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ABSTRACT

The seven papers in this volume address three topics: the economic effects of vocational education, occupational projections, and coordination among institutions providing training. The first paper analyzes high school vocational education from an economic viewpoint, while the second examines the effects of vocational training coupled with the size of firms on the employment experience of noncollege youth. The last paper in the outcomes of vocational education section assesses the effectiveness of vocational education and Comprehensive Employment and Training Act (CETA) programs through the use of routinely available administrative data. In the second section on occupational projections and vocational education, technical information on occupational coding is provided, and vocational education for coal mining in West Virginia is profiled. The final section examines educational coordination, first between CETA and vocational education as seen by vocational educators and then through an examination of the role of federal vocational education funding in promoting reemployment of disabled workers. (KC)

National Commission for Employment Policy

The Federal Role in Vocational Education: Sponsored Research

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Preface

The papers in this volume address three topics: the economic effects of vocational education, occupational projections, and coordination among institutions providing training. They were prepared as part of the Commission's work on the Federal role in vocational education. Dr. Patricia Brenner, Commission staff, monitored this work over 1980 and 1981.

As this volume was being prepared for printing, President Reagan appointed a new membership to the Commission. Although the other new Commissioners and I were not involved in the work and research of this particular volume, we feel that vocational education is an area of great national concern. Our authorizing legislation combines with our interest to promote a continuing consideration of this topic and we believe the material will add substanially to the body of knowledge available in this vital area.

Kenneth M. Smith
Chairman

AN ECONOMIC ANALYSIS OF HIGH SCHOOL VOCATIONAL EDUCATION

by

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AN ECONOMIC ANALYSIS OF HIGH SCHOOL VOCATIONAL EDUCATION

Chapter 1

Vocational Education: How Should It Be Measured?

Introduction

This is the first of four chapters analyzing the economics of high school vocational education. This chapter examines what high school vocational education is and how it should be measured. The second is concerned with the role of States, schools, and individuals in determining participation in vocational education. Chapter 3 studies the effect of vocational education on postsecondary school choices. Finally, the labor market effects of vocational education are analyzed.

What is high school vocational education and how should it be measured? This chapter challenges the traditional view that high school education should be characterized by two, three, or more mutually exclusive programs--for example, an academic, a general, or a vocational program. Categorical definitions of this sort have been used in most, if not all, previous evaluations of vocational education, including Grasso and Shea (1979), Meyer and Wise (1979), Rosenbaum (1980), and Gustman and Steinmeier (1981).[1] Alternatively, high school education can be characterized by the number and type of courses a student takes. Several recent longitudinal data sets contain information that allows both variables to be analyzed.[2] Here, data from the National Longitudinal Study of the High School Class of 1972 (NLS72) are used to compare the two approaches.

Based on our analysis, we conclude that actual course enrollment data form a more objective and relevant measure of vocational education than reports by individual students or by

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[1]Grasso and Shea (1979), for example, compare the experiences of persons in the academic and general programs with the experiences of two groups of vocational students: business and office (commercial) and other vocational subjects.

[2]The National Longitudinal Study of the High School Class of 1972, High School and Beyond, and the National Longitudinal Study of Labor Force Behavior.

schools of high school program. The first section of this chapter develops criteria appropriate for making this judgment. The second briefly discusses measures of vocational education in the NLS72. The following section contains an empirical application of the analysis in the first section. Measures of vocational and nonvocational education based on actual high school course data are analyzed and separate data are presented for men and women and for blacks, Hispanics, and whites. We find, on average, that blacks and Hispanics enroll in more vocational courses than whites do. However, in comparison with persons with equivalent ability and family background, blacks and, to a lesser degree, Hispanics take fewer vocational education courses than do whites. This finding is consistent with other evidence that blacks and Hispanics are more likely than whites to attend college (Meyer and Wise, 1979). The last section summarizes our main findings and conclusions.

Criteria for Evaluating Different Measures of Vocational Education

Preference for one measure of vocational education or another presumably depends on at least four considerations: (1) the information content and relevance, (2) the accuracy in measurement, (3) the availability of data and convenience in statistical application, and (4) the relevance to public policy questions.

Under the first criterion, the quality of a categorical definition of vocational education depends on whether something resembling a standard program in vocational education exists. If most students take some vocational education and the range in vocational coursework is substantial, a definition of vocational education that embodies differences in the degree of participation is obviously preferable. New empirical questions also arise in this case. Does the intensity or level of vocational coursework affect earnings? Do these effects diminish or increase with the level of vocational education? How does coursework in vocational education interact with coursework in math, science, and English? Categorical definitions of vocational education cannot be used to address these questions.

The accuracy of categorical definitions of vocational education is closely linked with the first criterion. If the degree of participation in vocational education varies widely from one student to another, assignment to one program over another may be arbitrary and ambiguous. Course data obtained directly from a person's school record is likely to be relatively free of error. Comparability of data across different schools is a

potentially serious problem for both types of measures. Categorical variables are likely to be affected by differences in program requirements, availability of specific courses and programs, and State and school rules that place limits on the number of nonacademic courses that a person can take. Measures of course enrollment should allow for differences in length of classes and frequency of class meetings.[3]

Vocational education measures constructed from complete school records clearly require more detailed data than do categorical variables constructed from a single question, and, as mentioned, many of the recent longitudinal data sets contain both types of data. Both categorical and continuous measures of vocational education are convenient to use as explanatory variables in statistical models of earnings and employment.[4] In models that attempt to identify the determinants of participation in vocational education, continuous measures of vocational education are far superior to categorical variables. In general, statistical modeling with qualitative or categorical outcomes is more difficult and expensive than with continuous outcomes, for which standard regression techniques can be employed.[5]

Finally, the policy interest in correctly defining vocational education is twofold. First, in most States the cost of providing vocational education is closely linked to the number of students enrolled in vocational courses, not to the total number of students in vocational programs. The economic consequences of incorrectly defining vocational education are serious if students in nonvocational programs take a significant number of vocational courses. Second, the State and Federal interest in vocational education depends somewhat on whether vocational education--as a whole or in individual subjects--is found to have a positive effect on the labor market position of youth. The criteria discussed above provide a framework for deciding which measures of vocational education are best suited to this task.

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[3]Measuring vocational education as the percentage of total coursework taken in vocational subjects is a simple method of controlling for differences across schools.

[4]See, for example, chapter 4.

[5]See, for example, Maddala (1977). Chapter 2 presents estimates of a model of the determinants of participation in vocational education.

Measures of High School Vocational Education in the NLS72

This analysis of alternative definitions of high school vocational education is based on the National Longitudinal Survey of the High School Class of 1972 (NLS72), a data set that offers at least four different measures of vocational education. The NLS72 consists of a single cohort of 23,000 men and women, all of whom were high school seniors in the spring of 1972. Seniors from about 1,300 high schools were included in the sample. Schools were selected as a stratified random sample in order to overrepresent minority and disadvantaged students.

The four measures of vocational education we will evaluate are individuals' responses to two questions, schools' responses to a question on the nature of each student's program, and course enrollment data from school records. Table 1 shows the questions asked of individuals and schools.

The first question, referred to in the report as "High School Program Reported by Individual," was asked in the Base Year Survey (spring 1972). It is most similar to the question on vocational education that is asked in the Parnes data, the National Longitudinal Surveys of Labor Market Experience (NLS). The NLS data have been analyzed extensively by Grasso and Shea (1979), Hofferth (1980), and Gustman and Steinmeier (1981).[6] The second question, referred to as "High School Training," was included in the first followup survey and asked students about their high school education, but is more specifically directed to the question of whether the education was employment related. Meyer and Wise (1979) report findings based on this definition of vocational education.

The school record form asked for each student's type of program. The possible responses to this question were the same as those for the first student question (compare questions 1 and 3 in table 1). Unfortunately, the responses to these two questions frequently did not agree, as will be discussed next.

In NLS72, detailed information on six vocational and eight academic courses taken during high school (see table 2) also was collected from the students' school records. We have used this information to construct four general measures of the amount of coursework taken in each of these course areas: total semesters

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[6]Their findings are discussed in chapter 4.

Table 1

Questions on Vocational Education

1. High School Program Reported by Individual

Base Year Survey - Question 2

Which of the following best describes your present high school program?

	(Circle One)
General	1
Academic or college preparatory	2
Vocational or technical:	
Agricultural occupations	3
Business or office occupations	4
Distributive education	5
Health occupations	6
Home economics occupations	7
Trade or industrial occupations	8

2. High School Training

First Followup Survey - Question 60

While you were in high school, did you receive any specialized training intended to prepare you for immediate employment upon leaving school (for example, auto mechanics, secretarial skills, or nurse's aide)?

No	1
Yes	2

3. High School Program Reported by School

School Record - Question 7

Which of the following most closely describes this student's course of study?

	(Circle One)
General	1
Academic or college preparatory	2
Vocational or technical:	
Agricultural occupations	3
Business or office occupations	4
Distributive education	5
Health occupations	6
Home economics occupations	7
Trade or industrial occupations	8

Table 2

Courses Taken During High School

4. How many semester courses will the student have taken in each of the following subjects between July 1, 1969, and the date he or she graduates? How many class periods per week did these courses meet?

EXAMPLE: If a student took six semester courses in science, and four of these courses met five class periods per week whereas two courses met only three class periods per week, you would enter "6" for the *Total number of semesters of instruction* and "4" and "2", respectively, in the "5" and "3" columns under *Number of class periods per week*.

Type of course	Total number of semesters of instruction ▼	Number of class periods per week						
		1	2	3	4	5	More than 5	
Science	A	B	C	D	E	F	G	(1)
Foreign languages	H	I	J	K	L	M	N	(2)
Social studies	O	P	Q	R	S	T	U	(3)
English	V	W	X	Y	Z	AA	BB	(4)
Mathematics	CC	DD	EE	FF	GG	HH	II	(5)
Industrial arts	JJ	KK	LL	MM	NN	OO	PP	(6)
Commercial	QQ	RR	SS	TT	UU	VV	WW	(7)
Fine arts or performing arts	XX	YY	ZZ	AAA	BBB	CCC	DDD	(8)

5. Please indicate the total number of semester courses this student will have taken in each of the following vocational-technical subjects by the time he or she graduates. For each subject in which the student has taken courses, please indicate in the appropriate class-periods-per-week columns the number of courses taken before July 1, 1969, and after July 1, 1969.

Type of vocational-technical course	Total number of semesters of instruction ▼	Before July 1, 1969: Number of class periods per week						After July 1, 1969: Number of class periods per week						
		1	2	3	4	5	More than 5	1	2	3	4	5	More than 5	
Agricultural	A	B	C	D	E	F	G	H	I	J	K	L	M	(1)
Business or commercial	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	(2)
Distributive education	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL	MM	(3)
Health occupations	NN	OO	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY	ZZ	(4)
Home economics	AAA	BBB	CCC	DDD	EEE	FFF	GGG	HHH	III	JJJ	KKK	LLL	MMM	(5)
Trade or industrial occupations	NNN	OOO	PPP	QQQ	RRR	SSS	TTT	UUU	VVV	WWW	XXX	YYY	ZZZ	(6)

of instruction, total number of class periods,[7] average hours of class per week,[8] and percentage of total coursework. Most of our analysis will be based on the third and fourth definitions of coursework since they are likely to be the most comparable measures of coursework for different school systems. To simplify the analysis, we have also constructed a number of more aggregate measures of coursework, grouping together similar types of courses (e.g., all academic courses, all vocational courses, and all commercial or business courses). These groupings are defined in appendix table A.1.

Comparison of Alternative Measures of Vocational Education

Tables 3 and 4 report the results of cross-tabulating of information on high school students and programs for women and men. Thirty percent of all individuals disagree with their schools over the classification of their high school programs. Of those women who claimed to be in a vocational program, 69 percent were assigned to a vocational program by the school and 24 percent were assigned to the general program. The individuals' assignment to a general program were even less accurate, since the schools actually assigned 19 to 20 percent of these individuals to the vocational program and over 20 percent to the academic program. Despite the internal disagreements, the overall program totals are in agreement; the school and individual questions both indicate that 28 percent of all women and 20 to 22 percent of men are in a vocational program.

There is even less consistency between responses to the high school training question and the respondents' own assessments of their high school programs (top halves of tables 3 and 4). A relatively large number of women, 37 percent, indicate having received employment-related training in high school. Only 53 percent of this group, said they had been enrolled in a vocational program, while 19 and 28 percent said they had been enrolled in a college and general program, respectively. Of those women in a vocational program, 71 percent said they had

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[7]Total number of class periods takes into account differences in the number of class meetings per week.

[8]Average hours of class per week takes into account both differences in the number of class meetings per week and differences in the length of class periods.

Table 3

Cross-Tabulation of Three Measures of Vocational Education: Women

High School Training	High School Program Reported by Individual			Total
	Academic	General	Vocational	
No Training				
Frequency[a]	3,137	2,304	805	6,246
Percentage of total[b]	31.50	23.14	8.08	62.72
Row percentage[c]	50.22	36.89	12.89	
Column percentage[d]	81.67	68.59	29.19	
Training				
Frequency	704	1,055	1,953	3,712
Percentage of total	7.07	10.59	19.61	37.28
Row percentage	18.97	28.42	52.61	
Column percentage	18.33	31.41	70.81	
Total				
Frequency	3,841	3,359	2,758	9,958
Percentage of total	38.57	33.73	27.70	100.00

High School Program Reported by School	High School Program Reported by Individual			
Academic				
Frequency	3,295	844	203	4,342
Percentage of total	31.55	8.08	1.94	41.58
Row percentage	75.89	19.44	4.68	
Column percentage	82.71	23.78	6.98	
General				
Frequency	512	2,006	692	3,210
Percentage of total	4.90	19.21	6.63	30.74
Row percentage	15.95	62.49	21.56	
Column percentage	12.85	56.52	23.78	
Vocational				
Frequency	177	699	2,015	2,891
Percentage of total	1.69	6.69	19.30	27.68
Row percentage	6.12	24.18	69.70	
Column percentage	4.44	19.70	69.24	
Total				
Frequency	3,984	3,549	2,910	10,443
Percentage of total	38.15	33.98	27.87	100.00

a. This refers to the number of individuals in the cell.

b. The number of individuals in the cell as a percentage of the total sample.

c. The number of individuals in the cell as a percentage of the row total.

d. The number of individuals in the cell as a percentage of the column total.

