

Appendix A—Human Capital Model

The human capital model that may be used will have components that (1) capture the time patterns of earnings and costs, with and without college, to take into account that earnings that come earlier are worth more than earnings that come later, and (2) account for factors unrelated to a college degree that may be causing part of the earnings differential, such as age, experience, location, gender, and race. The data will need to indicate not only whether individuals graduated from college or not and their race, but also whether the college was an 1890.

The following is a slightly modified version of the human capital approach employed by Cohn and Hughes (1994). Several steps are involved to control for earnings differences for high school versus college graduates that are related to non-college sources such as native ability, location, and personal characteristics. The first step is to account for differences in the college and high school groups using a self-selection technique such as the Heckman (1979) procedure. Probability of college attendance is estimated using a probit equation of the form:

$$CD=f(Z) \quad (1)$$

where CD is a zero-one variable that indicates whether or not the individual has a college degree, and Z is a vector of variables that is expected to influence college attendance (such as education of the father and mother, one- versus two-parent family, number of siblings, location, rural/small town/big city, race, and economic conditions at the time of college decision). The equation is estimated with maximum likelihood (ML). The following earnings equation is then estimated, first for high school graduates and then for college graduates:

$$\ln Y = a + b_1A + b_2A^2 + c_1T + c_2T^2 + \sum d_i X_i + e \quad (2)$$

where Y represents hourly earnings, A = age, T = tenure in employment, and X is a vector of relevant labor-market and personal characteristics such as marital status, location, race, and sex. The coefficients a, b, c, and d are scalars and e is a random error term. The X vector also includes a “selectivity” variable, LAMBDA, which is derived from the ML estimation of equa-

tion 1 using the inverse of Mill’s ratio. After this estimation, in order to take account of the differences between the X vectors of the two groups in one time period, as well as differences in the X vectors over time, the means of the attributes of the college graduates for one time period are substituted for the X vector for all years and for both college and high school graduates. Let

$$B = a + \sum d_i \bar{X} \quad (3)$$

where a is taken from the estimates of equations 2. Then substitute B into equations 2.

$$\ln Y = B + b_1A + b_2A^2 + c_1T + c_2T^2 \quad (4)$$

Because age and tenure are correlated, it is necessary to estimate the age-related values of tenure. A regression of age on tenure ($T = f(A)$) is estimated, and the estimated $f(A)$ is substituted for T in equation 4. After this substitution, $\ln Y$ is a function of A only. Age earnings profiles are then calculated on the basis of equation 4 for each age. Next, the adjusted earnings (E) are obtained using equation 5 as follows:

$$E = [\text{Exp}(\ln Y)] * H \quad (5)$$

where H is the number of hours worked per week (which might be assumed to be 2,000 for 40 hours per week for 50 weeks, or it could be based on actual data for high school and college graduates). The next step is to use ordinary least squares to derive age earnings profiles separately for college and high school graduates using an equation such as:

$$E = f + g A + h A^2 + v \quad (6)$$

where f, g, and h are partial regression coefficients and v is a random error term. The two age-earnings profiles provide estimates of E_{ct} for college graduates and E_{ht} for high school graduates, to be used in estimating a rate of return to education. The following equation is used to estimate that rate of return:

$$\sum_{t=1..n} (E_{ct} - E_{ht} - C_t)/(1 + r)^t = 0 \quad (7)$$

where C_t are the direct costs of college education at age t and r is the internal rate of return.

