

## **Chapter Seven**

### **Implications and limitations of the study**

This chapter presents the implications and limitations of the study. Section 7.1 presents the implications of the study, while the limitations of the study are discussed in Section 7.2. Section 7.3 summarizes the results of the study.

#### **7.1 Implications of the study**

This study is motivated by the increasing pressure on higher education institutions to justify higher financial support from public sources. When making informed educational investment decisions it is important to know the returns associated with such investments. This study focuses on the value of a Virginia Tech undergraduate degree. Net Present Values (NPVs) and private rates of return are calculated to impute the value a VT undergraduate degree. In contrast to previous work this study considers the decision to participate in the laborforce as an endogenous variable, and adjusts the expected future earnings of the graduates for the probability of laborforce participation. The NPV (calculated using the probability adjusted earnings of the graduates) estimates give the value in terms of dollars, while the private rate of return is in percentage terms. In the calculation of NPVs, a 5 percent discount rate is used. The private rate of return is an important determinant of an individual's decision to go to college. The decision to go to college is often based on financial expectations. A higher rate of return on a college education means higher benefits for the individual attending college. It is desirable to invest in a college education as long as the rate of return on the college education exceeds market interest rates. Significant non-monetary benefits are associated with a college degree, and NPVs / rates of return significantly increase if the non-monetary benefits of a college education are considered.

NPV and rate of return estimates are particularly sensitive to costs because they do not extend into the distant future and are therefore not discounted heavily. This is the reason why NPVs and rates of return can change due to changes in educational costs (tuition and

fees). Particularly, changes in tuition rates could alter the consumption of higher education, affect private rates of return and impact economic growth.

The results suggest that Virginia Tech plays an important role in the economic growth and development of the state through the production of high quality human capital. A VT undergraduate education significantly increases the earnings of graduates, and leads to several other benefits to the graduate, to his/her family, and to society. The average NPV for a VT undergraduate education, including monetary costs and opportunity costs of time, was found to be \$143,738<sup>1</sup>. The average value of discounted benefits (monetary) was \$191,894, while the average value of undiscounted benefits was found to be \$591,497. The average NPV using the model without the workforce participation correction was found to be \$160,330. Although, this model gives a higher NPV value relative to the model with the workforce participation decision correction, the difference is not large. This is due to the fact that although the probability adjustment lowers the earnings streams of the graduates, the higher probability of college graduates to participate in the laborforce relative to high school graduates helps to maintain the earnings difference between the two groups. Haveman and Wolfe (1984) and Wolfe and Zuvekas (1997) reported that the value of non-monetary benefits is approximately equal to the value of monetary benefits due to a college education. Using this result, and assuming that out of the approximately 4,000 graduates each year 50 percent remain in the state after graduation, the additional state income that could be attributed to VT graduates is \$760,000,000 per year. Private rates of return and state income tax revenues that could be attributed to VT undergraduates were also calculated. The average private rate of return to a VT undergraduate education was 16.2 percent. AVT education leads to higher income tax revenues for the state government. The discounted value of state income tax that could be attributed to a VT student was found to be \$15,082 per year, assuming that the student remains in the state after graduation. The figure reveals that the annual tax return to the state roughly equals public investment in the undergraduate degree. If we consider that approximately 2,000 graduates remain in the state, it implies that \$30,164,000 of state income tax is added by VT undergraduates each year.

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<sup>1</sup> 1995-96 dollars

The results also indicate that the net present value (NPV) is the highest for engineering majors, followed by business majors. A natural resources degree has the lowest NPV. The private rate of return is the highest for engineering majors, and lowest for natural resources majors. Rates of return give an idea about the relative demand for different occupational fields (majors). Variation in rates of return across occupational fields reflects oversupplies in some professions and shortages in others. The high rates of return associated with engineering and business majors probably reflect the higher labor market demand (relative to supply) for individuals with these skills. The high rates of return to engineering and business majors could also represent differences in non-schooling attributes, for example, superior ability of the graduates.

The rates of return for females are either slightly higher or equal to that of males across all majors and races, implying that VT female graduates do not encounter wage discrimination in the labor market. Another reason for the relatively high rates of return for female graduates is due to the lower values of foregone earnings relative to male graduates.

Racial differences in rates of return dominate differences due to gender. Across races, Asians gain a higher rate of return relative to African Americans and Whites. The high rates of return to non-white VT graduates probably reflect the abilities of this selected group of individuals, equal opportunity in the labor market and limited opportunities for these groups without a college degree.

In economic terms, a higher rate of return implies underinvestment. Therefore, there is underinvestment in majors like engineering and business, and overinvestment in majors like natural resources and agriculture. Across races, there is underinvestment by the minority groups – African Americans and Asians. The results suggest that there is underinvestment in the education of women relative to men.

The high rates of return to a VT degree is probably an important reason for the increasing student enrollments at Tech. However, from a policy perspective, the high rates of return (underinvestment) imply that students could be charged a higher tuition rate. The important issue is whether it is desirable to increase tuition rates or not. There are several important reasons why tuition rates should not be increased, or, in other words, public investments should not be reduced. First, past studies have shown that college enrolments are sensitive to tuition rates. Higher tuition rates could discourage individuals from attending college, implying a loss in national/state income. Second, there are important positive externalities associated with a college education. The benefits of educated individuals are enjoyed by society as a whole. Third, with ever increasing pressures for public dollars for other public purposes, there is a danger that higher tuition rates will result in the diversion of revenues for non-educational purposes. Finally, the argument for public investments in education is due to the very high returns associated with educational investments relative to other public expenditure programs.

The conclusion is that public investments should increase or at the least remain constant for the state to reap the benefits of a well-educated population.

## **7.2 Limitations of the study and further research**

The key limitation to the study stem from the data. Only starting salaries (within six months of graduation) of the graduates were used for the analysis. Earnings data 5-10 years after graduation would have been more appropriate because by that time the graduates would have settled into their long-run age-earnings curve. The initial earnings could also be misleading because many graduates are on probation during initial employment, and many take jobs at lower salaries and change jobs during the first two or three years. The results could be more reliable if earnings of the graduates for 5-10 years after graduation could be used. However, such data could not be obtained. Future studies could improve on the results by using such data.

The earnings data are based on the graduates that responded to the survey conducted by the Career Services Office. There could be a bias due to underreporting.

The other limitations of the study are related to the assumptions of the study. First, a VT graduate experiences the same earnings growth as that of a college graduate in the CPS sample. Second, the earnings growth is the same across majors, races and genders. Third, the earnings differential for a VT graduate with and without the VT degree is the same as the earnings differential between a college graduate and high school graduate in the CPS sample. Finally, the probabilities of workforce participation of VT graduates are based on the probabilities of workforce participation of individuals in the CPS sample.

The study does not consider differential costs incurred by students receiving financial aid. The NPVs and rates of return could be higher for individuals receiving financial aid.

### **7.3 Summary**

Virginia Tech significantly contributes to social and economic progress through its undergraduate teaching mission. The average net present value (NPV) of a VT undergraduate degree was found to be \$143,738. Assuming that out of the approximately 4,000 graduates each year 50 percent remain in the state after graduation, the contribution to state income that could be attributed to VT graduates is \$760,000,000 per year, while the value of state income tax revenue is \$30,164,000 per year. The average private rate of return to a VT undergraduate education was found to be 16.2 percent.