Table 4

Cross-Tabulation of Three Measures of Vocational Education: Men

High School Training	High School Program Reported by Individual			Total
	Academic	General	Vocational	
No Training				
Frequency[a]	3,764	2,774	930	7,468
Percentage of total[b]	40.09	29.54	9.90	79.53
Row percentage[c]	50.40	37.15	12.45	
Column percentage[d]	91.65	81.21	49.81	
Training				
Frequency	343	642	937	1,922
Percentage of total	3.65	6.84	9.98	20.47
Row percentage	17.85	33.40	48.75	
Column percentage	8.35	18.79	50.19	
Total				
Frequency	4,107	3,416	1,867	9,390
Percentage of total	43.74	36.38	19.88	100.00

High School Program Reported by School	High School Program Reported by Individual			
Academic				
Frequency	3,471	807	167	4,445
Percentage of total	33.57	7.80	1.62	42.99
Row percentage	78.09	18.16	3.76	
Column percentage	79.37	21.00	7.86	
General				
Frequency	695	2,295	585	3,575
Percentage of total	6.72	22.20	5.66	34.57
Row percentage	19.44	64.20	16.36	
Column percentage	15.89	59.72	27.54	
Vocational				
Frequency	207	741	1,372	2,320
Percentage of total	2.00	7.17	13.27	22.44
Row percentage	8.92	31.94	59.14	
Column percentage	4.73	19.28	64.60	
Total				
Frequency	4,373	3,843	2,124	10,340
Percentage of total	42.29	37.17	20.54	100.00

a. This refers to the number of individuals in the cell.

b. The number of individuals in the cell as a percentage of the total sample.

c. The number of individuals in the cell as a percentage of the row total.

d. The number of individuals in the cell as a percentage of the column total.

job-related training. Substantially fewer men, 20 percent, said they had had employment-related training in high school. Although this number is consistent with overall totals for the other vocational education measures, half those men in a vocational program also claimed to have received high school training. Thus, in the NLS72, the categorical definitions of vocational education fail the test of accuracy and consistency.

The wide disparities among these different definitions of vocational education suggest the following:

> Participation in vocational education may vary more along a continuum of choices than discretely. Assignment to categories will depend on where respondents draw the lines of demarcation.
>
> Assignment to different categories may reflect attitudes and circumstances at the time of the questionnaire (e.g., "Do I intend to go to college?" or "Am I in a job that uses my high school vocational training, even though it consisted of only 1 or 2 vocational courses?") as well as objective measurement of vocational education.

This indicates that it may be misleading to base evaluation of vocational education on the categorical variables that have been discussed so far, although it has predominated in previous evaluations of vocational education. Next, we compare our categorical definitions of vocational education with measures based on actual enrollment. The objective is to determine whether high school programs discriminate well between students taking vocational education courses and those specializing in non-vocational subjects. A second objective is determine whether students in vocational programs tend to take a standard amount of vocational coursework or whether the range of vocational coursework is substantial.

Table 5 presents average vocational class hours by high school program, as reported by the individual and the school. Standard deviations are in parentheses below each mean. As could be expected, on average, vocational students take the most vocational courses and academic students take the least. The standard deviations are quite large, however, indicating that the distributions of vocational courses overlap; some academic students take more vocational courses than some vocational students do! This is fully apparent if one examines the actual distribution of vocational class hours by high school program, in graphs 1 and 2. The striking fact illustrated in these graphs is that almost all students take some vocational education. Only 9 percent of all women and 14

Table 5

Average Vocational Class Hours Per Week by High School Program

Men

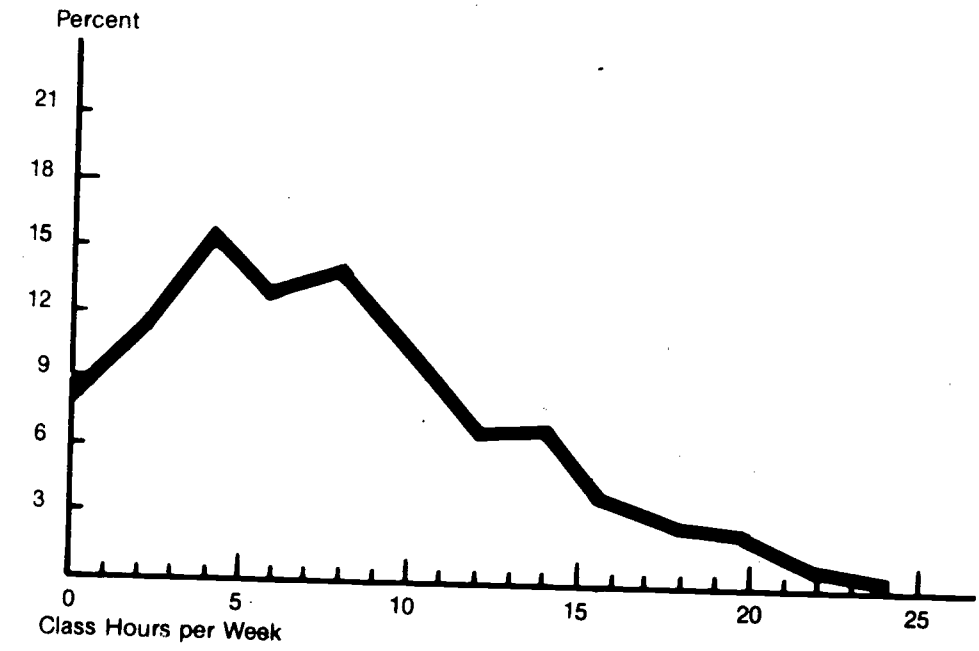
High School Program as Reported by School	High School Program as Reported by Individual			Total
	Academic	General	Vocational	
Academic	2.82 (3.17)	4.24 (3.75)	5.60 (3.81)	3.17 (3.37)
General	5.28 (4.24)	6.50 (4.40)	7.75 (4.67)	6.45 (4.47)
Vocational	9.55 (5.26)	10.43 (5.34)	9.90 (5.55)	10.03 (5.46)
Total	3.50 (3.81)	6.73 (4.89)	8.96 (5.37)	5.72 (5.03)

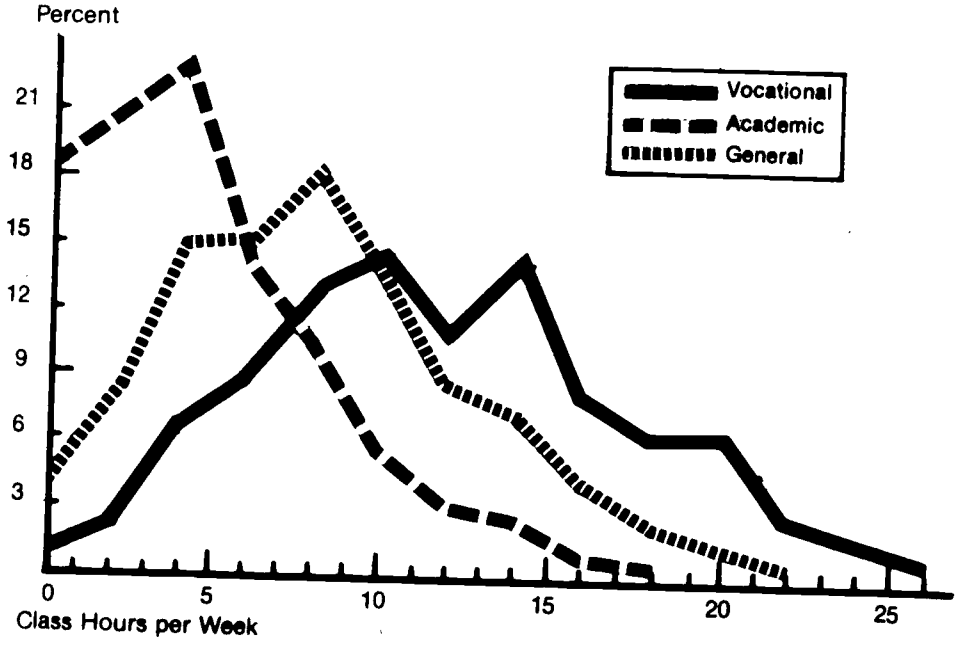
Women

High School Program as Reported by School	High School Program Reported by Individual			Total
	Academic	General	Vocational	
Academic	3.17 (3.21)	5.09 (4.22)	7.41 (5.09)	3.72 (3.69)
General	6.12 (4.11)	6.94 (4.17)	8.97 (5.19)	7.24 (4.50)
Vocational	10.35 (4.85)	11.30 (5.00)	12.67 (5.91)	12.20 (5.69)
Total	3.83 (3.81)	7.37 (4.85)	11.45 (6.00)	7.09 (5.73)

Standard deviations are in parentheses.

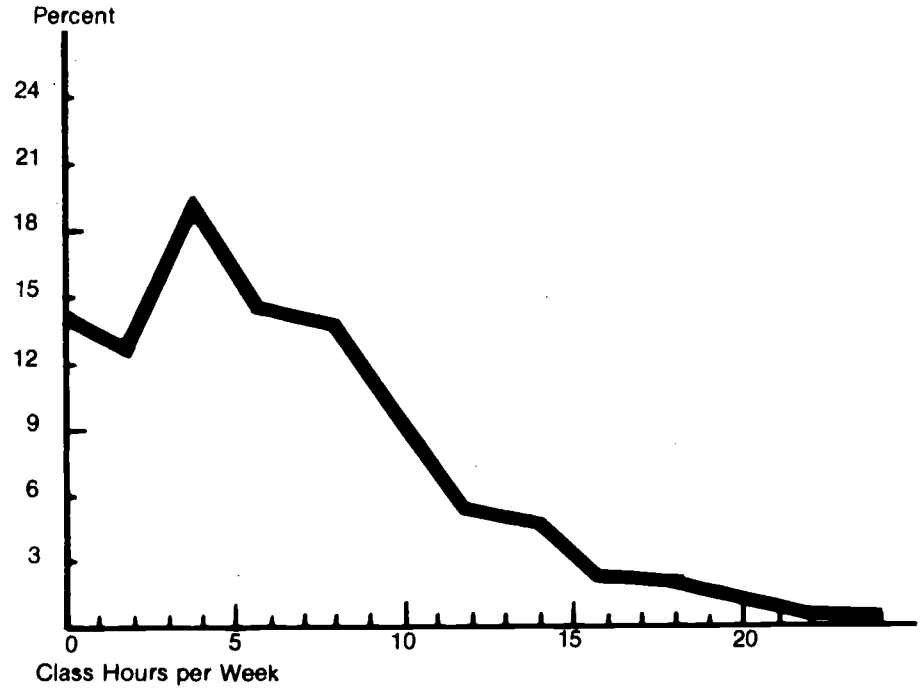
Graph 1: Distribution of Total Vocational Class Hours per Week: Women

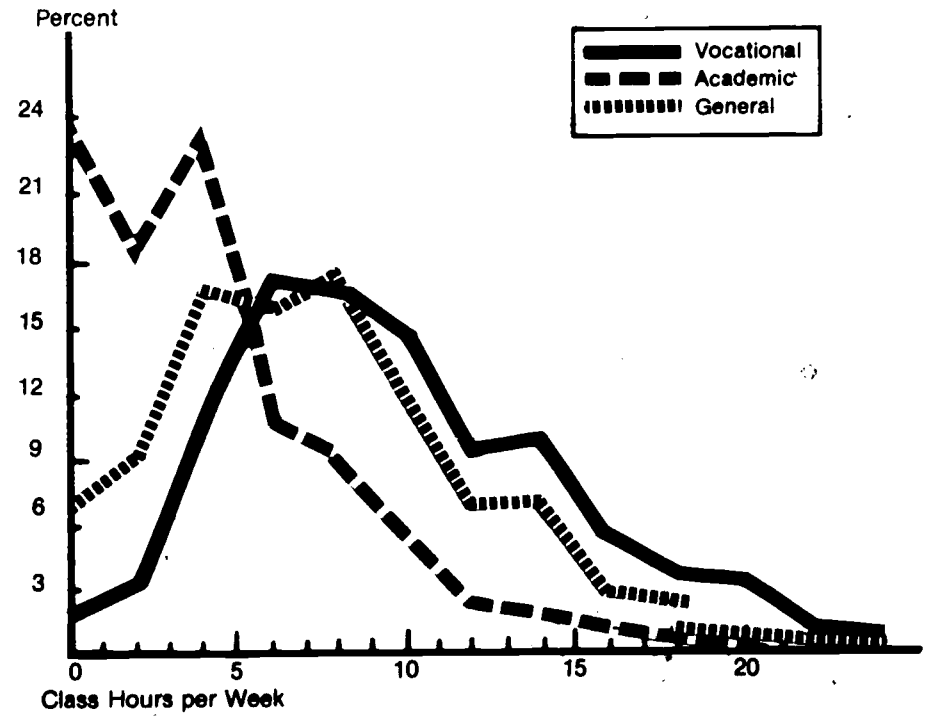




Note: Percentages were calculated for 2-hour intervals (0, 0-2, 4-6, etc.).

Graph 2: Distribution of Total Vocational Class Hours per Week: Men





Note. Percentages were calculated for 2-hour intervals (0, 0-2, 4-6, etc.).

percent of all men take no vocational education. Even among individuals classified as academic students, only 18 percent of the women and 24 percent of the men take no vocational education.

Table 5 shows that, as could be expected, students who are designated by both program measures as academic take the least amount of vocational coursework, on average. The variance of this mean is substantial; however, even in tandem, the two measures of high school program do not distinguish well among students with more and less vocational class hours. Similar comments apply to the other subgroups.

