Labor Mobility among Agricultural College Graduates: A Human Capital Approach

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Determinants of job mobility and job advancement were motivated from a model of investment in human capital. Least squares and Tobit models were specified and estimated using data from a recent survey of Kansas State University College of Agriculture graduates. Determinants of job turnover and the number of promotions earned were quantified. Job change and job advancement were found to occur early in the careers of agriculture college alumni. Job experience was found to be the most significant determinant of labor mobility and promotion. Personal and occupational characteristics were found to have significant but small impacts on labor mobility and advancement.

Key words: agriculture college alumni, human capital, labor mobility, Tobit analysis.

The movement of workers between jobs is common in modern industrial economies. Labor mobility is particularly pronounced among workers in the first years of labor force participation; Topel reports that approximately 60% of all new jobs held by young workers end during the first year. Hall indicates that about half of the 11 jobs held by the average worker over the course of his or her work life are taken during the 10 years immediately following entrance into the labor market. Rapid turnover among younger workers typically evolves into job stability and longer tenure among more experienced workers.

Labor mobility can be analyzed as an investment in human capital (Becker). Within this framework, workers maximize lifetime earnings by selecting a sequence of positions over the course of their careers. Firms invest in labor productivity by attracting and rewarding workers to maintain a motivated work force. Ehrenberg and Smith demonstrate the theory's approach to understanding the movement of workers between positions and firms.

Previous studies of labor markets of agriculture college alumni have concentrated on earnings of the alumni (Broder and Deprey; Preston, Broder, and Almero) and the characteristics of graduates sought by employers (Litzenberg and Schneider; Preston and Broder). However, the literature has neglected the consequences of labor mobility. The objective of this research is to use the theory of human capital to identify and quantify the determinants of labor mobility (job turnover) and labor advancement (promotions) during the first years of labor force participation among graduates of the College of Agriculture at Kansas State University, 1978 to 1988. Specific objectives include a discussion of the motivation that underlies job change. A detailed examination is made of the impact of personal and occupational characteristics on the number of positions held and promotions earned since graduation from the College of Agriculture. Students in colleges of agriculture actively seek information about their uncertain future careers. Agriculture college teachers and advisors could use the results of the statistical analysis to advise future graduates of agricultural cur-

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Partial funding for this research was made available by the Agriculture Alumni Association of Kansas State University and is greatly appreciated. This manuscript is contribution number 91-100-J of the Kansas Agricultural Experiment Station.

Barry K. Goodwin, Ted C. Schroeder, the KAES Editor, and three anonymous *WJAE* reviewers provided valuable comments in the review process. Thanks are due to Jong-I Perng for providing diligent computational assistance.

ricula about job market conditions and career decision making.

The survey data used in this study are unique because of the large number of observations and the 11-year period of investigation. The statistical analysis contributes to the literature on labor mobility by providing estimates of the determinants of job change and advancement for a recent group of agricultural college graduates.

A Human Capital Theory of Labor Mobility

In his seminal contribution, Becker asserts that labor mobility can be analyzed as an investment in human capital. In this framework, workers maximize lifetime earnings by changing jobs when the net present value of one position rises above the net present value of an alternative position. Consider an individual who can pursue two jobs, with position i yielding an earnings stream of w_{it} over time (t), and position j yielding w_{jt}. Define the net present value, V_t, where r is the discount rate and C_{ijt} denotes the costs associated with changing jobs. The period of job change is t_0:

$$(1) \qquad V_t = \int_{t_0}^{T} [(w_{it} - w_{jt}) - C_{ijt}] e^{-rt} \, dt.$$

The individual is considered to maximize the net present value of earnings, V_t. In this case, occupation i is preferred when $V_t \geq 0$ and j is selected at time t_0 when $V_t < 0$.

Job change is not costless; the costs of job search and other activities associated with locating and moving to a new position can be large. The C_{ijt} include both pecuniary and nonpecuniary costs. Equation (1) summarizes the investment that workers make by changing jobs. The costs of investment are C_{ijt}, and the returns to the investment are the net gains in earnings, $(w_{jt} - w_{it})$. Human capital investments such as on-the-job training and job change are expected to take place early in the career because, ". . . younger people have lower opportunity costs and a longer period over which to recoup such [investment] costs" (Ehrenberg and Smith, p. 318).

Experience and on-the-job training increase worker productivity because workers learn while performing their jobs. Becker defines two types of training, general and specific. General training refers to gains in productive ability that can be transferred to many firms (e.g., computer skills). The marginal productivity (and hence wages) of an individual who undertakes general training will rise, both in the current position (i) and in alternative positions (j). Specific training refers to an investment that increases productivity in a given firm but is not transferable to other firms, such as specific knowledge of a firm's internal operations.

