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THE RETURN TO COLLEGE EDUCATION

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Formal education represents a human capital investment. Individuals invest in education to enhance their labor market productivity which enhances their future earnings capacity and work conditions. The increase in wages from a college degree is determined by the value of the enhanced skills in the labor market. College-educated workers earn higher wages than high-school educated workers. This earnings differential varies over time.

The U.S. Department of Education reported that the ratio of mean earnings of college to high school graduates was 1.16 in 1975 (i.e., wages of college educated workers were on average about 16% higher). In 1996, the ratio increased to 1.71 (i.e., wages of college educated workers were 71% higher than high school educated workers, on average); and in 2006, the ratio was 1.86.[1] Numerous economists have argued that the dramatic increase in the college-to-high school earnings differential is related to increased demand for technical skills with the increased use of computers and decreased availability of high paying blue collar jobs. The college-to-high school earnings differential also tends to increase with the age of the worker. This reflects the fact that wages of college-educated workers increase faster than wages of high-school educated workers as they gain experience. The earnings increase from a college education varies, depending on the type of degree (vo-technical, associate of arts, bachelors, masters, PHD, and professional) and the academic discipline (e.g., humanities, science, business, and engineering). On average, the greater the number of years required to attain a degree, the higher the wage rate.

[1]U.S. Department of Education, *Digest of Education Statistics 2007,* December 2008.

Acquiring a college education is a form of investment—human capital investment. Like any investment, a college education must provide a high enough rate of return to induce an individual to pursue a given college degree. The net return to education over an individual's life-span is the enhanced future earnings and amenities (discounted to their present value) less the opportunity costs of education. Acquiring formal education imposes opportunity costs of forgone wages based on a current earning capacity and the cost of attending school (tuition, books, supplies, etc.). Private benefits from a college education not only reflect the higher lifetime earnings capacity, but also more amenable working conditions that are obtainable by college graduates (economists refer to these as internal benefits since the private individual making the market transaction directly receives the benefits).

The return to education has a public as well as a private aspect. The public return to education reflects enhanced labor force productivity (or output per worker) which improves long-run economic growth. Countries with high stocks of human capital have a work force with greater cognitive skills, making their workers more creative and efficient learners and allowing them to design and adapt new technologies which lead to new products and more efficient production processes. A greater rate of technological change also increases labor productivity and long-run economic growth. Many economists have argued that the rapid integration of computer technology since the 1990s has lead to the high economic growth rates that the U.S. economy has experienced since the mid-1990s. Given increased globalization of world markets, countries with a high rate of technological change will produce cheaper, more innovative products and will strengthen their global economic competitiveness. Countries with a high rate of long-run economic growth have a higher per-capita level of income than countries with slower long-run economic growth and have a superior standard of living for all members of the economy. Economists refer to the augmentation of long-run economic growth from a country's human capital stock as endogenous economic growth (which

reflects the positive externality or social benefits from education because the economy as a whole benefits rather than just the individual making the educational investment). To the degree that human capital accumulation generates long-run economic growth, investment in education is a form of economic development. This is the typical justification for public funding for higher education.

Estimates of the College Earnings Differential

This research estimates the college earnings differential of South Dakota and the surrounding states of Iowa, Minnesota, Montana, Nebraska, North Dakota, and Wyoming and compares the regional earnings differential to the national labor market. The study also estimates the earnings differential for specific college degrees: two-year vo-technical and associate of arts degrees, bachelors of arts and science degrees, master's degrees, PhD degrees, and professional degrees (MD, DDS, DVM, JD, etc.). The data is from the Current Population Survey (CPS) data set, pooled over the 1995 through 2007 survey years. The pooled data set contains 190,770 observations.[2] The CPS, compiled by the U.S. Bureau of the Census, is micro-data (individual interviews) and is conducted monthly. The data utilized for this study is from the March survey (Annual Demographic File) which includes migration information in addition to monthly labor force data on wages and employment.

