375		4.6747	-2.3400		-2.1034	.82
		(10.67)		(4.25)	(3.10)		(3.75)	

a/ Variables are:

X_1 = Quantity of undergraduate students in all land-grant colleges of agriculture.
X_2 = Civilian male population in the 14 to 34 age group.
X_3 = Rural population.
X_4 = Gross national product per capita deflated by the Consumers Price Index.
X_5 = Net farm income per capita deflated by the Consumers Price Index.
X_6 = Parity Price Ratio.
X_7 = Difference between United States disposable income per capita and net farm income per capita deflated by the Consumers Price Index. (All indexes are relative to a 1910-14 base period.)

b/ Figures in parentheses are T ratios.

goods or investment in future human productive capacity by farm people. The positive regression coefficient of gross national product per capita appears to indicate that education does have some of the characteristics of a luxury good to people of higher absolute income levels.

The War Period

Agricultural education was primarily influenced by the number of civilian males from 14 to 34 years of age during World War II and for six years following the war. Undergraduate enrollment fell to a low of 4,500 students in 1944 when the number of civilian males decreased by approximately fifty percent from the 1940 level. A peak enrollment of 47,500 students was reached in 1950. The quantity of civilian males had risen to prewar levels and a vast number of young people whose educational plans were interrupted by the war also entered college at this time. The Vocational Rehabilitation Act of 1943 and the Serviceman's Readjustment Act of 1944 furnished veterans with financial support for higher education which provided an added incentive for veterans to enroll in college.

The Postwar Period

Results of the 1952 to 1965 analysis imply that a major change has occurred in the attitude of rural people. Net farm income per capita and difference between disposable income and net farm income now have a positive relationship to agricultural enrollments. Many of the hypotheses mentioned earlier to support the prewar analysis are no longer valid. Conditions have changed immensely in both the rural and urban sectors of the American society within a very short period of time. The growth of highly sophisticated agricultural industries has created a large demand for college graduates with rural backgrounds. Rapid technological advances within agriculture and the greater complexity of a modern farm have increased the value of a college education for a farm manager. Realization of the rapidly decreasing number of opportunities for farm boys to remain on the family farm and of the differential between farm and nonfarm income per capita also influences the demand for education.

Education exhibits the characteristics of both a consumer good and an investment during the postwar period. The positive effect of net farm income per capita upon agricultural enrollments supports the hypothesis that education is purchased for its value in satisfying present wants. The second motive for obtaining a higher level of education, to increase future productive capacity and consumption, is given some empirical basis by the positive effect of the variable measuring the absolute difference between disposable income and net farm income per capital. An increasing income differential creates an incentive to improve one's financial situation and education is a method of accomplishing this task.

Finally, a belief in the concept of agricultural fundamentalism is probably not as strong in a generation of young people who have grown up with transisterized radios and TV dinners as it was with their parents. These factors and many others have drastically shifted values and attitudes of farm people toward higher education.

The Entire Period

The explanatory equation for the entire period reflects the implications drawn from the analysis of the war and prewar periods. The equation reveals one of the weaknesses of using multiple regression techniques to analyze data over a long time period. It does not show the changing degree of association between various independent factors and the dependent variable. In this case, the equation derived from 1920 to 1965 data is completely irrelevant for describing demand during the

1952 to 1965 period and any projections based upon either of these time periods will probably be obsolete due to rapid change in social, technical, and economic conditions.

Summary

A major portion of the annual fluctuations of undergraduate enrollments in land-grant colleges of agriculture can be associated with changes in social and economic conditions in United States, but it was not shown that the level of enrollment is dependent upon those conditions. In economic theory and in reality, education is both a consumption and an investment good, therefore, an error is made when education is viewed as either a cause or effect of economic growth without consideration of its dual role.

The relationship of undergraduate enrollment to the various social and economic indicators has changed radically during the period from 1920 to 1965. Comparison of the prewar and postwar equations indicate that major shifts have occurred in the attitude of rural people toward agricultural education. The primary characteristic of the demand for agricultural education appears to be change, a change not only in the social and economic conditions influencing demand, but also in their relationship to enrollment in agricultural education.

Any accurate projection of future enrollment will have to predict the nature and extent of future changes in the attitude of farm people, the rural population, the income level of rural and urban people, and the ability of the agricultural college to meet the needs of tomorrow's society. This last factor may be the most important determinant of the future undergraduate enrollment in land-grant colleges of agriculture.

References

1. Brunner, Henry S., Specialist for Agricultural Education, Division of Higher Education, United States Department of Health, Education, and Welfare.

2. Griliches, Zvi, "Research Expenditures, Education, and the Aggregate Agricultural Production Functions," American Economic Review, Vol. LIV, December 1964, pp. 961-74.

3. Schultz, T. W., The Economic Value of Education, Columbia University Press, 1963.

4. United States Department of Agriculture, Agricultural Statistics, Washington, D. C., 1936-65.

5. United States Bureau of the Census, Statistical Abstract of the United States, Washington, D. C., 1950-65.