General training increases mobility by increasing the number of alternative job offers that an individual receives. Greater job opportunities (a larger number of w_{jt}) are expected to be associated with more job changes. In theory, general training leads to equal wage increases with both the current firm and in potential employments. In the real world, wages in the current job may lag behind the worker's productivity in a given job. In this case, alternative job offers become more attractive to the worker, and job change becomes more likely. Becker states, ". . . firms are not too concerned about the turnover of employees with general training and have no incentive to offer them a premium above wages elsewhere because the cost of such training is borne entirely by the employees" (p. 31).

Workers willingly pay for general training by accepting lower wages during the training period in order to garner higher wages that reflect greater productivity once the training has been completed. Firms are willing to pay generally trained workers a higher wage because if they did not, workers would take their transferable human capital to a competing firm.

Specific training is more likely to tie a worker to a firm because the training is not transferable to other employment. Becker suggests that workers and firms will share both the costs and returns of the investment in specific human capital. This contract ties the worker to the firm because job change would reduce the returns for both parties.

Quits and layoffs can also be better understood within the framework of a human capital model. Quits and layoffs are expected to be inversely associated with the amount of specific training that an individual receives. When a job separation of a specifically trained worker occurs, the firm loses its share of the expected future returns to that investment if the trained worker is replaced by an inexperienced worker.

Individuals with specific training who quit will not receive their share of the returns to training, which is the salary increment associated with the investment.

The productivity of labor depends on an individual's motivation and intensity of work effort. Firms can increase productivity by investing in human capital. Examples of such investments are the provision of day care facilities, training programs, profit sharing, and other rewards. A pay raise or promotion can also be considered an investment in human capital; Becker refers to this type of investment as a "productive wage increase." Following Becker, let MP be the marginal productivity of a given worker and W be the wage rate. Static models assert that $MP = W$ in all time periods. However, when dynamic life cycle (human capital) considerations are taken into account, a firm may benefit by offering a productive wage increase that costs an amount C in period t and collecting the return over the course of the next several years. Define G in equation (2) as the return to such an investment and t_0 as the period when job change occurs:

$$G = \int_{t_0}^{T} (MP_t - W_t) e^{-rt}\, dt. \tag{2}$$

Productive wage increases are distinguished from on-the-job training because the cost of a productive wage increase (promotion) is received as higher wages (Becker). In equilibrium, the firm's expenditures ($W + C$) will equal the marginal productivity of labor plus the return on the productive wage increase ($MP + G$). In many cases, promotions are identical to, or simultaneous with, wage increases. The analysis can be extended to include nonpecuniary aspects of promotions, such as status, power, or fringe benefits, by redefining w_{jt}.

The empirical implications of the human capital model for labor mobility also apply to productive wage increases and, hence, promotions. Firms will be more likely to grant a productive wage increase to investments specific to the firm. In the case of general investments, productive wage increases could be lost to competing firms. Investments in workers who are in the early part of their working lives have a higher probability of being recouped by a firm, since the return to the investment will extend over a long horizon. Thus, earlier investments by firms will be more valuable than later investments. Firms will reduce the uncertainty associated with this type of investment by seeking out and granting promotions to employees with characteristics associated with the potential to increase productivity.

Data Collection and Summary

The data utilized in this research were collected from a mailed survey of graduates of the College of Agriculture at Kansas State University (KSU) from 1978 to 1988, conducted in August 1989. The empirical study is based on 1,016 usable responses, which are assumed to be a representative sample of the population of KSU Agriculture College graduates. Labor mobility is measured by the number of positions held (*NOPO*) and the number of promotions earned (*NOPR*) since attainment of the highest degree (table 1). The variables *NOPO* and *NOPR* are responses to the survey questions "How many positions (jobs) have you held since completing your highest degree?" and "How many promotions have you earned since the completion of your highest degree?" Given the survey data, it is impossible to distinguish between intrafirm and interfirm job changes.

Agricultural college alumni were generally quite mobile; the average number of jobs held was 2.135, and the average number of promotions was 1.911. These results are for all graduates over the 11-year period, with an average number of years of experience (*NEXP*) of 5.572.[1]

All major fields of study and degree programs were represented in the sample. Over 32% of the respondents earned an advanced degree; 16% earned an M.S. degree, 5% earned a Ph.D., and 5% earned a D.V.M. degree. Over three-quarters of the sample were male, and two-thirds were married at the time of the survey. Over 5% reported a double major. Self-employed persons were deleted from the sample, because the number of positions and promotions for such persons would have no meaning. Part-time workers and students were also deleted.

[1] The graduating class of 1988 was considered to have one year of experience in August 1989.