The evidence presented in this section strongly supports the conclusion that definitions of vocational education based on the level of coursework taken in vocational fields provide the most objective and accurate measures of participation in vocational education. Categorical measures of vocational education appear to be prone to inconsistent measurement. In addition, continuous measures of vocational education contain a great deal of information that is lost in categorical measures. Almost all students take courses in vocational education, and individuals take widely varying amounts of courses in both academic and vocational subjects. There is no standard academic, general, or vocational program that is characterized by a set number of vocational and academic courses. In fact, many students in the academic program take more vocational coursework than do vocational students.

Analysis of Course Enrollment Data

This section presents a series of tables that characterizes the coursework taken by "typical" high school students,[9] based on data from NLS72. Separate results are presented for men and women and for blacks, Hispanics, and whites. Courses are measured as a percentage of total coursework, unless otherwise indicated.

Average coursework in four major subject areas is presented in table 6.[10] The general patterns are similar for all ethnic

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[9]Most students, of course, diverge from the average course patterns presented in this section. See, for example, graphs 1 and 2. To convey a sense of the variation in course enrollment, standard deviations are presented with each average.

[10]Appendix table A.2 contains similar tabulations for individual academic courses.

Table 6

Average Coursework in Major Subject Areas, by Race and Sex

Women

Subject Area	White	Black	Hispanic	All
Natural Science	21.11 (10.69)[a]	21.97 (9.46)	18.42 (9.58)	21.14 (10.47)
Humanities	42.81 (11.67)	43.55 (11.59)	40.76 (11.31)	42.84 (11.65)
Foreign Language	7.09 (7.41)	4.61 (6.25)	6.97 (6.71)	6.68 (7.26)
Vocational	28.98 (19.62)	29.87 (17.47)	33.85 (17.38)	29.34 (19.22)
Occupational	23.85 (18.37)	23.23 (16.99)	28.04 (17.00)	23.93 (18.12)
Home Economics	5.13 (6.55)	6.64 (7.53)	5.81 (6.34)	5.41 (6.73)
Total Class Hours Per Week	22.90 (6.05)	22.05 (6.36)	22.65 (6.13)	22.75 (6.11)
Number of Observations	8,406	1,712	467	10,585

Men

Subject Area	White	Black	Hispanic	All
Natural Science	26.57 (11.34)	24.59 (9.73)	22.17 (9.66)	26.11 (11.12)
Humanities	42.93 (11.00)	45.69 (12.09)	41.64 (10.64)	43.24 (11.18)
Foreign Language	5.99 (7.03)	3.63 (5.83)	6.72 (7.11)	5.71 (6.93)
Vocational	24.51 (18.28)	26.09 (16.57)	29.47 (17.08)	24.94 (18.05)
Total Class Hours Per Week	22.04 (5.76)	21.58 (5.85)	22.77 (5.84)	22.01 (5.78)
Number of Observations	8,595	1,393	464	10,452

a. Standard deviations are in parentheses.

groups. The average individual is in class for about 22 to 23 hours per week, or about five classes per day. Additional time may be spent in courses not included in our data set (such as physical education) and in homework and extracurricular activities. Women take somewhat more coursework than do men, 22.8 hours versus 22.0 hours. Small differences exist among ethnic groups. Evidence in Meyer and Wise (1979) also suggests that individuals spend a significant amount of time working, 14.3 hours per week for men and 9.8 hours per week for women, on average. Significant numbers of men and women work as many as 30 hours per week and more.

Subjects are grouped into four major areas: natural science, which includes math and science; humanities, which includes English, social studies, and fine arts; foreign languages; and all vocational fields. For women, vocational coursework is also split into home economics courses, which are not primarily occupational, and all other vocational courses. The average student takes over 40 percent of her coursework in humanities. Women tend to take somewhat less natural science than men, 21 versus 26 percent, and somewhat more vocational education 29 versus 25 percent. If home economics is excluded from the vocational total for women, however, men and women enroll in approximately the same percentage of occupational courses.

For both men and women, blacks take a greater portion of vocational coursework than do whites, and Hispanics take more than blacks. Hispanic men and women take about 29 percent of their coursework in occupational courses. These ethnic differences, however, are primarily the result of average differences in socioeconomic status between blacks, Hispanics, and whites. Among women with comparable ability and family background, blacks and Hispanics take fewer vocational education courses than do whites--8 percentage points less for black women and 4 percentage points less for Hispanic women. Similar, although smaller, differences are found for men. These results are taken from a set of least squares regression estimates presented in tables 7 and 8.

Tables 7 and 8 contain estimates of equations that relate course levels in major subject areas to personal characteristics and geographic factors.[11,12] Observe that individuals living

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[11]Means and standard deviations of the variables used in these regressions are presented in appendix table A.3.

[12]See chapter 2 for an empirical model of the demand for high school vocational education that incorporates the effect of institutional factors (i.e., school and State characteristics) on individual enrollment in vocational education.

Table 7

Determinants of Coursework in Major Subject Areas: Women

Variable	Natural Science	Humanities	Foreign Language	Vocational	Occupational	Home Economics
Mean	21.28 (10.52)[a]	42.72 (11.56)	6.79 (7.27)	29.20 (19.22)	23.87 (18.11)	5.33 (6.67)
Black	4.72 (0.32)	2.05 (0.38)	1.36 (0.21)	-8.14 (0.58)	-7.66 (0.57)	-0.48 (0.21)
Hispanic	2.05 (0.53)	-1.02 (0.63)	3.25 (0.35)	-4.29 (0.97)	-3.14 (0.95)	-1.14 (0.35)
Test	8.57 (0.29)	-0.81 (0.34)	6.25 (0.19)	-14.01 (0.53)	-10.08 (0.52)	-3.93 (0.19)
Parents' Income ($ thousands)	0.08 (0.02)	0.08 (0.03)	0.10 (0.02)	-0.26 (0.04)	-0.22 (0.04)	-0.04 (0.02)
Education of Mother Less than High School	-1.08 (0.25)	-0.79 (0.30)	-0.80 (0.16)	2.66 (0.45)	2.53 (0.44)	0.14 (0.16)
Education of Mother College Degree or More	1.33 (0.38)	1.58 (0.45)	1.35 (0.25)	-4.26 (0.68)	-3.79 (0.67)	-0.47 (0.25)
Education of Father Less than High School	-1.04 (0.25)	-1.06 (0.29)	-0.94 (0.16)	3.03 (0.45)	2.29 (0.44)	0.74 (0.16)
Education of Father College Degree or More	1.93 (0.32)	1.94 (0.38)	1.87 (0.21)	-5.73 (0.59)	-5.38 (0.58)	-0.36 (0.21)
Rural	-0.56 (0.32)	-0.99 (0.38)	-2.42 (0.21)	3.98 (0.59)	2.07 (0.58)	1.90 (0.21)
Urban	0.33 (0.30)	-0.67 (0.35)	-0.13 (0.19)	0.47 (0.54)	0.88 (0.52)	-0.41 (0.19)
Town	-0.11 (0.30)	-0.29 (0.36)	-1.28 (0.20)	1.68 (0.54)	0.86 (0.53)	0.82 (0.20)
South	4.46 (0.41)	-2.42 (0.48)	0.30 (0.27)	-2.34 (0.74)	-1.34 (0.72)	-0.99 (0.27)
East	4.60 (0.35)	-3.90 (0.42)	3.11 (0.23)	-3.81 (0.64)	-1.06 (0.62)	-2.75 (2.31)
West	0.51 (0.41)	0.40 (0.48)	0.08 (0.27)	-0.99 (0.74)	-0.58 (0.73)	-0.42 (0.27)
R^2	0.1821	0.0479	0.2690	0.1926	0.1297	0.1233
Sample Size	8,957	8,957	8,957	8,957	8,957	8,957

a. Standard deviations are in parentheses.

Note: Courses are measured as a percentage of total courses.

Table 8

Determinants of Coursework in Major Subject Areas: Men

Variable	Natural Science	Humanities	Foreign Language	Vocational
Mean	26.32 (11.12)	43.16 (10.97)	5.85 (6.98)	24.66 (17.95)
Black	2.04 (0.35)	2.08 (0.39)	0.36 (0.22)	-4.47 (0.57)
Hispanic	.37 (0.54)	-1.65 (0.60)	3.30 (0.33)	-2.02 (0.87)
Test	10.39 (0.29)	-1.58 (0.33)	5.76 (0.18)	-14.58 (0.47)
Parents' Income ($ thousands)	0.10 (0.02)	0.05 (0.03)	0.06 (0.02)	-0.21 (0.04)
Education of Mother Less than High School	-0.70 (0.27)	0.12 (0.30)	-0.88 (0.17)	1.46 (0.44)
Education of Mother College Degree or More	0.66 (0.37)	0.61 (0.42)	1.22 (0.23)	-2.48 (0.61)
Education of Father Less than High School	-0.87 (0.26)	-0.50 (0.29)	-0.50 (0.16)	1.87 (0.43)
Education of Father College Degree or More	1.70 (0.33)	0.56 (0.37)	1.14 (0.20)	-3.39 (0.53)
Rural	-1.97 (0.33)	-1.55 (0.36)	-2.66 (0.20)	6.18 (0.53)
Urban	-0.30 (0.31)	-0.07 (0.34)	0.19 (0.19)	0.18 (0.50)
Town	-0.66 (0.31)	-0.64 (0.34)	-1.22 (0.19)	2.52 (0.50)
South	4.50 (0.41)	-1.87 (0.46)	1.57 (0.25)	-4.21 (0.67)
East	5.96 (0.37)	-2.73 (0.41)	3.98 (0.23)	-7.20 (0.60)
West	0.09 (0.42)	-0.95 (0.48)	0.69 (0.26)	0.16 (0.69)
R^2	0.2387	0.0204	0.2608	0.2248
Sample Size	8,718	8,718	8,718	8,718

a. Standard deviations are in parentheses.

Note: Courses are measured as a percentage of total courses.

in the South and in the East take significantly higher levels of natural science and less vocational education than individuals in the West and Midwest. Individuals living in rural areas take more vocational education than other students. Ability and parental education have very strong effects on enrollment in natural science, foreign language, and vocational courses. A 2-standard deviation increase in the measured ability of men and women is associated with a decline in vocational coursework of more than 6 percentage points. Given ability and parental education, parents' income has a statistically significant but modest effect on course enrollment.

Next, we turn our attention to the typical enrollment profiles of students with different levels of vocational course enrollment. Three levels are distinguished in tables 9 and 10 based on vocational education as in a portion of total coursework: low participation, 0 to 15 percent; medium participation, 15 to 35 percent; and high participation, 35 percent and over. Men and women with the highest level of vocational coursework tend to take significantly more hours of class than other students. This fact may stem from graduation requirements that stipulate minimum levels of coursework in humanities and natural science. Beyond some threshold, individuals may have to increase total course enrollment in order to take additional vocational courses. On average, however, if academic courses are associated with more homework than vocational courses, class hours plus study hours may be unrelated to the level of participation in vocational education.

Tables 9 and 10 illustrate the typical tradeoffs that occur when individuals increase participation in vocational education. Enrollment in natural science, foreign languages and humanities declines, although the declines are proportionately less for humanities. If, for example, we compare average coursework for women in the low and high categories, natural science declines from 30 to 13 percent, humanities decline from 51 to 35 percent, and foreign language declines from 13 to 2 percent. The implicit substitution of vocational courses for natural science courses can conveniently be summarized by estimating the statistical relationship between natural science and vocational education. Similar relationships can be estimated for humanities and foreign language. Results for these equations are presented in table 11. The coefficients for women indicate that an increase in vocational coursework is split among natural science, humanities, and foreign language courses in decreases of 38, 44, and 18 percent, respectively. An increase in occupational coursework is also associated with a small decrease in home economics for women. These relationships are similar for the different ethnic groups.

Table 9

Average Coursework in Major Subject Areas by Level of Participation in Vocational Education and Race: Women

Vocational Level	Subject	White	Black	Hispanic	All
	Natural Science	30.06 (8.97)[a]	30.68 (8.43)	29.56 (9.72)	30.12 (8.93)
	Humanities	50.41 (11.07)	53.63 (11.15)	51.95 (11.16)	50.85 (11.13)
Low 0-15 Percent	Foreign Language	13.18 (7.32)	9.83 (7.42)	11.14 (7.67)	12.72 (7.42)
	Vocational	6.34 (5.13)	5.86 (5.48)	7.36 (5.35)	6.31 (5.18)
	Total Class Hours Per Week	20.27 (5.00)	19.39 (5.62)	18.21 (4.53)	20.10 (5.08)
	Number of Observations	2,490	359	75	2,924
	Natural Science	22.83 (8.02)	24.08 (7.40)	21.26 (7.56)	23.00 (7.90)
	Humanities	45.08 (9.70)	46.14 (9.43)	44.54 (9.40)	45.26 (9.64)
Medium 15-35 Percent	Foreign Language	7.16 (6.43)	4.73 (5.89)	8.81 (6.73)	6.77 (6.43)
	Vocational	24.93 (5.79)	25.04 (5.74)	25.39 (5.49)	24.97 (5.77)
	Total Class Hours Per Week	22.43 (5.49)	20.95 (5.21)	22.04 (5.72)	22.13 (5.48)
	Number of Observations	2,740	682	162	3,584
	Natural Science	12.63 (6.82)	15.16 (6.58)	12.80 (6.14)	13.05 (6.81)
	Humanities	34.89 (8.41)	35.52 (7.78)	34.44 (8.17)	34.97 (8.30)
High 35+ Percent	Foreign Language	2.26 (3.91)	1.69 (3.44)	4.32 (5.07)	2.28 (3.95)
	Vocational	50.22 (10.13)	47.63 (9.02)	48.44 (9.46)	49.69 (9.97)
	Total Class Hours Per Week	25.35 (6.29)	24.61 (6.88)	24.79 (5.98)	25.20 (6.38)
	Number of Observations	3,176	671	230	4,077

a. Standard deviations are in parentheses.

Note: Courses are measured as a percentage of total courses.

