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The Market for New Ph.D. Agricultural Economists

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Models of the market for post-graduate trained individuals were pioneered by Freeman (1971, 1975a, b). Such models have been frequently applied to studies of the economics profession.[1] This paper represents the first attempt to apply this methodology to the agricultural economics profession. This paper is further differentiated from earlier studies by utilizing data disaggregated to the department level rather than a time series of national aggregates. Use of disaggregated data allows us to study how changes in both local and national markets affect the supply of and demand for agricultural economists.

We propose and fit demand and supply functions for graduate students, a supply function for new Ph.D.s and a demand function for total faculty in agricultural economics. The tuition cost and availability of teaching and research assistantships are incorporated into the supply decisions of graduate students. We also consider the effect of student enrollment and state economic conditions on the demand for faculty and graduate students. The observations for this study are the agricultural economics departments that offered a graduate program during 1962-1982 and that were located in state universities. The primary data source is the annual surveys of agricultural economics departments that were conducted by Francis Boddy.

The paper has the following organization. The models of behavior are proposed in the first section. The data are described in the second section and the econometric results are presented in the third section. The final

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section contains conclusions and suggestions for future research.

The Models of Behavior

In this section, we consider the market for graduate students and faculty in agricultural economics by focusing on decisions at the departmental or institutional level. This includes demand and supply functions for graduate students, supply function for new Ph.D.s and demand function for total faculty in agricultural economics.

The Supply of Graduate Students

One could estimate (4) directly using maximum likelihood methods. In this study, however, we approximate (4) by:

$$(5)\quad G_t^s = g^S[\overset{+}{G}{}_t^d, \overset{+}{W}{}_t^G, \overset{-}{T}_t, \overset{-}{W}{}_t^A, (\overset{-}{Y^f}/F)_t, \overset{+}{W}{}_t^E, \overset{+}{FA}_t; Z_{1t}]$$

where[4]

G_t^s = total number of graduate students enrolled in an agricultural economics department,

G_t^d = total number of graduate agricultural economics positions receiving financial assistance in the department,

W_t^G = departmental wage rate for graduate assistants based upon a full-time appointment,

T_t = university tuition rate for graduate students,

W_t^A = national average wage rate for beginning accountants,

$(Y^f/F)_t$ = state average net farm income per farm,

W_t^E = national average wage rate for assistant professors in agricultural economics,

FA_t = the number of faculty members in the department with rank of assistant professor or higher,

Z_{1t} = other control variables for the supply equation (trend, institutional dummy variables and the number of foreign Ph.D.'s awarded in the department).

The Demand for Graduate Students

$$(6)\quad G_t^d = g^d[\overset{-}{W_t^G},\ \overset{?}{W_t},\ \overset{+}{R_t},\ \overset{+}{E_t},\ \overset{+}{Y_t},\ \overset{?}{Y_t^f}\ \overset{+}{U_t},\ Z_{2t}]$$

where

R_t = total state agricultural experiment station expenditures,

E_t = total state agricultural extension expenditures,

Y_t = total state personal income,

Y_t^f = total state net farm income,

U_t = departmental number of undergraduate agricultural economics students,

Z_{2t} = other control variables entering the demand function (trend and institutional dummy variables).

The Supply of New Ph.D.s

$$(7)\quad P_t^s = P[\overset{+}{G_{t-2}^d},\ \overset{+}{W_{t-2}^G},\ \overset{-}{T_{t-2}},\ \overset{-}{W_{t-2}^A},\ (\overset{-}{Y^f}/F)_{t-2},\ \overset{+}{W_{t-2}^E},\ \overset{+}{FA_{t-2}};\ Z_{1t}]$$

where

P_t^s = the number of new Ph.D. recipients supplied by a department.

The Demand for Faculty

$$(8)\quad FA_t = f(\overset{-}{W_t^E},\ \overset{?}{W_t^G},\ \overset{+}{G_t^S},\ \overset{+}{R_t},\ \overset{+}{E_t},\ \overset{+}{Y_t},\ \overset{?}{Y_t^f};\ Z_{2t})$$

Table 1. Econometric Estimates, 1962-1982.

	G_t^s		G_t^{d1}	G_t^{d2}	P_t^s a/		FA_t^d	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
G_t^d	.226	.227			.25	.237		
	(6.2)	(6.8)			(3.3)	(3.1)		
G_t^s							.085	.084
							(2.6)	(2.6)
W_t^G b/	.574	.568	-1.093	-.921	.286	.328	-.585	-.650
	(2.7)	(2.63)	(2.0)	(1.8)	(2.0)	(2.4)	(2.3)	(2.4)
W_t^A c/	-1.096	-.737			-2.283	-2.834		
	(1.2)	(.98)			(3.3)	(3.5)		
$(Y^f/F)_t$	-.086	-.083			.083	.075		
	(2.2)	(2.1)			(1.2)	(1.1)		
Y_t			1.684	1.638			.643	.661
			(4.9)	(5.1)			(3.8)	(3.7)
Y_t^f			-.123	-.097			-.039	-.039
			(2.5)	(2.1)			(1.5)	(1.5)
W_t^{E1} d/		.427	1.598	.763		2.98		.255
		(.9)	(4.2)	(2.1)		(4.7)		(1.3)
W_t^{E2} d/	.472				2.176		.150	
	(1.2)				(5.2)		(1.1)	
FA_t	.219	.224			-.01	-.002		
	(2.7)	(2.8)			(.1)	(.0)		
R_t			-.664	-.161			.082	.077
			(4.3)	(1.1)			(1.1)	(1.0)
E_t			.191	.063			.392	.394
			(.9)	(.3)			(3.5)	(3.6)
U_t			.199	.173				
			(3.8)	(3.4)				
Z_t e/	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
R^2	.81	.81	.70	.70	.73	.73	.85	.85
N	421	421	422	422	314	314	416	416

t-statistics in parentheses.

a/ All variables in the Ph.D. supply equations are lagged two years.

b/ In the supply equations, wages are net of tuition costs. In the demand equation, the full wage is used. Predicted wages are used in all equations except the Ph.D. supply equation in which twice-lagged actual values are used. The wage equation included all exogenous variables in eqs. (5) and (6) in the text as well as a

Table 1. Continued

variable representing military draft activity and another representing per capita state income.

[c] The alternative wage is a bachelor's level, inexperienced accountant salary in the graduate student supply equation and an experienced accountant salary in the Ph.D. supply equation.

[d] W_t^{E1} is the national mean of assistant professor's salaries in agricultural economics. W_t^{E2} is the national mean of starting salaries in agricultural economics.

[e] The coefficients on the Z_t variables are not reported but were included in all regressions. Departmental dummy variables and a trend variable were included in the demand equations. The same variables plus the logarithm of the number of foreign Ph.D.s in the department were included in the supply equations.

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