Appendix B—Tables

Appendix table B1—Student enrollment in 1890 land-grant universities, fall 1990-98

| | 1990 | 1992 | 1994 | 1998 |
|--------------------------------------|---------------|---------------|---------------|---------------|
| Alabama A&M University | 4,886 | 5,068 | 5,543 | 5,128 |
| Alcorn State University | 2,863 | 2,919 | 2,742 | 2,847 |
| University of Arkansas-Pine Bluff | 3,672 | 3,709 | 3,823 | 3,069 |
| Delaware State College | 2,606 | 2,936 | 3,381 | 3,320 |
| Florida A&M University | 8,344 | 9,487 | 10,084 | 11,956 |
| Fort Valley State College | 2,158 | 2,537 | 2,823 | 2,847 |
| Kentucky State University | 2,506 | 2,541 | 2,563 | 2,299 |
| Langston University | 2,792 | 3,315 | 3,408 | 4,012 |
| Lincoln University | 3,619 | 4,030 | 3,512 | 3,214 |
| University of Maryland-Eastern Shore | 2,067 | 2,430 | 2,925 | 3,305 |
| North Carolina State College | 6,595 | 7,723 | 8,136 | 7,354 |
| Prairie View A&M University | 4,990 | 5,660 | 5,849 | 5,995 |
| South Carolina State College | 4,822 | 5,071 | 4,693 | 4,657 |
| Southern University | 8,941 | 10,403 | 9,904 | 9,567 |
| Tennessee State University | 7,393 | 7,591 | 8,180 | 8,750 |
| Tuskegee University | 3,510 | 3,598 | 3,322 | 3,090 |
| Virginia State University | 3,988 | 4,435 | 4,007 | 4,272 |
| Total | 75,752 | 83,453 | 84,895 | 85,682 |

Sources: National Center for Education Statistics (NCES) and 1890 Land-Grant System, Strategic Plan.

Appendix table B2—Student enrollment in 1890 land-grant universities, 1998-99

| | Undergraduate | Graduate | Total |
|--------------------------------------|---------------|---------------|---------------|
| Alabama A&M University | 3,903 | 1,225 | 5,128 |
| Alcorn State University | 2,533 | 314 | 2,847 |
| University of Arkansas-Pine Bluff | 3,004 | 65 | 3,069 |
| Delaware State College | 3,057 | 263 | 3,320 |
| Florida A&M University | 10,711 | 1,245 | 11,956 |
| Fort Valley State College | 2,407 | 440 | 2,847 |
| Kentucky State University | 2,203 | 96 | 2,299 |
| Langston University | 3,969 | 43 | 4,012 |
| Lincoln University | 2,959 | 255 | 3,214 |
| University of Maryland-Eastern Shore | 2,984 | 321 | 3,305 |
| North Carolina State College | 6,367 | 987 | 7,354 |
| Prairie View A&M University | 4,738 | 1,257 | 5,995 |
| South Carolina State College | 3,875 | 782 | 4,657 |
| Southern University | 8,023 | 1,544 | 9,567 |
| Tennessee State University | 7,021 | 1,729 | 8,750 |
| Tuskegee University | 2,932 | 158 | 3,090 |
| Virginia State University | 3,341 | 931 | 4,272 |
| Total | 74,027 | 11,655 | 85,682 |

Source: 1890 Land-Grant System, Strategic Plan.

Appendix table B3—Number of students graduated by 1890 land-grant universities, fall and spring 1997-98

| | Undergraduate | Graduate | Total |
|--------------------------------------|---------------|--------------|---------------|
| Alabama A&M University | 544 | 375 | 919 |
| Alcorn State University | 523 | 212 | 735 |
| University of Arkansas-Pine Bluff | 371 | 9 | 380 |
| Delaware State College | 409 | 101 | 510 |
| Florida A&M University | 1,450 | 821 | 2,271 |
| Fort Valley State College | 557 | 289 | 846 |
| Kentucky State University | 328 | 25 | 353 |
| Langston University | 558 | 9 | 567 |
| Lincoln University | 456 | 92 | 548 |
| University of Maryland-Eastern Shore | 415 | 76 | 491 |
| North Carolina State College | 2,075 | 2,215 | 4,290 |
| Prairie View A&M University | 720 | 357 | 1,077 |
| South Carolina State College | 561 | 256 | 817 |
| Southern University | 948 | 274 | 1,222 |
| Tennessee State University | 822 | 260 | 1,082 |
| Tuskegee University | 416 | 101 | 517 |
| Virginia State University | 421 | 126 | 547 |
| Total | 11,574 | 5,598 | 17,172 |

Source: 1890 Land-Grant System, Strategic Plan.

