Using Administrative Records to Assess Return on Investment at a Publicly Supported College

Gerard G. Walter Michael Servé William Welsh National Technical Institute for the Deaf
Dorothea Riley Statistics of Income Division Internal Revenue Service

ABSTRACT

Lifetime earnings are one measure of the value of a college education. As an alternative to using questionnaires to obtain earnings information from graduates of a publicly supported college, cooperation was sought from the U.S. Internal Revenue Service (IRS). The IRS was able to provide frequency distributions of wages and salaries of the college's graduates categorized by the independent variables: year of graduation, gender, degree, and major. Only grouped data were provided and in such a fashion that individuals could not be identified. The findings indicate that such data can be used to evaluate the effects of achieving a college degree both in terms of individual earnings, and increased lifetime contributions to the Federal Treasury.

The Research reported in this document was produced at the National Technical Institute for the Deaf in the course of an agreement between the Rochester Institute of Technology and the U.S. Office of Education.

INTRODUCTION

Studies of the economic and occupational attainments of deaf persons have consistently shown that their employment conditions have been chronically depressed (Weinrich, 1972; Schein and Delk, 1974; Schroedel, 1976; MacLeod-Gallinger, 1985). This is manifested by, among other things, substantially reduced lifetime earnings.

The National Technical Institute for the Deaf (NTID) at the Rochester Institute of Technology (RIT) was given the task by Congress in 1965 (P.L. 89-36) of helping to reverse these depressed employment conditions. As a result of the law, the federal government annually appropriates funds for the education of deaf students at RIT.

Higher education in the United States is, most often, a joint financial undertaking of the individual and society. *Individual* contributions include direct expenditure of personal funds for such things as tuition, books, board, and travel in addition to lost income that would have resulted from the individual working during the period of matriculation. *Societal* investments take the form of contributions made by the university from endowment and other funds, grants in aid, and direct governmental support to the education of the individual. At NTID, these costs (in the form of appropriations from the Federal Treasury) approximate $15,000.00 per student per year (1986 dollars). As a result of these expenditures, the Congress, the Department of Education and the Office of Management and Budget often ask questions concerning the return on the investment made by the government in educating deaf persons at the college level.

There exists an extensive literature about the effect of degree attainment on earnings for hearing persons (Taubman and Wales, 1974; Bowen, 1977; Witmer, 1978). However, until 1978 (the year NTID began surveying its graduates), there existed no literature about the effects of college completion for deaf individuals. NTID's *Alumni Feedback Questionnaire* (AFQ) (Welsh, 1986) was designed to collect data about work and continuing educational activities of NTID graduates. However, the *AFQ* is subject to at least two limiting conditions. First, the data are self-reported, and thus open to response bias. Second (and related), data are available only for those graduates who choose to respond to the survey. No data can be collected on (a) those who choose not to respond, or (b) those graduates of unknown address. Because of these problems, an alternative data source was sought that could (a) increase the number of alumni about whom data could be gathered, and (b) reduce or eliminate the possibility of response bias.

In 1981, the Social Security Administration (SSA) was contacted. Since this agency collects work force data on most U.S. citizens, it was anticipated that their files could be tapped for information about deaf RIT graduates. As a result, the SSA provided several analyses of earnings. While the data were useful, their incompleteness (the SSA did not have earnings data on approximately fifteen to twenty percent of the graduates)[1] resulted in NTID considering other alternatives.

[1] *The SSA reports zero earnings for all persons in non-FICA paying jobs, including: federal employees; some state workers; and some persons in education. It is estimated that fifteen to twenty percent of deaf RIT graduates are employed in such professions.*

As a result of interaction with the SSA, contact was made with several persons at the Statistics of Income Division of the Internal Revenue Service (IRS). These individuals indicated that the IRS could provide selected and grouped analyses of work force data for NTID alumni but under strict review to insure confidentiality. The remainder of this paper will describe our analysis of the information provided by the IRS by (1) defining a model for estimating the return to the Federal Treasury of the funds invested to educate a deaf student at RIT, (2) using the model to describe how much time it takes alumni to pay back the invested capital, and (3) determining the additional revenues realized by the Treasury because students attended NTID.

METHOD

Subjects

A computer tape, containing the social security numbers of 1,928 hearing-impaired students who had graduated or withdrawn from NTID at RIT between 1968 and 1980 was sent to the IRS. Other variables included on the tape were: year of graduation; gender; degree; and major. The social security numbers were matched against IRS files to extract Salaries and Wages reported on 1982 W-2 forms for the 1,928 individuals.