Table 10

Average Coursework in Major Subject Areas by Level of Participation in Vocational Education and Race: Men

Vocational Level	Subject	White	Black	Hispanic	All
Low 0-15 Percent	Natural Science	35.12 (8.78)	32.16 (8.97)	31.63 (9.00)	34.71 (8.87)
	Humanities	48.29 (10.55)	53.94 (11.85)	49.87 (10.20)	48.93 (10.82)
	Foreign Language	10.97 (7.30)	7.92 (7.33)	11.83 (8.10)	10.67 (7.39)
	Vocational	5.62 (5.35)	5.99 (5.30)	6.66 (5.19)	5.68 (5.34)
	Total Class Hours Per Week	20.29 (4.60)	19.42 (4.90)	20.11 (4.89)	20.09 (4.65)
	Number of Observations	3,096	379	105	3,580
Medium 15-35 Percent	Natural Science	26.77 (8.21)	25.16 (7.73)	23.07 (7.13)	26.34 (8.14)
	Humanities	43.86 (9.59)	47.63 (9.30)	44.23 (9.02)	44.47 (9.61)
	Foreign Language	4.70 (5.74)	2.52 (4.64)	7.39 (6.60)	4.49 (5.72)
	Vocational	24.66 (5.78)	24.70 (5.38)	25.31 (5.61)	24.70 (5.71)
	Total Class Hours Per Week	21.71 (5.35)	20.78 (5.11)	22.21 (5.28)	21.59 (5.32)
	Number of Observations	3,005	589	179	3,773
High 35+ Percent	Natural Science	15.70 (7.56)	17.06 (6.92)	15.75 (7.00)	15.89 (7.46)
	Humanities	35.16 (8.43)	35.64 (8.20)	34.27 (7.08)	35.17 (8.32)
	Foreign Language	1.35 (3.19)	1.36 (3.23)	3.07 (4.49)	1.45 (3.30)
	Vocational	47.79 (9.54)	45.94 (8.81)	46.91 (8.88)	47.49 (9.43)
	Total Class Hours Per Week	24.60 (6.55)	24.60 (6.37)	24.89 (6.12)	24.61 (6.50)
	Number of Observations	2,494	425	180	3,099

a. Standard deviations are in parentheses.

Note: Courses are measured as a percentage of total courses.

Table 11

The Effect of Changes in Vocational Coursework on Coursework in Other Subjects

	Women			
Courses	Natural Science	Humanities	Foreign Language	Home Economics
Vocational	-37.93 (0.42)[a]	-44.26 (0.51)	-17.82 (0.33)	--
Occupational	-36.00 (0.46)	-43.12 (0.54)	-16.28 (0.35)	-4.60 (0.39)

	Men		
	Natural Science	Humanities	Foreign Language
Vocational	-40.21 (0.50)	-42.94 (0.58)	-16.84 (0.36)

a. Standard deviations are in parentheses.

Notes: These equations also include variables listed in tables 7 and 8. Regressions that do not control for these variables give approximately the same results.

Tables 12 through 15 present a more detailed look at specific vocational subjects: commercial, trade and industry, industrial arts, agriculture, distributive, health, and home economics.[13] A comparison of tables 12 and 13 shows that enrollment patterns differ radically by sex. Women from all ethnic groups are concentrated in basically two fields: commercial and home economics. Over 80 percent of all women receive some commercial training. Over 50 percent of all women take some home economics. The average commercial student takes over 25 percent of her classwork in commercial courses. Men are concentrated in four fields: commercial, trade, industrial arts, and, to a lesser degree, agriculture. The percentage of men enrolled in these subjects is 58, 44, 49, and 13 percent, respectively. For both men and women, representation in distributive and health education ranges from 6 to 8 percent. Almost no women take courses in agriculture.

Tables 14 and 15 show similar patterns for different ethnic groups. Differences among blacks, Hispanics, and whites of the same sex are not large, although black men, and to an even greater degree, Hispanic men, are more likely to take courses in trade and industrial arts than are whites. Hispanic men and women are more likely to take health courses than either blacks or whites.

For those individuals who take vocational courses in a given field, the average level of enrollment is consistently high, 10 to 15 percent of total coursework in most cases. This corresponds to about three to five semesters of instruction in a 3-year period. However, the standard deviations reported in the tables indicate that levels of enrollment vary substantially even with specific subject areas.

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[13]Tables 12 through 15 report for each subject (1) the percentage of individuals enrolled in at least one course and (2) the average percentage of total courses taken by individuals that are enrolled in at least one course. In previous tables we have reported the average coursework of all individuals, which is the product of the first two terms. This latter number is also reported in the third column of tables 12 and 13.

Table 12

Average Vocational Coursework for
Different Levels of Course Grouping: Women

Course Grouping	Percentage Enrolled in Subject	Average Coursework of Enrollees	Average Coursework of All Persons
Commercial	83.28 (37.32)[a]	25.47 (16.36)	21.21 (17.70)
Home Economics	54.22 (49.82)	9.97 (6.17)	5.41 (6.73)
Trade	5.88 (23.52)	11.96 (10.03)	0.70 (3.72)
Industrial Arts	7.59 (26.48)	8.50 (5.12)	0.64 (2.66)
Agriculture	0.92 (9.53)	8.24 (5.38)	0.08 (0.94)
Distributive	6.29 (24.28)	10.19 (7.31)	0.64 (3.08)
Health	8.03 (2.72)	8.19 (7.46)	0.66 (3.07)
Commercial	83.28 (37.32)	25.47 (16.36)	21.21 (17.70)
Home Economics	54.22 (49.82)	9.97 (6.17)	5.41 (6.73)
Technical	24.18 (42.82)	11.26 (8.91)	2.72 (6.51)
Occupational	87.02 (33.61)	27.50 (16.70)	23.93 (18.11)
Home Economics	54.22 (49.82)	9.97 (6.17)	5.41 (6.73)
Total Vocational	91.44 (27.98)	32.08 (17.78)	29.34 (19.22)
Sample Size	10,585		

a. Standard deviations are listed in parentheses.

Note: Coursework is defined as percentage of total courses.

Table 13

Average Vocational Coursework for Different Levels of Course Grouping: Men

Course Grouping	Percentage Enrolled in Subject	Average Coursework of Enrollees	Average Coursework of All Persons
Commercial	57.55 (49.43)[a]	14.61 (9.79)	8.41 (10.36)
Trade	43.98 (49.64)	14.80 (10.04)	6.51 (9.91)
Industrial Arts	49.08 (49.99)	14.01 (7.89)	6.88 (8.92)
Agriculture	12.63 (33.22)	14.25 (8.57)	1.80 (5.63)
Distributive	5.74 (23.26)	10.80 (7.24)	0.62 (3.05)
Health	5.60 (22.99)	6.25 (4.51)	0.35 (1.79)
Commercial	57.55 (49.43)	14.61 (9.79)	8.41 (10.36)
Trade and Industrial Arts	61.01 (48.78)	21.94 (14.53)	13.38 (15.60)
Other Occupational Courses	21.70 (41.22)	12.76 (8.78)	2.77 (6.66)
Total Vocational	86.58 (34.09)	28.81 (16.27)	24.94 (18.05)
Sample Size	10,452		

a. Standard deviations are listed in parentheses.

[illegible] Coursework is defined as percentage of total courses.

Table 14

Average Vocational Coursework for Different Levels of Course Grouping by Race: Women

Course Grouping	Percentage Enrolled in Subject			Average Percentage of Total Coursework of Enrollees		
	Black	Hispanic	White	Black	Hispanic	White
Commercial	79.26 (40.55)[a]	86.94 (33.73)	83.89 (36.76)	24.31 (14.90)	27.52 (15.12)	25.57 (16.68)
Home Economics	58.88 (49.22)	60.81 (48.87)	52.90 (49.92)	11.28 (6.63)	9.55 (5.50)	9.70 (6.06)
Trade	8.82 (28.37)	8.56 (28.02)	5.13 (22.06)	12.84 (9.97)	12.30 (12.32)	11.63 (9.83)
Industrial Arts	9.46 (29.28)	11.13 (31.49)	7.01 (23.53)	9.53 (5.30)	8.45 (5.16)	8.23 (5.04)
Agriculture	1.17 (10.75)	0.43 (6.54)	0.89 (9.40)	6.73 (3.11)	7.97 (5.37)	8.65 (5.82)
Distributive	6.89 (25.34)	10.71 (30.95)	5.92 (23.61)	10.84 (8.33)	8.66 (7.15)	10.19 (7.06)
Health	9.93 (29.92)	12.21 (32.77)	7.41 (26.20)	11.10 (7.57)	9.50 (11.83)	7.27 (6.67)
Commercial	79.26 (40.55)	86.94 (33.74)	83.89 (36.76)	24.31 (14.90)	27.52 (15.12)	25.57 (16.68)
Home Economics	58.88 (49.22)	60.81 (48.87)	52.90 (49.92)	11.28 (6.63)	9.55 (5.50)	9.70 (6.06)
Technical	30.08 (45.88)	35.12 (47.78)	22.38 (41.68)	13.17 (9.54)	11.72 (10.67)	10.69 (8.48)
Occupational	85.69 (35.03)	92.29 (26.70)	87.00 (33.64)	27.11 (15.22)	30.38 (15.55)	27.41 (17.03)
Home Economics	58.88 (49.22)	60.81 (48.87)	52.90 (49.92)	11.28 (6.63)	9.55 (5.50)	9.70 (6.06)
Total Vocational Courses	91.53 (27.85)	95.50 (20.75)	91.20 (28.34)	32.64 (15.60)	35.44 (16.11)	31.78 (18.26)
Sample Size	1,712	467	8,406	1,712	467	8,406

a. Standard deviations are listed in parentheses.

Table 15

Average Vocational Coursework for Different Levels of Course Grouping by Race: Men

Course Grouping	Percentage Enrolled in Subject			Average Percentage of Total Coursework of Enrollees		
	Black	Hispanic	White	Black	Hispanic	White
Commercial	49.82 (50.02)[a]	58.62 (49.30)	58.74 (49.23)	15.14 (9.63)	15.70 (10.52)	14.48 (9.77)
Trade	50.18 (50.02)	54.53 (49.85)	42.41 (49.42)	15.10 (10.48)	16.00 (12.84)	14.66 (9.72)
Industrial Arts	48.82 (50.00)	61.21 (48.78)	48.47 (49.98)	13.88 (7.35)	13.53 (8.18)	14.06 (7.96)
Agriculture	16.44 (37.08)	12.72 (33.35)	12.01 (32.51)	13.25 (7.35)	12.94 (10.82)	14.55 (8.66)
Distributive	6.89 (25.34)	7.54 (26.44)	5.46 (22.72)	11.65 (8.16)	9.06 (8.15)	10.76 (6.95)
Health	5.24 (22.29)	9.91 (29.92)	5.42 (22.65)	9.17 (5.70)	6.13 (5.01)	5.81 (4.07)
Commercial	49.82 (50.02)	58.62 (49.30)	58.74 (49.23)	15.14 (9.63)	15.70 (10.52)	14.48 (9.77)
Trade and Industrial Arts	67.34 (46.92)	73.06 (44.41)	59.34 (49.12)	21.32 (13.95)	23.27 (15.66)	21.96 (14.55)
Other Occupational Courses	26.20 (43.99)	26.29 (44.07)	20.72 (40.53)	13.21 (8.10)	11.17 (9.34)	12.78 (8.86)
Total Vocational	89.95 (30.08)	92.89 (25.73)	85.69 (35.02)	29.00 (14.86)	31.73 (15.56)	28.61 (16.52)
Sample Size	1,393	464	8,595	1,393	464	8,595

[a] Standard deviations are listed in parentheses.

Summary

Based on a comparison of different measures of vocational education available in the NLS72, we found strong support for the conclusion that measures of vocational education based on actual course enrollment data are more accurate and informative than are categorical program measures. Although most previous evaluations of vocational education have been based on categorical measures, several longitudinal data sets contain both types of variables. In other chapters of this report we have used the measures of vocational education developed in this paper to study three topics:

(1) The determinants of the demand for vocational education,

(2) the effect of vocational education on postsecondary school and training choices, and

(3) the labor market effects of vocational education.

In the second half of this chapter we presented a detailed analysis of course enrollments in different subject areas by race and sex. Almost all individuals take some coursework in vocational subjects. Women, however, are concentrated in basically two vocational fields: commercial and home economics. Men are concentrated in commercial courses, trade, and industrial arts. Finally, although blacks and Hispanics, on average, take more vocational education than whites, among individuals with the same ability and family background, blacks and Hispanics take substantially less vocational education.

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APPENDIX TABLE A.1

OUTLINE OF COURSE GROUPINGS

I. Vocational Courses
   - A. Home Economics
   - B. Occupational Courses
     1. Commercial
     2. Technical
        - a. Trade and Industrial Arts
        - b. Other Technical
          - i. Agriculture
          - ii. Distributive
          - iii. Health

II. Academic Courses
   - A. Foreign Language
   - B. Natural Science
     1. Mathematics
     2. Science
   - C. Humanities
     1. English
     2. Social Studies
     3. Fine Arts

APPENDIX TABLE A.2

AVERAGE COURSEWORK IN ACADEMIC SUBJECTS BY RACE AND SEX

Subject	Women			
	White	Black	Hispanic	All
Science	10.52 (6.08)[a]	10.76 (5.65)	8.84 (5.39)	10.48 (5.99)
Math	10.60 (6.30)	11.21 (5.97)	9.58 (5.80)	10.65 (6.23)
English	19.66 (5.21)	20.80 (5.56)	18.92 (5.49)	19.81 (5.30)
Social Science	16.77 (5.49)	17.58 (6.06)	16.76 (5.34)	16.90 (5.59)
Fine Arts	6.38 (8.38)	5.17 (7.19)	5.07 (7.01)	6.13 (8.15)
Language	7.09 (7.41)	4.61 (6.25)	6.97 (6.71)	6.68 (7.26)
Total Academic	71.02 (19.62)	70.13 (17.47)	66.15 (17.38)	70.66 (19.22)
Number of Observations	8,406	1,712	467	10,585

Subject	Men			
	White	Black	Hispanic	All
Science	12.94 (6.72)	11.77 (5.92)	10.53 (5.34)	12.68 (6.60)
Math	13.62 (6.63)	12.82 (6.09)	11.63 (6.03)	13.43 (6.56)
English	20.51 (5.31)	21.57 (5.63)	19.51 (5.34)	20.61 (5.37)
Social Science	18.02 (5.82)	18.65 (6.23)	17.10 (5.17)	18.06 (5.85)
Fine Arts	4.40 (7.48)	5.47 (7.82)	5.03 (6.78)	4.57 (7.51)
Language	5.99 (7.03)	3.63 (5.83)	6.72 (7.11)	5.71 (6.93)
Total Academic	75.49 (18.28)	73.91 (16.57)	70.53 (17.08)	75.06 (18.05)
Number of Observations	8,595	1,393	464	10,452

a. Standard deviations are listed in parentheses.