Appendix table B4—Summary of minority baccalaureate enrollment in colleges of agriculture, renewable natural resources and forestry classified by academic area in 1890 land-grant institutions, 1993-96

| Academic area | 1993 (n=13) | 1994 (n=12) | 1995 (n=13) | 1996 (n=15) |
|------------------------------------|----------------|----------------|----------------|----------------|
| General Agriculture | 95 | 185 | 176 | 180 |
| Animal Sciences | 422 | 384 | 390 | 508 |
| Plant Sciences | 106 | 55 | 87 | 69 |
| Horticultural Sciences | 12 | 23 | 20 | 55 |
| Soil Sciences | 33 | 34 | 41 | 55 |
| Agricultural Business & Management | 561 | 549 | 426 | 489 |
| Education, Comm., Social Sci. | 92 | 61 | 94 | 85 |
| Natural Resources | 98 | 73 | 79 | 124 |
| Forest Sciences | 131 | 109 | 89 | 153 |
| Ag. Eng./Mechanization | 0 | 24 | 21 | 30 |
| Food Sciences/Human Nutrition | 42 | 38 | 45 | 94 |
| Related Biological/Physical Sci. | 0 | 0 | 173 | 184 |
| Total | 1,592 | 1,535 | 1,641 | 2,026 |
| Nonagricultural programs | 147 | 300 | 640 | 732 |
| Total (all programs) | 1,739 | 1,835 | 2,281 | 2,758 |

Note: n denotes the number of institutions reporting for the indicated year.

Source: Food and Agricultural Education Information System (FAEIS).

Appendix table B5—Master’s student enrollment in 1890 land-grant colleges of agriculture, renewable natural resources, and forestry classified by academic area, ethnicity, and citizenship, fall 1998

| Academic area | African-American | Hispanic | Native American | Caucasian | Foreign students | Master's total |
|----------------------------------|------------------|----------|-----------------|-----------|------------------|----------------|
| General Agriculture | 0 | 0 | 0 | 0 | 0 | 0 |
| Animal Sciences | 6 | 0 | 0 | 1 | 1 | 8 |
| Plant Sciences | 18 | 1 | 0 | 4 | 3 | 26 |
| Horticultural Sciences | 0 | 0 | 0 | 0 | 0 | 0 |
| Soil Sciences | 12 | 0 | 0 | 0 | 0 | 12 |
| Agricultural Business & Mgmt. | 23 | 0 | 1 | 5 | 10 | 39 |
| Educ., Comm., Social Sci. | 15 | 0 | 0 | 17 | 0 | 32 |
| Natural Resources | 20 | 0 | 1 | 33 | 3 | 57 |
| Forest Sciences | 0 | 0 | 0 | 0 | 0 | 0 |
| Ag. Eng. Mechanization | 0 | 0 | 0 | 0 | 0 | 0 |
| Food Sciences/Human Nutrition | 13 | 0 | 0 | 3 | 7 | 23 |
| Related Biological/Physical Sci. | 13 | 0 | 0 | 1 | 3 | 17 |
| Total | 120 | 1 | 2 | 64 | 27 | 214 |
| Nonagricultural Programs | 27 | 0 | 0 | 2 | 2 | 31 |
| Total (all programs) | 147 | 1 | 2 | 66 | 29 | 245 |

Note: Data represent only 8 of the 1890 land-grant institutions.

Source: Food and Agricultural Education Information System (FAEIS).