Table 1. Variable Definitions and Summary Statistics of Variables Used in the Analysis of the Number of Positions and Promotions

Variable	Variable Definition	Mean	Standard Deviation
NOPO	No. of Positions Held Since Graduation	2.135	1.194
NOPR	No. of Promotions Since Graduation	1.911	1.601
MAR	1 = Unmarried, 0 = Married	0.332	0.471
SEX	1 = Female, 0 = Male	0.230	0.421
Job Location Variables (*LOC*1, *LOC*2, *LOC*3):			
*LOC*1	1 = Rural Job, 0 = Else	0.106	0.308
*LOC*2	1 = Small-Town Job, 0 = Else	0.307	0.462
*LOC*3**	1 = Urban Location, 0 = Else	0.438	0.496
ACT[a]	No. of Activities in College	1.971	1.560
LEAD[a]	No. of Leadership Positions in College	0.574	0.916
TRANS	1 = Transfer Student, 0 = Else	0.432	0.496
Job Type Variables (*FARM, NONAG, AGBUS*):			
FARM	1 = Farm Job, 0 = Else	0.068	0.252
NONAG	1 = Nonagricultural Job, 0 = Else	0.345	0.476
*AGBUS***	1 = Agribusiness Job, 0 = Else	0.587	0.493
GOVT[b]	1 = Government Job, 0 = Else	0.272	0.445
DOUBLE	1 = Double Major, 0 = Else	0.055	0.228
NEXP[a]	Years of Experience	5.572	3.118
NEXP2[a]	*NEXP* Squared	40.761	37.048
TENURE[a]	Years at Current Job	3.619	2.723
TENURE2[a]	*TENURE* Squared	20.505	28.696

Note: ** denotes the default category, omitted from the regression analysis.
[a] Continuous (not qualitative) variables.
[b] *GOVT* is a type of job but is not contained within the three mutually exclusive "Job Type Variables" of *FARM, NONAG,* and *AGBUS.*

Empirical Specification

Number of Positions

The theoretical discussion summarized by equation (1) implies that investments in human capital (and hence the number of positions) are systematically related to: (*a*) the costs of investment (C_{ijt}), (*b*) how specific the investment (or type of job) is, and (*c*) job experience, because investments are expected to occur early in a worker's career. Ignoring the time subscript, these three implications yield equation (3), where $NOPO_k$ is the number of positions taken by individual k:

$$(3) \quad NOPO_k = f(C_{ijk}, JOB\ SPECIFICITY_k, EXPERIENCE_k).$$

The three hypothesized determinants of job change on the right-hand side of equation (3) are discussed in turn. First, the costs of investment in job change for individual k (C_{ijk}) are hypothesized to be a function of personal attributes, such as marital status (MAR_k), gender (SEX_k), job location (LOC_k), extracurricular involvement while in college (ACT_k), leadership in activities while in college ($LEAD_k$), and transfer status ($TRANS_k$) as summarized in equation (4):

$$(4) \quad C_{ijk} = C(MAR_k, SEX_k, LOC_k, ACT_k, LEAD_k, TRANS_k).$$

Married persons are expected to be less mobile; the costs of job change and relocation increase with additional family members. More importantly, individuals in dual-career households have less flexibility in changing locations, because job change implies the disruption of two careers. A priori, it is anticipated that women may be less mobile than men. Female graduates are expected to remain in the labor force a shorter time than male graduates because of child bearing and rearing (Stigler). When labor mobility is considered to be an investment in human capital, females are expected to switch positions fewer times than males.

Job location is also expected to be associated with costs of adjustment, for both pecuniary and nonpecuniary reasons. Rural and small

town dwellers may face costs of making employment changes, as well as face different living costs (real incomes) that make job change less likely. Individuals in nonurban locations may be resistant to giving up nonurban lifestyles, regardless of enhanced job opportunities in cities. There may also be reluctance on the part of urban dwellers to leave a particular city, but a greater number of job opportunities are available to urban persons that do not necessitate a change in residence, resulting in lower costs of job change (C_{ijk}).

Other variables that are included as proxies of the costs of job change are membership and leadership in extracurricular activities (ACT_k and $LEAD_k$) and transfer status ($TRANS_k$). Previous studies indicate that extracurricular involvement may develop interpersonal and leadership skills (Litzenberg and Schneider). These skills are expected to influence labor mobility in two ways. First, experience and leadership in college activities may increase the number of job opportunities available to agriculture college graduates. Second, involvement in activities may lower the nonpecuniary costs of changing jobs by providing self-confidence in working with people that may be transferred to new situations and jobs. Transfer status indicates a willingness to change circumstances, and this willingness is reflected in lower costs of job change, C_{ijk}.