Note: Courses are measured as a percentage of total courses.

APPENDIX TABLE A.3

SIMPLE STATISTICS FOR REGRESSION EQUATIONS

	Women	Men
Black	0.1570	0.1251
Hispanic	0.0416	0.0445
Test	3.0282 (0.4463)[a]	2.9795 (0.4521)
Parents' Income ($ thousands)	10.3515 (5.4000)	11.2511 (5.3845)
Education of Mother Less Than High School	0.3318	0.2824
Education of Mother College Degree or More	0.0981	0.1105
Education of Father Less Than High School	0.3710	0.3394
Education of Father College Degree or More	0.1611	0.1746
Rural	0.2203	0.2374
Town	0.2666	0.2668
Urban	0.3041	0.2759
South	0.3596	0.3511
East	0.2247	0.2012
West	0.1639	0.1822
Sample Size	8,957	8,718

[a]. Standard deviations are in parentheses below means for variables that are not dummy variables.

Chapter 2

The Determinants of Participation In Vocational Education: The Role Of Schools and Personal Characteristics

The high school vocational education system is affected by policies at all levels of government--local, State, and Federal. Expenditures on public school vocational education amount to $6 billion, of which the Federal share is about 10 percent or less (National Institute of Education, 1980). In addition to providing most of the funding for vocational education, States and localities are responsible for designing and operating their vocational education systems. The marked absence of centralized organization is a characteristic shared by all elementary and secondary schools, a feature that has led to tremendous diversity in the types and quality of programs offered. One objective of this chapter is to document quantitatively the relative importance of States and schools in determining who enrolls in vocational education.[1]

Despite the relatively modest Federal financial contribution to vocational education, Federal legislation has sought to affect the direction of vocational education in major ways. Beginning with the Vocational Education Act of 1963 and the 1968 amendments, Federal policy has emphasized the special needs of disadvantaged and handicapped individuals. The Education Amendments of 1976 expanded this emphasis and introduced a new provision covering limited-English-speaking individuals. The 1976 amendments also added a commitment to reduce sex bias and sex-role stereotyping in vocational education (National Institute of Education, 1980). There is qualitative evidence that some, and perhaps many, States and schools have resisted Federal attempts to redirect the mission of vocational education toward the disadvantaged (Brenner, 1981). The second objective of this chapter, therefore, is to determine whether disadvantaged persons have adequate access to high school vocational education and whether schools and States have helped provide vocational education to these persons, particularly to blacks and Hispanics.

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[1] In related research we pursue a parallel objective: is the diversity in vocational offerings of different school systems an important source of variation in who gains economically from vocational education?

Individual and parental choices are undoubtedly the most important determinants of who participates in vocational education, and personal and family characteristics play a major role in our analysis. In the end, we will be able to assess the relative contribution of individuals, schools, and States in determining participation in vocational education.

Our analysis continues to be based on a large longitudinal data base of high school students, the National Longitudinal Survey of the High School Class of 1972 (NLS72). This data set is an unmatched source of information on personal and family characteristics, motivations and expectations, and labor market outcomes. An important feature of the data for our purposes is that high schools were the primary sampling unit used to obtain a national random sample. This distinguishes the NLS72 from most data sets, in particular the National Longitudinal Surveys of Young Men and Women which sampled individuals and families directly from the population. In the NLS72, approximately 18 students were selected randomly from each school. A variety of information about each high school was collected, including its location. In particular, we know whether each school was a specialized vocational high school.[2] The special sampling structure of the NLS72, coupled with an extensive set of school and individual questions, permits simultaneous investigation of the roles of students, schools, and States in the vocational education process.

The first section of this chapter discusses the actors that determine the distribution and level of participation in vocational education. The next section presents an econometric model of vocational education participation, tailored to data available in the NLS72. The last half of this chapter presents empirical estimates of this model.

Determinants of Participation in Vocational Education

Students, schools, and States are the key actors in the vocational education system. Within most school systems, students can choose from a variety of courses and curriculums. Although the variety and quality of offerings vary from one school system to another, all high schools offer courses in academic subjects: mathematics, science, English, and history. Most States mandate that students take as much as 50 percent or more of their coursework in these fields to satisfy graduation

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[2]Dr. Andrew Kolstad of the National Center for Educational Statistics constructed and provided us with this variable.

requirements (National Commission for Educational Statistics, A Compendium of State Legal Standards for the Provision of Public Education). Most students attend schools that also offer courses in vocational education. In chapter 1, we discovered that most students take courses in vocational education, and some students take over 50 percent of their coursework in vocational subjects.

The level of participation in vocational education is presumably determined by an individual's abilities, tastes, family, and friends. Individuals who are "good" at conventional academic schooling are likely to continue in that type of education into college. Vocational educators argue that vocational education provides an alternative learning environment for students without traditional academic interests. Students with a comparative advantage in learning by doing are presumed to choose the vocational alternative.

Individuals with a comparative advantage or preference for occupations that do not require a college degree have an economic interest in specializing in related vocational fields, such as agriculture or auto mechanics. Thus, each student, in concert with parents and perhaps with school faculty, chooses a set of courses commensurate with his or her needs.

In the empirical model, we will allow for these effects by including variables on ability, family income, parental education, and racial, ethnic, and sex status. The last section investigates whether the following factors have an independent effect on participation in vocational education: (1) occupation of mother and father, (2) parents' desires for the student to attend college, (3) postsecondary plans of friends, (4) the early (before tenth grade) expectation of attending college, and (5) the individual's perception of college ability.

Schools

Different States and school systems offer a wide variety of vocational and academic courses. Vocational programs differ in terms of the type and form of courses offered. Vocational courses are conventionally classified under eight major fields or areas--agriculture, distributive, health, business and office, technical, trade and industry, occupational home economics, and vocational consumer and homemaking education (National Institute of Education, 1980). In this chapter we will abstract from differences in major vocational fields and concentrate on modeling the extent of participation in vocational education as a whole.[3]

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[3]Because we are interested in vocational courses that are occupationally related, we have excluded home economics from the total measure of vocational education.

Vocational education can be delivered to students in several ways: (1) vocational education centers that serve several schools, (2) special area vocational high schools, (3) special arrangements with community colleges and vocational technical schools, (4) large comprehensive high schools with special vocational education facilities, and (5) comprehensive high schools that offer both academic and vocational courses. Some schools have special vocational programs with set course requirements and, occasionally, admission requirements. Some schools set aside half the school day for intensive instruction in occupational subjects. Other schools do not consider students taking vocational courses to be in a separate academic program. Of course, schools also differ in the quality and economic relevance of their vocational offerings. These factors suggest that diversity among schools may be a major determinant of the level of participation in vocational education.

States

States are similar to schools in the diversity of their approaches and financial commitments to vocational education (National Institute of Education, 1980). Although the Education Amendments of 1976 explicitly encouraged States to become active in vocational and labor market planning, some States still leave such decisions to individual schools. States also differ in their formulas for disbursing State and Federal funds for vocational education. These and other factors have combined to either prompt or slow the growth of vocational education in different parts of the country.

Econometric Model of Vocational Education

In chapter 1 we concluded that the amount of vocational education a student takes in high school provides a better measure of vocational education than the standard categorical variable based on assignment to an academic, general, or vocational program.[4] Let V_{ijk} indicate the amount of coursework in vocational subjects, as a percentage of all courses.

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[4]We also note that the statistical analysis developed in this paper is not easily adaptable, if at all, to a model based on categorical outcomes. See, for example, Chamberlain (1980).

Because V_{ijk} is measured as a percentage, it is relatively free of errors that could arise because of differences in scheduling across school systems.[5] The indices i, j, and k index States, schools, and individuals, respectively. The econometric model that we will develop is based on analysis of covariance, with fixed effects for each school j and each State i (see, for example, Mundlak, 1961; Scheffe, 1959; and Maddala, 1977). In many models of this type, the fixed effects are "nuisance" parameters that are introduced only as controls. If school and State effects are correlated with the characteristics of individuals (e.g., race), then failure to include the State and school effects in the model will lead to bias in the estimated effect of personal and family characteristics on vocational education participation. This result is the reason our more general model is preferred.

In our analysis, however, the contribution of schools and States to the vocational education system is of interest in itself. Therefore, we will explicitly model the factors that determine school and State effects on vocational education.

We assume that vocational education is related to a set of individual characteristics represented by the vector X_{ijk}, a parameter vector β, a school effect α_{ij}, a State effect S_i, and a random individual residual, e_{ijk}. Formally, this is expressed as

$$(1) \quad V_{ijk} = X_{ijk}\beta + \alpha_{ij} + S_i + e_{ijk}.$$

If α_{ij} and S_i are correlated with X_{ijk}, then failure to include them in the equation will yield biased estimates of β. Equation 1 can be rewritten to illustrate three "levels" of analysis: (1) the individual or <u>within</u> school level, (2) the <u>between</u> school level, and (3) the <u>between</u> State level. Let $\bar{X}_i$ indicate the average of individual characteristics in State i, and let $\bar{X}_{ij}$ indicate the average of individual characteristics in school j in State i. Then,

Within School	Between School	Between State

$$(2) \quad V_{ijk} = (X_{ijk} - \bar{X}_{ij})\beta + e_{ijk} + (X_{ij} - \bar{X}_i)\beta + \alpha_{ij} + \bar{X}_i\beta + S_i$$

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[5] We experimented with a measure that explicitly allows for school differences in class length and scheduling. Converting this variable to a percentage basis seemed to work best.

States differ because their student populations differ on average, as measured by $\bar{X}_i$, and because of factors embodied in S_i, for example, State educational resources, vocational policies, and labor market characteristics. Schools differ because, given State effects, their student populations differ, as measured by $X_{ik} - \bar{X}_i$. Factors such as school size, local education policy, and location are embodied in α_{ij}. Finally, controlling for differences in schools and States, individuals within schools vary in their personal and family characteristics; there is also a random factor e_{ijk}.

Our empirical analysis will focus on obtaining consistent estimates of β, the coefficient vector of personal, family, and ethnic characteristics. We will also estimate the relative contribution of States, schools, and individual characteristics to the observed variation in the level of vocational education participation.

As a second stage, we will estimate explicit models of State effects (S_i) and school effects (α_{ij}). S_i will depend on average individual characteristics by State $\bar{X}_i$ and a vector of State variables Z_i. Similarly, α_{ij} will be related to average individual characteristics by school ($\bar{X}_{ij} - \bar{X}_i$) and Y_{ij}, a vector of school variables. Formally,

$$(3) \quad S_i = \bar{X}_i \delta_1 + Z_i \delta_2 + u_i, \text{ and}$$

$$(4) \quad \alpha_{ij} = \bar{X}_{ij} \theta_1 + Y_{ij} \theta_2 + w_{ij}.$$

Both u_i and w_{ij} are randomly distributed residuals. In this context, we will be able to test the hypothesis that area vocational schools are more successful at delivering a large volume of vocational education to their students. We can also infer whether States or schools have given major emphasis to providing vocational education to disadvantaged students. The next section presents estimates of these models.

Empirical Estimates of Analysis of Covariance Model

Empirical estimates of equation 1 were obtained in two steps. First, consistent estimates of β were obtained from the within estimator of β. Variation in vocational coursework attributable to differences between schools and States was purged from the model by subtracting the means, by school and State, from each variable. At a second stage, consistent

Table 1

Estimates of Within School Model

Variable	Men (1) OLS	Men (2) Within	Women (3) OLS	Women (4) Within
Black	-5.93 (0.53)[a]	-3.96 (0.55)	-7.38 (0.51)	-5.21 (0.60)
Hispanic	-2.15 (0.83)	-1.39 (0.83)	-2.25 (0.85)	-1.06 (0.92)
Test	-14.24 (0.47)	-14.56 (0.41)	-9.30 (0.49)	-8.97 (0.47)
Parents' Income	-0.21 (0.04)	-0.11 (0.03)	-0.21 (0.04)	-0.19 (0.04)
Education of Mother Less than High School	1.41 (0.43)	1.42 (0.37)	2.37 (0.41)	1.82 (0.38)
Education of Mother College Degree or More	-2.63 (0.59)	-2.21 (0.50)	-4.13 (0.63)	-3.36 (0.57)
Education of Father Less than High School	2.48 (0.41)	1.88 (0.35)	2.53 (0.41)	1.83 (0.37)
Education of Father College Degree or More	-4.66 (0.51)	-3.44 (0.44)	-5.82 (0.53)	-4.35 (0.50)
Constant	70.45 (1.49)	--	54.48 (1.59)	--
Standard Error	16.40	12.95	16.95	14.38
R^2	.160	.161	.118	.088
Sample Size	10,075	10,075	10,306	10,306

a. Standard errors are in parentheses.

estimates of β will be used to estimate S_i and α_{ij}. The within estimator can be written formally as

$$(5) \quad (V_{ijk} - \bar{V}_{ij}) = (X_{ijk} - \bar{X}_{ij})\beta + e_{ijk}.$$

Estimates of this equation are presented in table 1. Also contained in table 1 are ordinary least squares estimates (OLS) of equation 1 with school and State effects excluded.