Appendix table B6—Fall 1998 graduate and undergraduate enrollment in 1890 land-grant colleges of agriculture, renewable natural resources, and forestry classified by level, gender, and academic area

| Region & Institution | Enrollment report by program area and level | | | | | | | | | | | | | | | | | | | |
|--|---|------|------|-------|-------------------|------|------|-------|-----------------------|-------|------|-------|-----------------|------|------|-------|-----------------------|-------|------|-------|
| | Forestry | | | | Natural Resources | | | | Agricultural Sciences | | | | Non-Ag Programs | | | | Total Fall enrollment | | | |
| | 2 year | Bac. | Mas. | Ph.D. | 2 year | Bac. | Mas. | Ph.D. | 2 year | Bac. | Mas. | Ph.D. | 2 year | Bac. | Mas. | Ph.D. | 2 year | Bac. | Mas. | Ph.D. |
| North Central: Lincoln University | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 125 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 128 | 0 | 0 |
| North Eastern: Delaware State University | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 142 | 0 | 0 |
| U. of Maryland- Eastern Shore | 0 | 0 | 0 | 0 | 0 | 50 | 10 | 17 | 0 | 84 | 21 | 0 | 0 | 125 | 0 | 0 | 0 | 259 | 61 | 17 |
| Southern: Alabama A&M University | 0 | 53 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 139 | 69 | 33 | 0 | 124 | 31 | 0 | 0 | 373 | 100 | 33 |
| U of Arkansas at Pine Bluff | 0 | 0 | 0 | 0 | 0 | 23 | 2 | 0 | 0 | 89 | 5 | 0 | 0 | 121 | 0 | 0 | 10 | 233 | 7 | 0 |
| South Carolina State University | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 10 | 0 |
| Fort Valley State University | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 127 | 0 | 0 |
| Tuskegee University | 0 | 7 | 0 | 0 | 0 | 19 | 15 | 0 | 0 | 495 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 531 | 67 | 0 |
| Total (All reporting institutions) | 0 | 60 | 0 | 0 | 0 | 180 | 27 | 17 | 10 | 1,204 | 157 | 33 | 0 | 398 | 31 | 0 | 10 | 1,852 | 245 | 50 |

Source: Food and Agricultural Education Information System (FAEIS).

Appendix table B7—Fall 1998 graduate and undergraduate enrollment in 1890 land-grant colleges of agriculture, renewable natural resources, and forestry classified by level, gender, and academic area

| Academic area | Baccalaureate | | | Masters | | | Doctoral | | |
|--|---------------|--------|-------|---------|--------|-------|----------|--------|-------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| General Agriculture | 157 | 99 | 256 | 0 | 0 | 0 | 0 | 0 | 0 |
| Animal Science | 103 | 194 | 297 | 6 | 20 | 8 | 0 | 0 | 0 |
| Plant Sciences | 11 | 13 | 24 | 17 | 9 | 26 | 11 | 2 | 13 |
| Horticultural Sciences | 10 | 1 | 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| Soil Sciences | 13 | 2 | 15 | 7 | 5 | 12 | 8 | 2 | 10 |
| Agricultural Business & Mgmt. | 119 | 66 | 185 | 22 | 17 | 39 | 0 | 0 | 0 |
| Education Comm. & Social Sci. | 31 | 12 | 43 | 29 | 3 | 32 | 0 | 0 | 0 |
| Natural Resources | 97 | 83 | 180 | 22 | 35 | 57 | 12 | 5 | 17 |
| Forest Sciences | 47 | 13 | 60 | 0 | 0 | 0 | 0 | 0 | 0 |
| Agricultural Engineering/ Mechanization | 14 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| Food Science/Human Nutrition | 8 | 40 | 48 | 14 | 0 | 23 | 3 | 7 | 10 |
| Related Biological/ Physical Sci. | 77 | 234 | 311 | 11 | 0 | 17 | 0 | 0 | 0 |
| Total | 687 | 757 | 1,444 | 128 | 89 | 214 | 34 | 16 | 50 |
| Nonagricultural programs | 66 | 342 | 408 | 20 | 11 | 31 | 0 | 0 | 0 |
| Total (all areas) | 753 | 1,099 | 1852 | 148 | 100 | 245 | 34 | 16 | 50 |

Source: Food and Agriculture Education Information System (FAEIS).