Procedure

The type of information that could be obtained from the IRS was restricted by stringent confidentiality safeguards imposed by the IRS and enforced by its Disclosure and Security Division (recently renamed the Office of Disclosure). Grouped data were provided in such a fashion that individuals could not be identified--cells containing fewer than 3 subjects were combined. With these restrictions, the IRS was able to provide frequency distribtuions of wages and salaries categorized by the independent variables: year of graduation, gender, degree, and major (see Table 1 for an example of the data provided).

It must be noted that the reported earnings are from wages and salaries reported on W-2 forms, and exclude any income from self employment, as well as any unearned income (interest, dividends, Supplemental Security Income, etc.).

Projecting Earnings of Deaf Alumni

In order to assess the accumulated lifetime earnings of deaf graduates of RIT, it was necessary to develop a model to project growth in earnings over a forty year period of employment.[3] Since the growth in earnings of deaf college graduates is unknown, we applied a rate of growth equal to the average increase in earnings of the U.S. population during the thirty year period preceding 1982. Income data provided by the IRS permitted specification of earnings for alumni one year after graduation. By using an average annual growth rate of 5.2 percent (Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds, 1986), it was possible to estimate lifetime earnings (Table 2, column 2). Column 3 presents the estimated Adjusted Gross Income (AGI) realized from a given wage and salary level. The AGI was calculated by adjusting the amount in column 2 (Wages and Salaries) by a percentage representing the difference between AGI and Wages and Salaries as reported in *Individual Income Tax Returns* (Statistics of Income, 1984)[4].

Calculating Tax Liability

For the purposes of this paper, all taxes were estimated tax rates for 1982. Data provided by the Internal Revenue Service (Statistics of Income, 1984) were used for estimating Income Tax payments. The tax amount assigned to a given AGI (column 3) is the average tax paid on an equivalent AGI for all returns during the 1982 tax year. Social Security Contributions were calculated by multiplying reported Wages and Salaries by 14.3%. In addition, 0.5% of Wages and Salaries was calculated to account for Excise Tax contributions. The sum of these three sources of revenue was used to estimate total lifetime taxes paid by the alumni of NTID (see Table 2--columns 4 through 7).

Educational Costs

Educational costs are calculated by identifying that part of the NTID appropriation which is related directly to the education of students. This cost is calculated using a methodology developed by Bowen (1980) and supported by the National Center for Higher Education Management Systems (NCHEMS). In the methodology, educational costs include "current expenditures after excluding outlays for organized research and public service, and a prorated share of overhead cost attributable to the operation of auxiliary enterprises such as residence halls, dining facilities, student unions, and teaching hospitals. What remains after these exclusions is current expenditures for the education of students." (p. 115) For the 1982 academic year, these costs totaled $4,443.00 per quarter of instruction. Since the average length of time to graduation at NTID is 10.8 quarters, the average educational cost to the federal government for a graduate is $48,345.62--the amount we will use to evaluate time to repayment through cumulative tax contributions.

RESULTS

Table 2 contains the estimated cumulative payback to the Federal Treasury (Column 8) as a result of increased earnings over a forty year period of time (Columns 2 and 3). The accumulated taxes at the end of forty years can be used as one index of the economic effect of federal appropriations supporting the college education of deaf persons.

Deaf graduates of RIT take, on the average, almost 11 years to repay the cost of their education. Over a lifetime of work, they will contribute a gross amount of $662,128.05 to

Table 1. Sample of data received from the IRS.

GENDER	SALARIES AND WAGES (Midpoints of $5,000 ranges)								
	2500	7500	12500	17500	22500	27500	32500	37500	42500
MALE:									
N	49	53	119	154	102	55	16	7	5
TOTAL[2]	.1	.4	1.5	2.7	2.3	1.5	.52	.26	.23
FEMALE:									
N	44	78	126	62	30	5	0	0	0
TOTAL	.09	.6	1.6	1.1	.7	.1	0	0	0

[2]*The IRS reported the exact totals. In the interest of space we report the total amounts in 1,000,000's of dollars.*

[3]*The average age of graduates from NTID is approximately 24 years.*

[4]*Depending on the size of Wages and Salaries the differences ranges from 3.9 percent to 4.8 percent.*

the Federal Treasury. When we reduce this amount by the $48,345.62 it costs the government to educate deaf RIT graduates, the net amount of $613,782.44 is considerable and represents a return of 12.69 times the original investment in their education.