General training is expected to increase the probability of obtaining alternative job offers (w_{jt}) at wages greater than in the current job, whereas specific training gives both workers and firms an incentive to maintain the employment contract over time. The degree of specialization is approximated by the type of employment ($FARM_k$, $NONAG_k$, and $GOVT_k$) and double major ($DOUBLE_k$), as in equation (5):

$$(5)\quad JOB\ SPECIFICITY_k = S(GOVT_k, FARM_k, NONAG_k, DOUBLE_k).$$

Agricultural production jobs ($FARM_k$) are expected to be associated with fewer job changes relative to nonfarm jobs, given the low degree of transferability (job specificity) of farm skills to other occupations. Similarly, government jobs may reduce job opportunities and employment offers in the private sector. The nonagricultural job variable ($NONAG_k$) was included to test for systematic differences between labor mobility among agricultural and nonagricultural occupations. A double major ($DOUBLE_k$) is an indication of broad (general) training, expected to reflect greater job opportunities and higher levels of job change.[2]

Job changes are expected to occur early in the careers of agricultural college graduates. For this reason, the $EXPERIENCE_k$ variable of equation (3) is specified as a function of the number of years of experience ($NEXP_k$) and the squared term ($NEXP2_k$) in equation (6):

$$(6)\quad EXPERIENCE_k = E(NEXP_k, NEXP2_k).$$

By substituting the relationships proposed in equations (4)–(6) into equation (3) and asserting a linear functional form, we achieve the empirical job change equation (7) that is estimated using OLS with the use of the data collected in the alumni survey:

$$\begin{aligned}(7)\quad NOPO_k = {} & \beta_0 + \beta_1 MAR_k + \beta_2 SEX_k \\ & + \beta_3 LOC1_k + \beta_4 LOC2_k \\ & + \beta_5 ACT_k + \beta_6 LEAD_k \\ & + \beta_7 TRANS_k + \beta_8 GOVT_k \\ & + \beta_9 FARM_k\ \mathrm{p}+ \beta_{10} NONAG_k \\ & + \beta_{11} DOUBLE_k + \beta_{12} NEXP_k \\ & + \beta_{13} NEXP2_k + u.\end{aligned}$$

All of the independent variables included in the regression are categorical dummy variables, with the exception of *ACT, LEAD, NEXP,* and *NEXP2*. In the case of the location variables and the job type variables, one category is omitted from each group of variables as the default to avoid difficulties with singularity, as reported in table 1. The estimated regression model is employed to test specific hypotheses concerning the implications of human capital theory for job changes, rather than to explain all of the variation in the number of positions taken by recent graduates.

Number of Promotions

The theoretical analysis implies that productive wage increases and promotions (*NOPR*) are more likely to occur (*a*) when the investment is specific to the firm, occupation, or industry, as captured by the *JOB SPECIFICI-*

[2] The double major variable must be interpreted with care. For B.S. recipients, the double major has the usual meaning. However, for advanced degree recipients, a double major can be either a double major or one degree in one field and a second degree in another field.

TY_k variables; (*b*) when a person has quality characteristics associated with favorable performance, resulting in more job offers, or lower costs of job change (C_{ijk}); and (*c*) early in a worker's career or tenure with the firm ($EXPERIENCE_k$).

In the sample of agricultural college alumni, promotions are associated with increases in earnings. Regression results reveal that a promotion is associated with an increase in earnings of approximately $1,700, holding experience constant. This result solidifies the view that promotions can be considered to be productive wage increases.

The promotion variable ($NOPR_k$) is censored, because many graduates had not earned a promotion at the time of the survey. Note that the number of positions would be censored at the limiting value of zero if any of the surveyed graduates had been employed in zero positions. Because all graduates had taken at least one position, there are no limiting observations in the *NOPO* variable. Zero is the limiting value for promotions, and OLS estimates would be biased in this case (Tobin). A Tobit regression is utilized to correct for the censored data.

The Tobit model of the determinants of promotions is specified as:

$$(8)\quad y_k = X_k\beta + e_k \quad \text{if } X_k\beta + e_k > 0$$
$$= 0 \quad \text{if } X_k\beta + e_k \leq 0,$$

where y_k is the number of promotions (*NOPR*) earned by individual k, X_k is the vector of explanatory variables from equation (5), β is a vector of unknown parameters, and e_k is the residual error term.