The results in table 1 indicate that there is substantial bias in the least squares estimates for men and women. For both groups, the least squares estimates of the black and Hispanic coefficients are biased in the negative direction, ranging from 40 percent to over 110 percent. For men, the least squares coefficient on parents' income is biased negatively by 91 percent. The coefficients on father's education are biased away from zero by over one-third for both men and women. These results provide strong support for the analytical approach developed in this chapter. They also imply that the school or State effects are related to the characteristics of individuals, such as race and parents' income and education.

The within school estimates indicate that, controlling for personal characteristics and State and school characteristics (i.e., the availability of vocational education), blacks and Hispanics take fewer vocational education courses than do whites. For blacks, the effect is strong (6 percentage points) and highly significant. Individuals with greater ability and more highly educated and affluent parents also take fewer vocational education courses. A two standard increase in an individual's test score is associated with a decrease in vocational coursework of about 13 percentage points for men and 8 percentage points for women.

The estimates from equation 5--within estimates--can be used to obtain an estimate of both the school and State effects. From equation 1 it is apparent that we can solve sequentially for S_i and α_{ij} as follows:

$$(6) \quad S_i = \bar{V}_i - \bar{X}_i\hat{\beta}, \text{ and}$$

$$(7) \quad \alpha_{ij} = (\bar{V}_{ij} - \bar{V}_i) - \bar{X}_{ij} - \bar{X}_i)\hat{\beta} = (\bar{V}_{ij} - \bar{X}_{ij})\hat{\beta} - \hat{S}_i.$$

Intuitively, given consistent estimates of β, the State effect S_i is the average residual for each State over all individuals. Similarly, the school effect α_{ij} is the average

residual for each school, with differences in States removed (subtracted). In table 2 we present estimates of models using S_i and $\hat{\alpha}_{ij}$ as dependent variables.

Weighted least squares estimates of State and school equations 4 and 5 are presented in table 2. Because the number of individuals varies enormously by State and by school, least squares estimates of equations 4 and 5 are not efficient. The technique of weighted least squares allows for differences in the precision with which S_i and α_{ij} are estimated. In addition to State and school averages of individual characteristics, the equations also contain variables that are purely State or school level characteristics, such as whether a school is an area vocational school, or locational variables. In the school and State context, ethnic indicators (and other zero-one variables) should be interpreted as the percentage of an ethnic group that lives in a given State or attends a given school.

For both men and women, States with area vocational schools and area vocational schools within a given State are strongly associated with higher levels of vocational education. Because individuals may be able to choose whether to attend an area vocational school, the effect in the school equation may be overstated. In addition, since there are only 25 area vocational schools in our sample of 1,262 high schools, our results may not be fully applicable to the current environment where area vocational schools are more prevalent. It is our understanding that the number of area vocational schools and centers has grown rapidly in the past 10 years. Nonetheless, the results strongly support the belief that area vocational schools deliver more vocational education services to high school students than do traditional high schools.

Schools in rural areas and States with a high percentage of rural high schools provide more vocational education for men, but not for women, than do urban or suburban school systems. An increase of 20 points in the percentage of rural high schools is associated with an increase of 3.5 percentage points in the average State level of participation in vocational courses. This figure can be compared with the variance of S_i for men of 19 percentage points.

Table 2 indicates substantial regional variation in the level of vocational education. States in the South and East have significantly lower participation in vocational education than do States in the West and Midwest. Calculations not shown in this paper indicate that this regional variation is one of the sources of lower State vocational effects for blacks.

Table 2

Estimates of School and State Models

Variable	Men		Women	
	(5) State S_i	(6) School ij	(7) State S_i	(8) School ij
Black	2.93 (9.18)[a]	-0.19 (1.42)	0.66 (6.17)	-6.66 (1.30)
Hispanic	1.07 (8.46)	-2.59 (2.46)	-1.11 (6.97)	-2.86 (2.35)
Test	-2.47 (12.76)	4.01 (1.61)	-9.38 (9.58)	-1.68 (1.51)
Parents' Income	0.84 (9.28)	-0.41 (0.15)	0.94 (11.49)	0.08 (0.16)
Education of Mother Less than High School	19.96 (14.19)	0.47 (1.75)	-17.53 (11.36)	2.99 (1.61)
Education of Mother College Degree or More	6.52 (21.55)	-1.30 (2.42)	-7.28 (17.83)	-2.76 (2.44)
Education of Father Less than High School	-13.04 (13.85)	-0.71 (1.75)	18.24 (10.91)	1.63 (1.64)
Education of Father College Degree or More	10.32 (16.78)	-2.90 (2.06)	1.26 (16.77)	-5.12 (1.94)
Rural	17.55 (7.37)	6.19 (1.23)	1.93 (6.66)	0.54 (1.21)
Town	-2.24 (6.12)	2.68 (1.17)	0.64 (5.88)	0.27 (1.13)
Urban	5.14 (8.37)	-1.54 (1.23)	-3.14 (6.38)	0.83 (1.16)
Area Vocational School	34.85 (19.18)	4.41 (2.03)	16.82 (19.41)	12.15 (2.02)
State Unemployment Rate	-0.17 (0.48)	--	-0.36 (0.35)	--
State Wage Rate	1.48 (1.78)	--	1.71 (1.3[illegible])	--
South	-5.49 (1.76)	--	-0.28 (1.50)	--
East	-7.82 (1.63)	--	0.38 (1.53)	--
West	0.26 (1.62)	--	0.86 (1.74)	--
Constant	56.91 (38.54)	-0.01 (0.25)	67.46 (29.17)	-0.02 (0.24)
Standard Error	2.30	8.60	1.91	8.37
R^2	.722	.136	0.272	0.080
Sample Size	50	1,262	50	1,262

a. Standard errors are in parentheses.

An interesting outcome of our analysis is the decomposition of the variance of V_{ijk} into three parts: (1) the within school variance, (2) the between school variance, and (3) the between State variance. These numbers provide a basis for assessing the relative contribution of schools and States to the vocational education process. Is a person likely to receive more or less vocational education if he or she resides in another State or attends a different school? We have already seen that some factors are strongly associated with whether a State or school has a high level of vocational education. Below we assess whether such factors are quantitatively important when compared with variation in individual educational choices within schools.

Table 3 contains estimates of the variance decomposition for men and women. Each level of the decomposition distinguishes between variation associated with individual characteristics (X) and other variation. For both men and women, variation of course selections within schools explains about two-thirds of the total variation. The between school variance, however, is the source of almost one-third of all variation in vocational coursework. A small part of this variation can be attributed to average differences in students across schools. Most of the variation, however, is due to differences in school policies, community characteristics, and other factors. States seem to play a small role in the process, although differences in States are more important for men than for women.

As a final check on the validity of the model, we computed the correlation of the State and school effects for men and women. Although vocational education policy need not be identical for men and women in the same State or even in the same school,[6] we might expect that schools and States that emphasize vocational education for women, also emphasize it for men. In fact, we find that the correlation over schools of $(\alpha_{ik} + S_i)$ for men and women is quite high, 0.47. Thus, we conclude that there is a strong tendency for schools and States active in vocational education to promote programs for both men and women.

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[6]Recall that vocational course patterns differ significantly by sex.

Table 3

Variance Decomposition

	Men		Women	
Total Variance, V_{ijk}	319.8	100.0%	325.1	100.0%
Within Variance, $V_{ijk} - \bar{V}_{ij}$	199.8	62.5%	226.4	69.6%
Explained Variance $(X_{ijk} - \bar{X}_{ij})\beta$	32.0		19.7	
Unexplained Variance, e_{ijk}	167.8		206.7	
Covariance	0.0		0.0	
Between School Variance, $\bar{V}_{ij} - \bar{V}_i$	100.7	31.5%	93.1	28.6%
$(\bar{X}_{ij} - \bar{X}_i)\beta$	14.3		7.5	
School Effect, α_{ij}	86.2		76.8	
Covariance	0.1		4.4	
Between State Variance, $\bar{V}_i$	19.3	6.0%	5.6	1.7%
$\bar{X}_i\beta$	1.9		0.8	
State Effect, S_i	19.1		5.0	
Covariance	-0.8		-0.1	
Sample Size	10,075		10,306	

Other Determinants of Participation in Vocational Education

In this section, we test specific hypotheses about the role of individual and family factors on participation in vocational education. The econometric model presented earlier has been simplified by substituting equations 3 and 4 into equation 1 to obtain[7] the following reduced form equation:

$$(8) \quad V_{ijk} = \bar{X}_{ijk}\beta + \bar{X}_i\delta_1 + Z_i\delta_2 + \bar{X}_{ij}\theta_1 + Y_{ij}\theta_2 + u_i + w_{ij} + e_{ijk}.$$

In this model, estimated coefficients reflect within and between school effects.

As expected, individual perceptions of college ability and plans to attend college have strong effects on the decision to enroll in vocational courses. Individuals with plans (before tenth grade) to attend college take about 13 percentage points less vocational coursework. Individuals with friends who plan to attend college take about 9 percentage points less vocational coursework. Similarly, parents who expect their children to attend college have a significant negative impact on the amount of vocational coursework their children take. Parents who expect their children to attend postsecondary vocational school positively affect the level of high school vocational coursework their children take.

Perhaps the most unexpected finding is that mothers' and fathers' occupations have almost no effect on vocational education decisions. This is surprising in view of the hypothesis that exposure to different occupations is an important determinant of occupational choice and, consequently, educational choice.

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[7]Recall that Z_i and Y_{ij} are vectors of State and school characteristics.

Table 4

Estimates of Vocational Class Hours Equation: Women

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	74.64 (1.80)[a]	97.36 (2.23)	56.46 (2.15)	70.69 (1.75)	61.55 (1.79)	73.08 (1.82)
Black	-7.31 (0.54)	-5.02 (0.52)	-6.14 (0.53)	-6.24 (0.52)	-5.51 (0.52)	-7.17 (0.54)
Test Score	-13.91 (0.53)	-9.46 (0.53)	-10.65 (0.56)	-11.09 (0.52)	-8.85 (0.54)	-13.54 (0.55)
Parents' Income	-0.25 (0.05)	-0.14 (0.04)	-0.22 (0.04)	-0.19 (0.04)	-0.15 (0.04)	-0.22 (0.05)
Education of Mother Less Than High School	2.79 (0.45)	1.80 (0.44)	2.52 (0.45)	2.18 (0.44)	2.04 (0.43)	2.50 (0.46)
Education of Mother College Degree or More	-4.29 (0.69)	-2.61 (0.66)	-3.89 (0.68)	-3.90 (0.66)	-2.66 (0.66)	-3.62 (0.74)
Education of Father Less Than High School	3.07 (0.45)	2.03 (0.44)	2.76 (0.45)	2.22 (0.44)	2.22 (0.43)	2.80 (0.45)
Education of Father College Degree or More	-5.71 (0.59)	-4.30 (0.57)	-5.30 (0.58)	-4.90 (0.57)	-3.90 (0.57)	-4.88 (0.64)
South	-2.20 (0.49)	-1.36 (0.47)	-1.80 (0.49)	-1.78 (0.47)	-1.69 (0.47)	-2.02 (0.49)
East	-3.79 (0.53)	-3.65 (0.51)	-3.72 (0.53)	-3.37 (0.52)	-3.59 (0.51)	-3.67 (0.54)
West	-0.90 (0.58)	-0.55 (0.56)	-0.69 (0.58)	-0.30 (0.57)	-1.17 (0.56)	-0.78 (0.59)
Rural	3.98 (0.58)	3.34 (0.56)	3.84 (0.58)	3.44 (0.57)	3.67 (0.56)	3.59 (0.60)
Urban	0.49 (0.54)	0.62 (0.51)	0.55 (0.53)	0.49 (0.52)	0.72 (0.51)	0.42 (0.54)
Town	1.75 (0.54)	1.62 (0.52)	1.75 (0.54)	1.84 (0.53)	1.81 (0.52)	1.65 (0.54)
Father's Schooling Desires		-0.83 (0.16)				
Mother's Schooling Desires		-1.93 (0.16)				
Father's Vocational Desires		1.99 (0.62)				
Mother's Vocational Desires		3.20 (0.59)				
College Ability			4.20 (0.28)			
Friends Will Attend College				-9.22 (0.38)		

Table 4 (cont.)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Decided to Attend College Before 10th Grade					-12.81 (0.48)	
Decide to Attend College During 10th or 11th Grade					-9.88 (0.82)	
Father's Occupation						
Craftsman						0.32 (0.78)
Farmer						0.58 (1.13)
Manager						-2.32 (0.88)
Operative						0.86 (0.85)
Professional						-2.93 (0.96)
Other White Collar						-1.61 (0.80)
Other Blue Collar						-0.63 (0.76)
Mother's Occupation						
Clerical						-0.06 (0.87)
Homemaker						1.61 (0.69)
Professional Manager						-1.70 (0.96)
Service						0.47 (1.12)
Other Occupation						0.99 (0.89)
Missing Data Indicators	x	x	x	x	x	x
R^2	0.1913	0.2533	0.2114	0.2404	0.2555	0.1951
Sample Size	8,957	8,957	8,957	8,957	8,957	8,957

a. Standard errors are in parentheses.