The return reported above is somewhat misleading when one considers that even if the government contributes nothing to the education of deaf persons, they would probably have a job and thus be paying some taxes. To be realistic, it is necessary to adjust the return reported above by subtracting the amount which deaf persons, who did not attend college, would contribute to the Federal Treasury over a lifetime of employment. Walter, Welsh, and Servé (1987) have estimated this amount to be $367,319.00[5] for individuals graduating from high school in 1981, not attending college, and reporting taxes in 1982. Subtracting $367,319.00 from $613,782.44 yields a return of $246,463.44. This amount represents a return of 5.1 times the investment made by the government, a more realistic return to the government from supporting the college education of deaf people.

CONCLUSIONS

Implications

Overall, the results from this study support the value of providing for education of deaf students at the college level. The effects of higher education on the earnings of deaf persons has been documented by Welsh, Walter & Riley (1986) for deaf students and by Bowen (1978) for hearing students. However, this paper takes the analysis a step further by determining the net contributions to the Treasury resulting from the federal appropriations for NTID. Even with the amount invested in their education deducted from cumulative lifetime tax returns, graduates of NTID return significantly more to the treasury than do persons who do not receive a college education.

Use of governmental tax records clearly can be used for evaluating financial benefits of a college education without compromising confidentiality of individual earnings records. In addition, use of such records is superior to questionnaire data because of the unobtrusive nature in which the data are collected--insuring a larger and relatively bias free data set. Something generally not possible through questionnaires. Another advantage lies in the fact that the statistics generated from the analysis can be compared with national statistics computed from a national data base.

Limitations

There are a number of limitations of the data which must be pointed out.

(1) Projections of future earnings for deaf graduates were based on known rates of growth in earnings for the national population over the past thirty years. This same rate of growth was used to estimate growth for the next forty years. No adjustments for future economic, social or occupational trends were taken into account in the projections.

(2) All estimates of tax rates were based on rates in effect in 1982. Projections do not account for the effects of the current changes in income tax legislation, future changes in social security taxation, or other alterations in federal levies.

(3) The reader should exercise caution in attributing the differences in earnings solely to the effects of achieving a college education. Certainly variables such as parental socio-economic status, amount of hearing loss, intellectual abilities, etc. have an effect on earnings of all individuals (Taubman and Wales, 1974).

As a result of these limitations, the reader is cautioned against using the above data as other than illustrative of the impact of a college degree on earnings and federal tax collections. The data should not be used to estimate comparative economic returns to the government. For example, one should not compare the returns to the Treasury defined here with returns derived by investing similar dollars in some form of securities--such as stocks or bonds. Such comparisons are inappropriate since the original legislation establishing NTID did not stipulate this as a requirement, but rather the general economic and occupational improvement of deaf persons. Witmer (1978) presents this caution as follows:

> And anyone who invests in higher education merely to realize a monetary return will have missed the central point that the products of higher education--which are as varied as the students and their programs of study--promote the general welfare through the development of whole persons to the limit of their capacities. Monetary rates of return merely indicate market valuations of some of the resultant products in the world of work, which almost never match the valuation of any one person. (p. 57)

All we are saying is that the government more than recovers the cost of educating deaf persons at RIT; we do *not* attempt to attach an ultimate value to the phenomenon of higher education.

REFERENCES

Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds, Annual Report of the Board of Trustees, Washington, DC: U.S. Government Printing Office, 1986.

Bowen, H. R. Investment in Learning, San Francisco: Jossey-Bass, 1977.

Bowen, H. R. The Costs of Higher Education, San Francisco: Jossey-Bass, 1980.

MacLeod-Gallinger, J. Secondary School Follow-up Program for the Deaf, Sixth annual report, Rochester, NY: Rochester Institute of Technology, 1985.

Schein, J. D. & Delk, M. T. The Deaf Population of the United States, Silver Spring, Maryland: National Association of the Deaf, 1974.

Schroedel, J. G. Variables Related to the Attainment of Occupational Status Among Deaf Adults, (Doctoral Dissertation), New York: New York University, 1976. (Univ. Microfilm No. 77-16447).

Statistics of Income, Individual Income Tax Returns--1982, Washington, DC: U.S. Government Printing Office, 1984.

Taubman, P. & Wales, T. Higher Education and Earnings. New York: McGraw Hill Book Co., 1974.

Weinrich, J. E. Direct Economic Costs of Deafness in the United States, American Annals of the Deaf, 117, 1972, 446 - 454.

Walter, G., MacLeod-Gallinger, J. & Stuckless, E. R. Outcomes for Graduates of Secondary Programs for Deaf Students: Early findings of a cooperative National Longitudinal Study. Testimony presented before the Congressional Commission on Education of the Deaf. Bathesda, MD, March 13, 1987.