Following McDonald and Moffitt, Tobit estimates are decomposed to calculate (*a*) the probability that a survey respondent had at least one promotion ($y_k > 0$) at the time of the survey, (*b*) changes in the dependent variable for the entire sample, and (*c*) changes in ($NOPR_k$) for those observations with at least one promotion. The expected value of the dependent variable in a Tobit model is given by:

$$(9)\quad E(y) = X\beta\, F(z) + \sigma f(z),$$

where $z = X\beta/\sigma$, $f(z)$ is the normal probability density function, and $F(z)$ is the normal cumulative density function. The expected value of y, conditional on at least one promotion, is $E(y^*)$:

$$(10)\quad E(y^*) = E(y \mid y > 0).$$

The effect of a change in an independent variable on promotions for the entire sample is given by:

$$(11)\quad \partial E(y)/\partial X_k = F(z)(\partial E(y^*)/\partial X_k) + E(y^*)(\partial F(z)/\partial X_k).$$

The change in probability of having received at least one promotion because of a change in the independent variables is given by:

$$(12)\quad \partial F(z)/\partial X_k = f(z)\beta_k/\sigma,$$

and the change in the number of promotions brought about by changes in X_k among the subsample of those graduates with promotions is:

$$(13)\quad \partial E(y^*)/\partial X_k = [1 - zf(z)/F(z) - f(z)^2/F(z)^2]\beta_k.$$

The derivatives in equations (11) and (13) can be used to construct estimates of the elasticities of promotions ($NOPR_k$) with respect to the explanatory variables evaluated at the sample means.[3]

The independent variables for the empirical test of the number of promotions ($NOPR_k$) are identical to those employed in equation (7), with one exception. The statistical analysis of the number of promotions also includes a measure of the length of job tenure in the current position (*TENURE*) and the squared term (*TENURE2*) to capture the effect of the length of specific experience on promotional investments by firms. Longer tenures are expected to be associated with more promotions but at a decreasing rate.

Results

Number of Positions

Regression results of the labor mobility model are presented in table 2. The results of the model provide many interesting conclusions; six of the included variables were found to be significantly associated with the number of positions held since graduation, and the *F*-test is

[3] Because most of the independent variables in this study are qualitative, changes in probability are calculated rather than derivatives. In the case of discrete (dummy) variables, small changes in the independent variables are not meaningful, because these variables equal either unity or zero. Therefore z, $f(z)$, $F(z)$, $E(y)$, and $E(y^*)$ must be evaluated at values of zero and one within each category, holding all other variables at their sample means.

Table 2. Estimated OLS Model and Elasticities to Explain the Number of Positions

Independent Variable	Description	Estimate	*t*-Statistic	Elasticity[a]
Intercept		0.858***	5.756	—
MAR	1 = Unmarried, 0 = Married	−0.034	−0.455	−0.005
SEX	1 = Female, 0 = Male	0.071	0.839	0.008
LOC1	1 = Rural Job, 0 = Else	−0.190	−1.553	−0.009
LOC2	1 = Small-Town Job, 0 = Else	−0.156**	−1.990	−0.022
ACT[b]	No. of Activities in College	0.026	1.166	0.024
LEAD[b]	No. of Leadership Positions in College	−0.0003	−0.007	−0.0001
TRANS	1 = Transfer Student, 0 = Else	0.145**	2.039	0.029
GOVT	1 = Government Job, 0 = Else	−0.165**	−2.127	−0.021
FARM	1 = Farm Job, 0 = Else	0.219	1.477	0.007
NONAG	1 = Nonagricultural Job, 0 = Else	0.355***	4.684	0.057
DOUBLE	1 = Double Major, 0 = Else	−0.112	−0.747	−0.003
NEXP[b]	Years of Experience	0.315***	6.760	0.386
NEXP2[b]	*NEXP* Squared	−0.015***	−3.878	—
R^2		.185		
No. of Observations		1,016		
F-test		17.48***		
Root-Mean-Squared Error		1.085		

Note: A single asterisk denotes significance at the .10 level, double asterisks denote significance at the .05 level, and triple asterisks denote significance at the .01 level.
[a] Elasticities calculated at the mean.
[b] Continuous (not qualitative) variables.

highly significant. All of the calculated elasticities are small, with the exception of the experience variable (*NEXP*) elasticity. This indicates that the significant personal and occupational determinants of job mobility have a slight impact on job mobility relative to years of work experience.

Two out of the seven independent variables included in the empirical model to capture the costs of adjustment were found to be statistically significant. Graduates with small-town job locations were found to be less mobile relative to urban dwellers, as expected. The elasticity of the number of positions held since graduation with respect to small-town job locations equals −.022, reflecting the small but significant impact of job location on the number of job changes among recent agriculture college graduates. This may reflect reluctance of graduates in small towns to change jobs due to geographic preference and fewer opportunities available to graduates who located in small towns.

Students who transferred to the KSU College of Agriculture were expected to have lower costs of changing jobs because of their demonstrated ability to transfer from one situation to another. This hypothesis was confirmed by the estimated elasticity of .029 between transfer students and number of positions. There appear to be no significant differences in the number of position changes between married and unmarried graduates, male and female alumni, rural and urban job localities, and different levels of extracurricular involvement while in college.