Table 5

Estimates of Vocational Class Hours Equation: Men

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	72.40 (1.61)[a]	84.88 (2.01)	59.94 (1.98)	67.97 (1.59)	62.22 (1.63)	71.82 (1.62)
Black	-3.81 (0.51)	-2.76 (0.50)	-3.14 (0.51)	-3.49 (0.50)	-3.24 (0.50)	-3.82 (0.52)
Test Score	-14.47 (0.47)	-10.77 (0.49)	-12.18 (0.52)	-11.82 (0.48)	10.33 (0.50)	-14.56 (0.50)
Parents' Income	-0.20 (0.04)	-0.14 (0.04)	-0.17 (0.04)	-0.16 (0.04)	-0.14 (0.04)	-0.18 (0.04)
Education of Mother Less Than High School	1.54 (0.44)	1.13 (0.43)	1.39 (0.44)	0.97 (0.44)	1.15 (0.43)	1.40 (0.45)
Education of Mother College Degree or More	-2.55 (0.61)	-2.18 (0.59)	-2.38 (0.60)	-2.27 (0.60)	-1.75 (0.59)	-2.65 (0.65)
Education of Father Less Than High School	1.92 (0.43)	1.40 (0.42)	1.81 (0.43)	1.44 (0.42)	1.54 (0.42)	1.76 (0.43)
Education of Father College Degree or More	-3.43 (0.53)	-2.39 (0.52)	-3.20 (0.53)	-2.83 (0.52)	-2.18 (0.52)	-3.13 (0.58)
South	-6.04 (0.45)	-5.04 (0.44)	-5.60 (0.45)	-5.72 (0.44)	-5.59 (0.44)	-5.76 (0.45)
East	-8.23 (0.51)	-7.66 (0.49)	-7.97 (0.50)	-7.72 (0.50)	-7.69 (0.49)	-7.98 (0.51)
West	-0.45 (0.52)	-2.06 (0.51)	-0.09 (0.52)	-0.21 (0.51)	-0.62 (0.51)	-0.29 (0.52)
Rural	5.99 (0.53)	4.94 (0.52)	5.94 (0.52)	5.34 (0.52)	5.53 (0.51)	5.83 (0.54)
Urban	0.14 (0.50)	0.14 (0.48)	0.11 (0.50)	0.17 (0.49)	0.08 (0.48)	0.05 (0.50)
Town	2.34 (0.50)	1.81 (0.48)	2.29 (0.49)	2.15 (0.49)	2.28 (0.48)	2.29 (0.50)
Father's Schooling Desires		-0.75 (0.15)				
Mother Schooling Desires		-1.03 (0.15)				
Father's Vocational Desires		4.53 (0.66)				
Mother's Vocational Desires		1.32 (0.68)				
College Ability			2.71 (0.26)			
Friends Will Attend College				-6.98 (0.37)		

Table 5 (cont.)

variable	(1)	(2)	(3)	(4)	(5)	(6)
Decided to Attend College Before 10th Grade					-9.46 (0.44)	
Decide to Attend College During 10th or 11th Grade					-6.85 (0.69)	
Father's Occupation						
Craftsman						0.65 (0.74)
Farmer						0.79 (1.03)
Manager						-0.91 (0.83)
Operative						0.53 (0.85)
Professional						-0.57 (0.86)
Other White Collar						-0.44 (0.76)
Other Blue Collar						-0.37 (0.73)
Mother's Occupation						
Clerical						0.10 (0.80)
Homemaker						0.97 (0.62)
Professional Manager						-0.29 (0.92)
Service						1.12 (1.00)
Other Occupation						0.52 (0.83)
Missing Data Indicators	x	x	x	x	x	x
R^2	0.2231	0.2653	0.2340	0.2537	0.2649	0.2253
Sample Size	8,718	8,718	8,718	8,718	8,718	8,718

a. Standard errors are in parentheses.

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Chapter 3

The Effect Of Vocational Education on Postsecondary School Choices

The direct labor market effects of vocational education have received detailed attention from a number of researchers: Grasso and Shea (1979), Meyer and Wise (1979), Gustman and Steinmeier (1981), and most recently work presented in chapter 4. These studies have examined the effects of vocational education on earnings and employment for persons with no postsecondary education, a group comprising about 40 percent of the population. Although individuals who participate in vocational education are disproportionately represented in this group, a significant number of vocational education students attend college, junior college, and vocational school.[1] Because postsecondary education is an important determinant of income and occupational status (see Griliches, 1977), it is important to understand the links between high school education and postsecondary school choices.[2] In this chapter we analyze the relationships between postsecondary plans, participation in vocational education, and postsecondary choices.

Participation in vocational education is presumably highly dependent on an individual's plans for going to college or junior college. Thus, we should expect to find a significant statistical association between vocational education and individual postsecondary activities. Vocational education, however, may have an independent effect on an individual's decision to attend postsecondary schools: it may depress the probability that an individual will attend college or enhance the probability that an individual will attend postsecondary vocational school. Consequently, vocational education may have important indirect effects on earnings through an independent effect on postsecondary schooling. We will examine the theoretical relationships between high school and postsecondary schooling, and will find, not surprisingly, that the question of

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[1] In our data, 50 percent of men and women who had taken an average level of vocational coursework also attended postsecondary school.

[2] Rosenbaum (1980), for example, claims that assignment to the nonacademic tracks (i.e., general and vocational education) frustrates the college plans of high school students.

of whether vocational education is an independent determinant of postsecondary school choice is empirically difficult. The second and third sections will present the basic data on post-secondary activities and vocational education and estimates of an econometric model of postsecondary choice. Under some assumptions, the coefficients on vocational education can be interpreted as the independent effect of vocational education on postsecondary activities.

The Relationship Between Vocational Education and Postsecondary Activities

Throughout junior high and high school, many students make tentative plans to attend college or to enter the work force immediately after high school. (Although the percentage has decreased steadily over time, many students also drop out of high school.) For most individuals, these plans are highly uncertain, because many factors that influence the decision to attend college are unknown until later in high school; these factors include (1) the individual's financial resources, (2) the availability of financial aid, (3) the individual's ability to gain entrance to an academic institution, (4) occupational preferences and occupational-specific talents, (5) the market demand for different skills, (6) the individual's future academic qualifications, (7) tastes (or preferences) for more or less education, and (8) marital and family plans. These factors give rise to a set of probabilities associated with each postsecondary activity. We will distinguish four such activities: (1) college, (2) junior college, (3) vocational school, and (4) no postsecondary schooling.[3] Individuals who are indifferent about these four alternatives, because of their degree of uncertainty, will attach equal probabilities to each outcome. These relationships can be written formally as

$$(1) \quad P_j = f_j (X, e_j), \; j = 1,2,3,4,$$

where j indexes four postsecondary alternatives, P_j is the anticipated probability of choosing each alternative j, X is a set of variables (known or predicted[4] by the individual) that determine the anticipated probabilities, e_j is a similar set

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[3]Individuals who delay entry into a postsecondary school will be included in the appropriate schooling alternative.

[4]For simplicity, we assume that individuals are risk neutral and calculate anticipated probabilities on the basis of expected variables, e.g., expected financial resources.

of variables not available in the data, and f_j is a function that relates X and e_j to P_j. A simple form for f_j is linear in a set of parameters, B_j:

(2) $P_j = X B_j + e_j$.

Given these expectations, individuals choose their course plans. Students who definitely plan to attend college are likely to concentrate primarily in academic subjects to satisfy college entrance requirements and to prepare better for college. Almost all students, however, will take some vocational education (chapter 1). We assume that individuals (consciously or unconsciously) determine their preferred level of vocational education on the basis of their anticipated probabilities of attending college, junior college, and vocational school, and perhaps other factors. This can be written formally as

(3) $V = g\ (P_1, P_2, P_3, u)$,

where V is the level of vocational education, P_j is the anticipated probability of choosing activity j, u is a set of variables that also affect V, and g is a function that relates P_1, P_2, P_3, and u to V. A simple linear form for V is

(4) $$V = \sum_{j=1}^{3} P_j \delta_j + u,$$

where δ_j is the coefficient on P_j. If P_j is unknown, we can substitute equation 2 into 4:

(5) $$V = \sum_{j=1}^{3} (X B_j + e_j)\ \delta_j + u.$$

Finally, as students near completion of high school their plans tend to solidify as fewer uncertainties remain. Some individuals, whose uncertainties resolve favorably, may decide to attend college, even though prior expectations of attending college were low. On average, however, postsecondary choices are apt to be closely tied to prior expectations. A hypothesis to test is that vocational education independently affects postsecondary choices. Formally, this can be written as

(6) $C_k = h(P_k, V, \varepsilon_k)$,

or in the linear form,

(7) $C_k = \alpha_k + \beta_k P_k + \gamma_k V + \varepsilon_k$,

where C_k is 1 if alternative j was selected, 0 otherwise,[5] α_k and θ_k are coefficients for the kth alternative, ε_k is a set of additional influences on C_k, and γ_k is the independent effect of vocational education on selecting alternative k. If individual expectations are unbiased, then θ_k will equal 1.

Suppose P_k is known because students were asked at the beginning of 10th grade to assess their anticipated probabilities of choosing each of the four major postsecondary alternatives. Then equation 7 can be estimated to obtain unbiased estimates of γ_k, the vocational education effect. The problem lies in the fact that P_k will typically not be known to the analyst. Then, substitute equation 2 into equation 7 as follows:

$$(8) \quad C_k = \alpha_k + \theta_k (XB_k + e_k) + \gamma_k V + \varepsilon_k.$$

In this equation, γ_k cannot be estimated consistently because V and e_k are likely to be highly correlated, as is evident in equation 5. V picks up the effect of unmeasured prior intent to select alternative k. That is the reason that simple tables and calculations that show a relationship between vocational education and college attendance do not provide evidence of an independent effect of vocational education on college attendance. More realistically, these results reflect the fact that individuals headed directly for the labor market find it in their interest to take vocational courses.

Two methodological paths are available to try to overcome this problem. First, if it is known that one or more determinants of V do not affect postsecondary choice, then two stage least squares can be used to purge V of its correlation with e_k. Then, consistent estimates of γ_k, the vocational effect, can be obtained.[6] It is difficult to think of factors that satisfy this criterion. We therefore will pursue a second alternative: in equation 8, some of the determinants of P_k (namely e_k) are unknown to the analyst. Alternatively, if we can legitimately assume that all of the determinants of P_k

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[5] C_k can also be viewed as a continuous latent variable that indicates an intensity of preference for choosing activity j. This formulation was used in chapter 2 in a similar context.

[6] A related method is to assign individuals randomly to different levels of vocational education. It is well known that randomized experiments provide the most convincing statistical evidence concerning causality. For good reasons, however, we are unlikely to see much experimental evidence.

are known to the analyst and appear in X, then e_k vanishes and the vocational education effect can be estimated consistently. The truth, no doubt, lies somewhere in the middle. It is clear, however, that as more and more of the variation in P_k is captured by variables in X, the bias in the estimated vocational education effect falls. Our strategy is to estimate a variety of models that control for many of the important determinants of prior intent to attend postsecondary school. Our best estimate of the effect of vocational education will be based on the most complete specification.[7] We will also test for the possibility that vocational education, beyond some threshold level, has a greater effect on postsecondary choices than at lower levels. The hypothesis is that above certain levels, vocational coursework is taken at the expense of academic coursework, and students thus fail to satisfy college entrance requirements.

Before proceeding to the empirical results, we close this section with a theoretical extension of the choice model that allows for the possibility that individuals' anticipated probabilities of attending postsecondary school may depend on their expected level of vocational coursework. In other words, individuals may simultaneously determine their course plans and intent to attend postsecondary school. An example is an individual who knowingly fails to take coursework that will satisfy college admission requirements. This is clearly equivalent to a decision not to attend college. This can be written formally as

$$(9) \quad P_j = f_j (X, e_j, V),$$

where V is the expected level of vocational education. If P_j is unknown, we can substitute 9 into 7:

$$(10) \quad C_k = h(f_k (X, e_k, V), V, \epsilon_k).$$

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[7]Although this estimate may still be inconsistent due to important omitted variables, there is a possibility that we may overcompensate for bias by including too many variables in the equation. In particular, variables that are not prior to participation in vocational education, but are caused, in part, by vocational education, will absorb some of the true effect of vocational education, thus inducing a bias in the opposite direction. Some of the variables in our fuller specification may fall into this category. A priori, the net bias in γ, the vocational education effect, cannot be ascertained.

This equation implies that even if V has no independent unanticipated effect on postsecondary choice, V will appear as a determinant of C_k in reduced form equation 10. This changes the interpretation of γ, the partial effect of vocational education. As before, γ measures the effect of vocational education, holding constant the resources, opportunities, and abilities of individuals. The assumptions of our extended choice model, however, imply that some or all of this effect may be anticipated by the individual. The distinction between anticipated and unanticipated effects of vocational education is a topic for future research. Of course, if P_j can be ascertained by surveying beginning high school students, consistent estimates of the unanticipated effect of vocational education on postsecondary choice can always be obtained.

Cross-Tabulations of the Level of Vocational Education and Postsecondary Alternatives

The analysis is based on the National Longitudinal Survey of the High School Class of 1972 (NLS72), a data set that consists of a single cohort of 23,000 men and women, all of whom were high school seniors in the spring of 1972. Individuals were sampled randomly from about 1,300 high schools. Schools were selected as a stratified random sample in order to overrepresent minority and disadvantaged students. Vocational education is measured as the total number of vocational classes as a percentage of all coursework.[8] We have split this continuous measure of vocational coursework into three categories of approximately equal sizes: 0 to 20 percent, 20 to 35 percent, and 35 percent or more.

Sex and Ethnic Differences in Postsecondary Choices

Table 1 indicates that men and women have similar probabilities of attending college, junior college, and vocational-technical school. About 29 percent of all women and 32 percent of all men attend college. Women are slightly more likely then men (11 percent versus 8 percent) to attend postsecondary vocational-technical school. A large percentage (about 45 percent) of women and men never attend a postsecondary school full time.

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[8]See chapter 1 for an extensive discussion of alternative measures of vocational education. We exclude home economics from our total measure of vocational education.