Walter, G., Welsh, W. & Servé, M. Using Income Tax Data in Outcomes Research at Publicly Supported Institution, Paper presented at the meeting of the Association for Institutional Research, Kansas City, MO, May, 1987.

Welsh, W. Deaf RIT Graduates in the Work Place: 1986, Rochester, NY: Rochester Institute of Technology, 1986.

Welsh, W., Walter, G. & Riley, D. Earnings of Deaf RIT Graduates as Reported by the Internal Revenue Service, Rochester, NY: Rochester Institute of Technology, 1986.

Witmer, D. B. Are Americans Overeducated? Are Returns on investments in Higher Education Lower than those on

[5] *Research at NTID (MacLeod-Gallinger, 1985; Walter, MacLeod-Gallinger and Stuckless; 1987) indicates that students withdrawing earn about the same amount each year as deaf high school graduates not attending college. Since we do not have IRS data for deaf high school graduates we chose to use the earnings of those withdrawing from NTID as a surrogate for the earnings of high school graduates who did not attend college.*

Alternate Investments?, Paper presented at the annual meeting of the American Educational Association, Toronto, Canada: 1978.

Ziterman, A. Rates of Return on Investment is Education: Recent Results for Britain, Journal of Human Resources, 8, 1973, 85 - 97.

Table 2. Estimated income, tax contributions, and payback of federal expenditure for education at NTID for a forty year period of time after graduation.

YEARS IN LABOR FORCE (1)	WAGES (2)	ADJUSTED GROSS INCOME (3)	INCOME TAX (4)	FICA (5)	EXCISE TAX (6)	TOTAL TAXES (7)	CUMULATIVE TAX PAYMENTS (8)	
1	13,173	13,687	1,101	1,957	68	3,127	3,127	
2	13,858	14,398	1,258	2,059	72	3,390	6,517	
3	14,579	15,147	1,419	2,166	76	3,661	10,178	
4	15,337	16,027	1,613	2,292	80	3,985	14,163	
5	16,134	16,860	1,908	2,411	84	4,403	18,566	
6	16,973	17,737	2,009	2,536	89	4,632	23,198	
7	17,856	18,659	2,111	2,668	93	4,873	28,071	
8	18,784	19,630	2,220	2,807	98	5,126	33,197	
9	19,761	20,650	2,625	2,953	103	5,681	38,878	
10	20,789	21,683	2,757	3,101	108	5,966	44,843	
								48,346*
11	21,870	22,810	2,899	3,262	114	6,275	51,119	
12	23,007	23,996	2,927	3,431	120	6,478	57,597	
13	24,203	25,244	3,301	3,610	126	7,037	64,634	
14	25,462	26,633	3,718	3,808	133	7,659	72,293	
15	26,786	28,018	4,133	4,007	140	8,279	80,573	
16	28,179	29,475	4,570	4,215	147	8,932	89,505	
17	29,643	31,008	5,030	4,434	155	9,619	99,124	
18	31,185	32,526	5,485	4,651	162	10,299	109,424	
19	32,807	34,218	5,993	4,891	171	11,057	120,481	
20	34,513	35,997	6,527	5,148	180	11,854	132,336	
21	36,308	37,869	7,088	5,415	189	12,693	145,029	
22	38,196	39,838	7,679	5,697	199	13,575	158,604	
23	40,182	42,231	8,397	6,039	211	14,647	173,251	
24	42,271	44,427	9,056	6,353	222	15,631	188,882	
25	44,470	46,737	9,749	6,683	234	16,666	205,548	
26	46,782	49,168	10,478	7,031	246	17,755	223,303	
27	49,215	51,725	11,245	7,397	259	18,900	242,204	
28	51,774	56,589	12,704	8,092	283	21,079	263,283	
29	54,466	59,531	13,587	8,513	298	22,398	285,681	
30	57,298	62,627	14,516	8,956	313	23,785	309,465	
31	60,278	65,884	15,493	9,421	329	25,244	334,709	
32	63,412	69,310	16,521	9,911	347	26,778	361,487	
33	66,710	72,914	17,602	10,427	365	28,393	389,880	
34	70,179	76,706	18,739	10,969	384	30,092	419,972	
35	73,828	80,694	19,936	11,539	403	31,879	451,850	
36	77,667	93,200	23,688	13,328	466	37,481	489,332	
37	81,706	98,047	25,142	14,021	490	39,653	528,984	
38	85,954	103,145	26,671	14,750	516	41,937	570,921	
39	90,424	108,509	28,280	15,517	543	44,340	615,261	
40	95,126	114,151	29,973	16,324	571	46,867	662,128	

*Amount of federal contribution to education at NTID.