The degree of job specificity, as measured by job type, was found to be associated with job mobility among survey respondents. Nonagricultural occupations were positively related to turnover relative to agribusiness positions, as reflected by the elasticity of .057. Surprisingly, graduates who held farm jobs at the time of the survey did not differ significantly from those in agribusiness positions in regard to the number of positions held. Graduates employed in government positions were less likely to have been employed in as many positions as nongovernment employees, although the elasticity of *NOPO* with respect to *GOVT* is relatively small, equal to −.021.

Double majors were expected to be more mobile due to broader training, which implies greater job opportunities. However, this variable was not found to be statistically significant. This result may be analyzed *ex post*; dou-

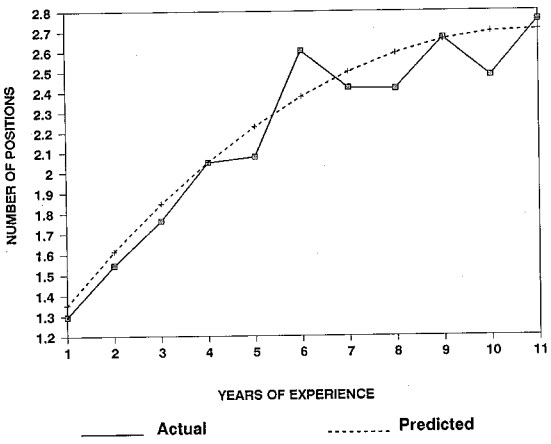

Figure 1. Position-experience profile, KSU College of Agriculture alumni, 1978-88

ble majors may obtain more desirable jobs directly out of college and thus be associated with lower turnover rates.

A major empirical result is the timing of employment changes. Years of experience (*NEXP, NEXP2*) were found to have a positive but diminishing impact on the number of positions taken by recent agriculture college graduates. Figure 1 illustrates the relationship between the average number of positions held and years of experience, together with predicted values of *NOPO*. The concavity of the position-experience profile validates the hypothesis that investments in job turnover occur early in the life cycle.

Number of Promotions

Table 3 presents the results of the Tobit analysis of the number of promotions earned. The decomposition of McDonald and Moffitt allows for estimates of the probability of receiving at least one promotion, reported in the "Probability of Change" column. Also reported are estimates of the expected change in promotions given a change in the independent variable for all graduates (Total Change) and for those graduates who had received at least one promotion at the time of the survey (Change Above Limit). Eight of the 15 included variables are highly significant. McFadden's R^2 has a value of .058, which is typical for qualitative dependent variable regressions employing cross-sectional data (Maddala). Given the objective of testing the specific hypotheses of human capital theory rather than explaining all of the causes of promotions, the Model Chi-Square statistic is relevant. The high level of significance indicates that the null hypothesis that all of the coefficients are equal to zero can be rejected. Similar to the regression on number of positions, the elasticities for the significant variables are small, indicating that the primary determinant of promotional advancement is career experience.

Of the seven variables that were expected to reflect the costs of job advancement, three were statistically significant: marital status, gender, and transfer status. Unmarried persons (*MAR*) were less likely to be promoted, possibly because a firm may be reluctant to invest in an individual who has lower mobility costs relative to married persons. Females also received fewer promotions. When interpreted from a human capital perspective, this implies that firms do not reward persons with a positive probability of leaving the labor force. This result implies that females may receive fewer promotions because firms use gender as a market "signal" based on a prior belief concerning the labor market activity of some women. Women with no intention of exiting the work force may receive fewer promotions simply because firms generalize the possibility of quitting to all individuals in the category (see Spence).

Although transfer students (*TRANS*) were associated with relatively more job changes, this variable had a negative impact on the number of promotions. This result was not anticipated. *Ex post,* we can speculate that there may be a negative association between job change and job promotion; persons who change jobs more often may not stay with one job long enough to be promoted.

Graduates employed in small towns and rural job locations did not have significantly different promotional experiences than did urban dwellers. Extracurricular activities were expected to be a signal of higher productivity and interpersonal ability, but neither the number of college activities nor the number of leadership positions was found to have a statistically significant impact on job promotions.