The earnings differentials estimated by the Department of Education are based on a ratio of average wages for college-educated workers relative to average wages for high-school educated workers. Wage rates are affected by other human capital attributes such as labor force experience, individual characteristics like gender and race, and the locality of a labor market. A wage regression model is employed to determine the college/high school education earnings differentials independent of other factors that influence wage rates. The estimated wage model controls for human capital, individual, and specific labor market attributes. Human capital variables used in the wage model include years of labor force experience, experience squared (to control for decreasing returns to additional years of experience), education, one year or more of tenure with the current employer, and part-time versus full-time employment. Years of labor force experience improve a worker's occupational skill level, and hence productivity, and have a positive effect on wages. Since additional years of labor force experience increase wages at a decreasing rate, the square of labor force experience has a negative effect on wages. Tenure has positive effect on wages as workers with a long-term relationship with an employer tend to receive raises and promotions. Education has a positive impact on wages and the wage effect of a given college degree is relative to the earning of a high school educated worker. High school dropouts are also included to show the value of a high school education. Part-time workers typically have fewer occupational skills than full-time workers, and part-time employment status has a negative impact on wages.

The base comparison group is nonmarried, white males. Married male workers generally have higher wages than nonmarried workers (presumably reflecting the stabilizing influence of marriage and the advantage of married partners in task specialization). Female and minority workers have lower wages, on average, than male workers. Labor market specific variables include region of residence (west, midwest, south, and east) and metropolitan or nonmetropolitan labor market. The base labor market for relative comparison is a nonmetropolitan residence in the eastern region. Western, Midwestern, and Southern regions have lower wages than the east. Metropolitan labor markets have higher wage rates than nonmetropolitan labor markets, due to greater labor demand from a higher employment density and greater disamenities such as crime and congestion. Wage regression estimates are obtained using a fixed-effects wage model.

Return to Specific Educational Degrees

The wage effects for specific educational degrees are compared to a high school degree (the estimated return reflects the percentage change in wages in comparison to a worker with a high school degree—holding constant all other human capital, individual, and labor market characteristics). The analysis for the national labor market yields predictable results (see table 1). The percentage earnings differential of a college degree relative to a high school degree increases as the number of years required to complete the degree and the cognitive skill complexity increase. Workers with vo-technical and associate of arts (AA) degrees earn about 16% to 19% more than high-school educated workers. Workers with bachelors' degrees receive a 48% higher wage rate. Master's, PhD, or professional degree recipients receive the highest earnings differentials—

[2]Descriptive statistics (means and standard deviations) for the total pooled data set and the individual state subsamples are available on request from the author.

about 70% to 96% higher than a high school graduate. Finally, high school dropouts pay about a 20% earnings penalty for not completing high school.

With respect to South Dakota and the surrounding states of Iowa, Minnesota, and Nebraska, the college earnings differential varies due to the uniqueness of an individual state's labor market, but generally the return to a college education is less than in the national market (see table 1). Wages in the Midwest are on average 5.1% lower than the northeast region (the base group in the national labor market). Lower Midwest wage levels are a factor in the lower returns to education relative to the national labor market. An alternative model uses a state dummy variable to capture the difference in wages between the national labor market and South Dakota and the surrounding states. Estimated average wage differentials find that South Dakota wages are on average 12.4% lower than wages nationally (controlling for human capital, demographic, and regional attributes); Iowa wages are 4.2% lower; Montana wages are 14.9% lower; Nebraska wages are 6.4% lower; North Dakota wages are 14.9% lower; Wyoming wages are 7.4% lower; and only Minnesota in the surrounding states has higher average wages by 6.9%.

In general, the earnings differential for specific degrees in a given state follows the pattern in the national market—the differential for a bachelor's degree is higher than that for a two-year degree, and the differential for an advanced or professional degree is higher than that for a bachelor's degree. Iowa and Minnesota are the largest states in the north-central region in terms of population and have a labor market composition that fairly closely reflects the national labor market. South Dakota, Montana, Nebraska, North Dakota, and Wyoming are smaller states where the labor market is less reflective of the national market. In the smaller states, there are fewer managerial, professional, and technical occupations that utilize college educated employees which would imply a lower rate of return to a college degree. The earnings differential for a two year degree in South Dakota and the surrounding states are similar to the national labor market, but four year degrees in South Dakota and the smaller surrounding states (with the exception of Wyoming) are well below the national earnings differential. The wage effect for master's degrees in the smaller states is also substantially below the national wage differential (with South Dakota having the highest and Nebraska and Wyoming having a wage effect for a master's degree that is lower than the wage effect for a bachelor's degree). The earnings differentials for two year, bachelor's and master's college degrees in the larger states of Minnesota and Iowa are more similar to the impact of college on earning nationally, but the wage effects are slightly smaller (which is consistent with lower earnings in the Midwest). These would be expected since the labor market in the more populous states would be more reflective of the national labor market. The wage effect from PhDs and professional degrees are similar in general to the national earnings differential which is expected since the occupations that these degree holders compete in are national markets. The very high return to PhDs in South Dakota (relative to earnings for South Dakota high school graduates) likely reflects the low level of earnings in the state relative to national earnings. South Dakota routinely ranks nationally 49th or 50th in average wages. The low level of wages in South Dakota has a greater impact on non-college educated workers.