Job specificity, as reflected by type of job and double majors was found to be associated with promotions among College of Agriculture alumni. The results of the *FARM* Tobit coefficient demonstrate the additional information that can be obtained from the decomposition

Table 3. Estimated Tobit Model, Total Change Derivatives, and Above-the-Limit Change Derivatives to Explain the Number of Promotions

Variable	Estimate	*t*-Statistic	Probability of Change	Total Change		Change Above Limit	
				Derivative[a]	ϵ^c	Derivative[b]	$\epsilon^{a,c}$
Intercept	0.167	0.604	—	—	—	—	—
MAR	−0.321**	−2.414	−0.049	−0.257	−0.048	−0.188	−0.028
SEX	−0.581***	−3.885	−0.093	−0.454	−0.058	−0.328	−0.034
*LOC*1	0.102	0.469	0.015	0.084	0.005	0.061	0.003
*LOC*2	0.053	0.384	0.008	0.043	0.007	0.031	0.004
ACT[d]	−0.001	−0.020	−0.0001	−0.001	−0.001	−0.001	−0.0003
LEAD[d]	−0.065	−0.946	−0.010	−0.053	−0.017	−0.039	−0.010
TRANS	−0.285**	−2.273	−0.043	−0.229	−0.055	−0.167	−0.032
GOVT	−0.381***	−2.772	−0.059	−0.302	−0.046	−0.219	−0.024
FARM	−1.224***	−4.506	−0.223	−0.878	−0.033	−0.624	−0.019
NONAG	0.013	0.099	0.002	0.012	0.002	0.009	0.001
DOUBLE	−0.643**	−2.389	−0.109	−0.490	−0.015	−0.350	−0.009
NEXP[d]	0.670***	7.122	0.100	0.542	0.541	0.397	0.378
*NEXP*2[d]	−0.040***	−5.159	−0.006	−0.032	—	−0.024	—
TENURE[d]	−0.029	−0.318	−0.004	−0.023	−0.030	−0.017	−0.018
*TENURE*2[d]	0.001	0.100	0.0001	0.001	—	0.001	—
McFadden's R^2		.058					
Model Chi-Square (14 d.o.f.)		108.38***					
Censored Observations		263					
Noncensored Observations		753					

Note: A single asterisk denotes significance at the .10 level, double asterisks denote significance at the .05 level, and triple asterisks denote significance at the .01 level.

[a] $\delta E(Y)/\delta X_i = \beta_i F(z)$; $E(Y) = 1.791$; $E(Y^*) = 2.216$; $F(z) = P(z) \leq .872 = .808$; $f(z) = .273$.

[b] $\delta E(Y^*)/\delta X_i = \beta_i[1 - zf(z)/F(z) - f(z)^2/F(z)^2] = .592\beta_i$.

[c] Elasticities calculated at the mean.

[d] Continuous (not qualitative) variables.

of McDonald and Moffitt. Graduates employed in a farm position were 22% less likely to have obtained any promotions relative to alumni in nonfarm positions (Probability of Change). However, for those graduates with farm jobs who had earned at least one promotion, the elasticity of *NOPR* with respect to *FARM* equals −.019, reflecting a significant yet small difference between farm and nonfarm alumni with at least one promotion. Farm workers were less likely to acquire a first promotion, possibly because of less formal labor contracts in farm jobs.

Graduates employed in government positions were 6% less likely to be promoted relative to nongovernment employees. However, the elasticities for all government workers (−.046) and for those government employees with at least one promotion (−.024) indicate that the negative relationship between government work and promotions is significant yet small. Persons in nonagricultural positions were promoted with the same frequency as agribusiness workers.

Double majors (*DOUBLE*) received relatively fewer promotions than other graduates in the sample. This result does not conform to our expectations, but may be explained *ex post*. A double major is indicative of broad training, and persons with general training may receive fewer promotions relative to specifically trained employees. Firms that invest in highly mobile (generally trained) personnel are less likely to recoup the costs of these investments because of the potential loss to competing firms through turnover. Also, double majors may self-select into positions where promotion is less likely, such as education.

The timing of promotions was captured by the significance of the coefficients for *NEXP* and *NEXP*2. An additional year of experience was associated with a 10% probability of earning at least one promotion. The largest elasticities estimated for both all observations (.541) and for those observations with at least one promotion (.378) were obtained for the work experience variable. As in the study of positions, the concavity of promotions with

respect to years of experience verifies that firms commit to investments of this type early in the work life of an employee.

Job tenure (*TENURE*) was not statistically related to the number of promotions earned. Job experience, rather than job tenure, appears to be the major determinant of the number of promotions.

Implications and Conclusions

Labor mobility is a characteristic of well-functioning labor markets in a dynamic economy. The movement of labor between jobs and other investments in human capital allows workers to enhance lifetime earnings, including both pecuniary and nonpecuniary returns. Wage increases and promotions can be used by firms to reward labor early in a career and increase worker motivation and productivity.

The early career experience of recent agriculture college graduates can be summarized by a representative alumnus who changes jobs roughly 2.7 times in the first 10 years of employment. Job turnover is associated with the costs of job change, as reflected by job location and transfer status. Job turnover is lower in small-town job locations relative to urban jobs but higher for transfer students. The degree of job specificity is also found to have an impact on job change; government jobs are associated with fewer position changes, and nonagricultural jobs are associated with more position changes relative to agribusiness careers. The statistical results confirm the hypothesis that job turnover occurs early in the careers of agricultural college alumni. Work experience is the primary determinant of job mobility; the other significant determinants have relatively small impacts on the number of jobs.

The number of promotions are negatively related to married individuals and female graduates. It costs more for married individuals to change jobs; these costs include the higher pecuniary costs (more individuals to move) and higher nonpecuniary costs. Some female graduates are not expected to remain in the work force during child-rearing years, resulting in reduced incentives to invest in human capital through job advancement.

Transfer students experience a greater number of position changes, but fewer promotions. This may reflect the willingness of some persons to change jobs for nonpecuniary reasons, rather than for the sole purpose of career advancement. Agriculture students who are interested in government positions should be aware that civil servants receive fewer changes in position and fewer promotions relative to private sector employment. The advantages of government work, which may include larger nonwage benefits (e.g., health insurance, pension plans) and greater job security, may outweigh the lack of promotions and job change for many alumni.

Farm jobs are also associated with fewer promotions, but the nonpecuniary aspects of careers in production agriculture may provide the motivation to remain in a farm job, rather than the opportunity to advance. Double majors are associated with fewer promotions. The timing of promotions is similar to the timing of job change; promotions occur early in a graduate's career.

The results of this study could be useful to agriculture college advisors. Students have diverse career interests and objectives. Some students may enroll in college to maximize the probability of remaining in a given geographic location or obtaining a specific type of job that yields a desired lifestyle. For many individuals, lifetime utility may be inversely related to job change and/or promotion. For example, the negative relationships between small-town job locations and the number of positions and farm employment and the number of promotions may indicate a satisfying career choice made for nonpecuniary reasons.

The lack of significance in many of the explanatory variables provides additional insight into labor mobility among agriculture college graduates. Specifically, neither extracurricular involvement nor leadership positions were associated with turnover and promotion. This result implies that while involvement in college activities is often promoted by college advisors and job recruiters, it appears to have little effect on job mobility or job advancement.[4]

One major implication of these results is that future agriculture labor market participants can use labor market information to form

[4] While extracurricular involvement and leadership positions did not significantly affect the number of positions or the number of promotions in this sample, the study has not tested the possibility that activities may increase the prospects for obtaining a first job after graduation. It may be true that the variables *ACT* and *LEAD* allow graduates to obtain better jobs, but promotion and job offers are determined by performance thereafter.

expectations concerning labor mobility in the diversity of careers available to them. Given the importance of mobility in a rapidly changing economic system, this information may be valuable. The results of this research confirm many of the empirical propositions of human capital theory, in particular, the hypothesis that investments in human capital and productive wage increases will occur early in the career.

[*Received August 1990; final revision received May 1991.*]

References

Becker, G. S. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* National Bureau of Economic Research, New York: Columbia University Press, 1964.

Broder, J. M., and R. P. Deprey. "Monetary Returns to Bachelors and Masters Degrees in Agricultural Economics." *Amer. J. Agr. Econ.* 67(1985):666–73.

Ehrenberg, R. G., and R. S. Smith. *Modern Labor Economics,* 2nd ed. Glenview IL: Scott, Foresman, and Company, 1985.

Hall, R. E. "The Importance of Lifetime Jobs in the U.S. Economy." *Amer. Econ. Rev.* 72(September 1982): 716–24.

Litzenberg, K. K., and V. E. Schneider. "Educational Priorities for Tomorrow's Agribusiness Leaders." *Agribus.: An Int. J.* 4(1988):187–95.

Maddala, G. S. *Limited-Dependent and Qualitative Variables in Econometrics.* Cambridge: Cambridge University Press, 1983.

McDonald, J. F., and R. A. Moffitt. "The Use of Tobit Analysis." *Rev. Econ. and Statist.* 62(1980):318–21.

Preston, W., and J. Broder. "Market Returns to Agribusiness Skills and Competencies." *Agribus.: An Int. J.* 6(1990):1–13.

Preston, W. P., J. M. Broder, and M. C. P. Almero. "Temporal Analysis of Income Earned by Former Agriculture Students." *Amer. J. Agr. Econ.* 72(1990):13–23.

Spence, M. "Job Market Signalling." *Quart. J. Econ.* 87(1973):355–74.

Stigler, G. J. "Information in the Labor Market." *J. Polit. Econ.* 70(1962):S94–S105.

Tobin, J. "Estimation of Relationships for Limited Dependent Variables." *Econometrica* 26(1958):24–36.

Topel, R. "Job Mobility, Search, and Earnings Growth: A Reinterpretation of Human Capital Earnings Functions." In *Research In Labor Economics, Vol. 8,* ed., R. G. Ehrenberg, pp. 199–233. Greenwich CT: JAI Press, 1986.