From an economic development perspective, state investment in bachelor's and advanced degrees provide the greatest social benefits. Macroeconomics demonstrates that domestic income and gross domestic product (GDP)—or from a state viewpoint, state domestic product (SDP)—reflect equal levels of economic activity. Any human capital investment that increases income will also raise GDP (or SDP). In the national labor market, the effect on GDP of employing a worker with a four-year bachelor's degree would have at least a 150% greater increase in GDP than from employing a worker with a two-year vo-technical or associate of arts degree. The relative impact on GDP from employing a worker with an advanced or professional degree would be 268% to 400% higher than employing a worker with a two-year degree. For a small state like South Dakota, the effect of policies that promote the employment of bachelor's or advanced degree workers would dramatically increase South Dakota SDP. Clearly, human capital development is a critical factor in state economic development, especially support to bachelor's and advanced degree granting institutions. Economic studies have also shown that higher expenditure levels on education generate a higher degree of state economic growth.

Summary

The earnings differential for two- and four-year college degrees varies substantially across the specific states in the study due to the uniqueness of the individual state's labor market. This is also true for the earnings differential for advanced and professional degrees, but the wage effects for these degrees more closely reflect

the national labor market since the competition for these occupations have more of a national scope. In general, the wage effect for specific college degrees for a given state follows the general pattern in the national market—the return for a bachelor's degree is higher than for a two-year degree, and the return for an advanced or professional degree is higher than for a bachelor's degree. In the national labor market, the average return to a four-year bachelor's degree is more than twice the return for a two-year vo-technical or associate of arts degree; and return for advanced and professional degrees is approximately 50% to 100% higher than for a bachelor's degree. Specifically for South Dakota, the return for a bachelor's degree is 99% to 174% greater than for AA and vo-tech degrees, respectfully. The return for a master's degree is 39% greater than for a bachelor's degree. The relative returns for PhD and professional degrees are even higher.

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Table 1: Educational Earnings Differential Relative to a High School Degree, 1995-2007[a]

	National	South Dakota[b]	Iowa[b]	Minnesota[b]	Montana[b]	Nebraska[b]	North Dakota[b]	Wyoming[b]
Dropout	-20.4%	-12.1%	-11.1%	-14.2%	-15.4%	-15.6%	-16.8%	-13.6%
Vo-technical	16.6%	13.6%	17.2%	16.7%	27.6%	14.3%	12.5%	20.1%
Assoc. of Arts	19.1%	18.9%	18.2%	25.1%	10.7%	7.2%[c]	11.9%	15.9%
Bachelors	47.6%	37.6%	46.9%	40.7%	37.0%	38.0%	35.8%	41.3%
Masters	70.3%	52.3%	64.2%	58.9%	41.0%	35.8%	54.5%	39.9%
PhD	91.1%	135.2%	81.2%	76.2%	92.1%	88.7%	77.7%	74.1%
Professional	95.7%	88.1%	104.9%	99.8%	76.0%	93.9%	93.1%	178.8%

[a] Sample size national labor market: 190,770 observations. The wage model is a log-linear functional form, and the college degrees and the high school dropout status are represented as dummy variables. The percentage wage effect for high school dropouts and the specific college degrees are calculated by the following formula: $e^{[\text{parameter estimate}]} - 1 \times 100$.

[b] State level sample observations are as follows: South Dakota, 2661; Iowa, 3202; Minnesota, 3932; Montana, 1875; Nebraska, 2964; North Dakota, 2589; and Wyoming, 2485.

[c] Not statically significant.