Table 1

Vocational Coursework and Postsecondary Alternatives

Women

Vocational Course Percentage	Postsecondary Alternative: Never in School	College	Jr. College	Vocational	Total
0-20					
Frequency[a]	1,535	2,214	757	439	4,945
Percent[b]	13.62	19.64	6.71	3.89	43.86
Row Percent[c]	31.04	44.77	15.31	8.88	
Column Percent[d]	29.66	68.02	46.10	36.55	
20-35	1,765	802	564	456	3,587
	15.66	7.11	5.00	4.04	31.82
	49.21	22.36	15.72	12.71	
	34.10	24.64	34.35	37.97	
35+	1,876	239	321	306	2,742
	16.64	2.12	2.85	2.71	24.32
	68.42	8.72	11.71	11.16	
	36.24	7.34	19.55	25.48	
Total					
Frequency	5,176	3,255	1,642	1,201	11,274
Percentage of Total	45.91	28.87	14.56	10.65	100.00

Men

0-20	1,129	2,136	712	236	4,213
	10.18	19.27	6.42	2.13	38.01
	26.80	50.70	16.90	5.60	
	23.13	61.03	38.38	27.80	
20-35	1,735	1,015	719	304	3,773
	15.65	9.16	6.49	2.74	34.04
	45.98	26.90	19.06	8.06	
	35.55	29.00	38.76	35.81	
35+	2,017	349	424	309	3,099
	18.20	3.15	3.82	2.79	27.96
	65.09	11.26	13.68	9.97	
	41.32	9.97	22.86	36.40	
Total					
Frequency	4,881	3,500	1,855	849	11,085
Percentage of Total	44.03	31.57	16.73	7.66	100.00

a. This refers to the number of individuals in the cell.

b. The number of individuals in the cell as a percentage of the total sample.

c. The number of individuals in the cell as a percentage of the row total.

d. The number of individuals in the cell as a percentage of the column total.

These conclusions differ somewhat for different ethnic groups, as is indicated in tables 2 and 3. About the same percentage of white and black women never attend school, which is remarkable because the average socioeconomic status of blacks is considerably lower than that of whites. Hispanic women are less likely to attend postsecondary school than are black or white women by about 10 percentage points. For men, the situation is almost reversed. Black men disproportionately never attend a postsecondary school. About 55 percent of black men, 52 percent of Hispanic men, and 42 percent of white men never attend postsecondary school. For Hispanic men and women, junior college is a common postsecondary alternative. Blacks and whites have relatively greater representation in colleges.

The statistical model discussed later estimates the effect of ethnic status on postsecondary choice, controlling for personal characteristics (e.g., ability and class rank) and family factors. These estimates indicate that black women and Hispanic women are more likely (by 17 percentage points and 10 percentage points, respectively) than white women with equivalent characteristics to attend postsecondary school. Comparable numbers for men are much smaller, 4 and 9 percentage points respectively, for blacks and Hispanics.

Differences in Postsecondary Choices by Vocational Course Level

For all race and sex groups, individuals from all levels of vocational education are represented in all four postsecondary alternatives. Table 1 shows that of women who never attend school, 30 percent are in the low vocational education category, 34 percent are in the medium category, and 36 percent are in the high category. As predicted earlier, however, vocational course level is strongly associated with the probability of selecting each alternative. As the level of vocational education falls for women, the probability of attending college rises from 9 to 22 to 45 percent. Mild complementarity between high school and postsecondary vocational education is apparent in the raw data for both men and women. About 9 percent of all women with less than 20 percent of their coursework in vocational classes attend postsecondary vocational school. Women with the medium or highest level of vocational education attend postsecondary vocational school with 11 to 13 percent probability. For men, the comparable numbers are 6, 8, and 10 percent.

These results confirm the existence of a strong association between vocational education and postsecondary activities, particularly college. To determine whether vocational education has an independent effect on postsecondary activities, however,

Table 2

Vocational Coursework and Postsecondary Alternatives
by Ethnic Status: Women

Blacks

Vocational Course Percentage	Postsecondary Alternative: Never in School	College	Jr. College	Vocational	Total
0-20					
Frequency[a]	318	289	112	109	828
Row Percent[b]	38.41	34.90	13.53	13.16	
20-35	297	154	96	99	646
	45.98	23.84	14.86	15.33	
35+	217	68	54	55	394
	55.08	17.26	13.71	13.96	
Total	832	511	262	263	1,868
	44.54	27.36	14.03	14.08	

Hispanics

0-20	81	35	20	12	148
	54.73	23.65	13.51	8.11	
20-35	100	32	39	20	191
	52.36	16.75	20.42	10.47	
35+	94	12	35	11	152
	61.84	7.89	23.03	7.24	
Total	275	79	94	43	491
	56.01	16.09	19.14	8.76	

Whites

0-20	1,136	1,890	625	318	3,969
	28.62	47.62	15.75	8.01	
20-35	1,368	616	429	337	2,750
	49.75	22.40	15.60	12.25	
35+	1,565	159	232	240	2,196
	71.27	7.24	10.56	10.93	
Total	4,069	2,665	1,286	895	8,915
	45.64	29.89	14.43	10.04	

a. The number of individuals in the cell.
b. The number of individuals in the cell as a percentage of row total.

Table 3

Vocational Coursework and Postsecondary Alternatives
by Ethnic Status: Men

Blacks

Vocational Course Percentage	Postsecondary Alternative: Never in School	College	Jr. College	Vocational	Total
0-20					
Frequency[a]	213	166	71	38	488
Row Percent[b]	43.65	34.02	14.55	7.79	
20-35	338	117	75	59	589
	57.39	19.86	12.73	10.02	
35+	821	57	50	48	425
	63.53	13.41	11.76	11.29	
Total	821	340	196	145	1,502
	54.66	22.64	13.05	9.65	
Hispanics					
0-20	54	36	41	5	136
	39.71	26.47	30.15	3.68	
20-35	88	36	48	7	179
	49.16	20.11	26.82	3.91	
35+	114	21	29	16	180
	63.33	11.67	16.11	8.89	
Total	256	93	118	28	495
	51.72	18.79	23.84	5.66	
Whites					
0-20	862	1,934	600	193	3,589
	24.02	53.89	16.72	5.38	
20-35	1,309	862	596	238	3,005
	43.56	28.69	19.83	7.92	
35+	1,633	271	345	245	2,494
	65.48	10.87	13.83	9.82	
Total	3,804	3,067	1,541	676	9,088
	41.86	33.75	16.96	7.44	

a. The number of individuals in the cell.
b. The number of individuals in the cell as a percentage of row total.

we need to control for differences between individuals that may also affect choice of postsecondary activities, for example, prior postsecondary intentions.

Econometric Model of Postsecondary Activity

The four postsecondary alternatives considered in this analysis are categorical and can be modeled conveniently with a multiple outcomes linear probability model. Following the model developed earlier, let C_{1i}, C_{2i}, and C_{3i}, and C_{4i} indicate whether or not individual i selects one of the four postsecondary alternatives. If individual i selects alternative j, C_{ji} is set to 1 and all other outcomes are set to 0. Each postsecondary indicator is allowed to depend on a set of personal and family characteristics, as follows:

$$
\begin{aligned}
(11)\quad C_{1i} &= X_i \Pi_1 + \gamma_1 V + e_{1i} \\
C_{2i} &= X_i \Pi_2 + \gamma_2 V + e_{2i} \\
C_{3i} &= X_i \Pi_3 + \gamma_3 V + e_{3i} \\
C_{4i} &= X_i \Pi_4 + \gamma_4 V + e_{4i},
\end{aligned}
$$

where Π_j is the vector of reduced form coefficients corresponding to $\theta_j B_j$ in equation 8, and γ_j is the independent effect of vocational education on the probability of selecting alternative j. Although the multiple outcomes linear probability model has well-known statistical deficiencies, it can be estimated with ordinary least squares and is relatively inexpensive. It also has the desirable property that the sum of the estimated coefficients across equations for any variable, except the constant term, will always be zero. The effect of any variable on the choice between alternatives can be derived by simply subtracting the two sets of coefficients. Simple manipulations of this sort are not possible with the more expensive multinomial logit or probit models.

Six different specifications are used in the following regression analysis. All equations contain a measure of vocational education, the percentage of all courses in vocational subjects.[9] The variables included in each equation are listed below.

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[9]For women, we also separated occupational courses from home economics.

Equation	Specification
I	No controls.
II	Basic controls: high school work experience, race, test, class rank, parents' income, parents' education, area wages, area unemployment, and regional indicators.
III	Basic controls plus the individual's own assessment of college ability.
IV	Basic controls plus (1) mother's and father's schooling desires for the individual (year of school) and (2) mother's and father's desire for the individual to attend postsecondary vocational school (1 if yes, 0 if no).
V	Basic controls plus an indicator that is 1 if most of the individual's friends plan to attend college, 0 otherwise.
VI	All controls.

Estimates of the complete model of postsecondary choice for equations II and VI are presented in appendix tables A.1 and A.2 for women and men, respectively. Separate pairs of equations are presented for each of the four postsecondary activities. Since we are primarily interested in the coefficients for vocational education, we will briefly summarize the other results.

The equations representing choice of the college alternative fit the data extremely well. For both men and women, 30 to 40 percent of the variance in college choice is explained by the model. All of the individual and family characteristics are highly significant. In the model with basic controls, a two standard deviation change in test or class rank increases the probability of attending college by 15 percentage points. An increase in both parents' education from less than high school to a college degree or more increases the probability of entering the college track by 33 percentage points. The effect of parental schooling desires, given individual ability, class rank, and parents' education and income, is very large. An increase in both parents' schooling desires from 12 years (a high school degree) to 16 years (a college degree) is associated with an increase in the likelihood of college attendance of 34 percentage points. Finally, individuals living in high-

wage areas are significantly less likely to attend college and more likely to attend junior college than are individuals from low-wage areas.

The equations representing the choice of junior college or postsecondary vocational school fit the data less well. The effects of individual and family characteristics are all smaller than in the college equation. However, the probability of attending a vocational school is quite sensitive to the parents' postsecondary vocational school desires. If both parents have a preference that their child attend a postsecondary vocational school, the probability of this rises by about 20 percent for women and 15 percent for men. Individuals with friends who are planning to attend college are more likely to attend college and junior college.

Table 4 contains estimates of vocational education coefficients for women in all six specifications. The first equation includes no control variables. Thus, the estimated vocational education coefficient (γ) is predicted to be significantly upward biased since it captures two effects: the independent effect of vocational education on postsecondary choice and the prior intent of the individual to choose a given alternative. In fact, γ is enormous. A two standard deviation increase in occupational education is associated with a decrease in the probability of attending college of 34 percentage points.[10]

In the next five specifications, we introduce several sets of personal and family characteristics designed to capture the individual's prior postsecondary intentions, thus reducing the bias in the estimated vocational education coefficient. Equation II, which includes a measure of individual ability, high school class rank, high school work experience, parental education and income, and race indicators, causes $\hat{\gamma}_2$, the coefficient for college attendance, to fall by 38 percent, from -.95 to -.59. Moreover, although home economics and occupational coursework appear to have different effects on the probability of attending college on the basis of the first specification, in the second (and other) specifications the effects are nearly identical. In all specifications, home economics has a greater effect than occupational coursework on junior college attendance.

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[10]The estimates from this specification yield approximately the same information as the cross-tabulation of postsecondary alternatives and vocational course level reported in tables 1, 2 and 3.

Table 4

Estimates of Vocational Education Coefficients with Different Control Variables: Women

Variable	(1) Never in School	(2) College	(3) Jr. College	(4) Vocational School
I. No Controls				
Occupational Courses	0.9881**	-0.9471**	-0.1130**	0.0720**
	(0.0269)[a]	(0.0247)	(0.0210)	(0.0185)
Home Economics	1.3609**	-1.3796**	-0.2310**	0.2497**
	(0.0731)	(0.0670)	(0.0570)	(0.0503)
II. Basic Controls				
Occupational Courses	0.6715**	-0.5850**	-0.1048**	0.0182
	(0.0278)	(0.0247)	(0.0226)	(0.0201)
Home Economics	0.7490**	-0.6321**	-0.2222**	0.1053*
	(0.0749)	(0.0667)	(0.0608)	(0.0541)
III. Basic Controls and College Ability				
Occupational Courses	0.6070**	-0.5535**	-0.0797**	0.0262
	(0.0276)	(0.0249)	(0.0227)	(0.0203)
Home Economics	0.6641**	-0.5920**	-0.1865**	0.1144**
	(0.0740)	(0.0666)	(0.0608)	(0.0542)
IV. Basic Controls and Parents' Schooling Desires				
Occupational Courses	0.4753**	-0.3565**	-0.0550**	-0.0638**
	(0.0274)	(0.0237)	(0.0232)	(0.0212)
Home Economics	0.5362**	-0.3837**	-0.1669**	0.0144
	(0.0719)	(0.0622)	(0.0609)	(0.0529)
V. Basic Controls and Friends Will Attend College				
Occupational Courses	0.5531**	-0.5035**	-0.0516**	0.0020
	(0.0280)	(0.0251)	(0.0231)	(0.0206)
Home Economics	0.6140**	-0.5392**	-0.1616**	0.0868
	(0.0739)	(0.0663)	(0.0608)	(0.0543)
VI. All Controls				
Occupational Courses	0.3826**	-0.3166**	-0.0073	-0.0587**
	(0.0275)	(0.0241)	(0.0236)	(0.0206)
Home Economics	0.4230**	-0.3382**	-0.1063*	0.0214
	(0.0710)	(0.0623)	(0.0608)	(0.0531)

*significant at the .10 level.
**significant at the .05 level.

a. Standard errors are in parentheses. Basic controls are listed in column 1 of appendix table A.1. All controls are listed in column 2 of the same table.

The third, fourth, and fifth specifications introduce additional variables that are more subjective, and possibly harder to quantify, than the variables used in the second equation. Nevertheless, we expect that they are excellent proxies for individuals' prior postsecondary plans. Two of the variables induce modest declines of 3 to 5 percentage points in the vocational education coefficent: the individual's own assessment of college-related ability and whether most of the individual's friends are planning to attend college. However, four additional variables measuring mother's and father's schooling desires induce a 23-point decrease in the vocational education coefficient. Taken together, all three sets of variables reduce β_2 from -.59 to -.32, a decrease of almost 50 percent. If this value is taken as the independent effect of vocational education on college attendance for women, then an increase in vocational coursework of 40 percentage points (about two standard deviations) independently decreases the probability of attending college by about 13 percentage points. Although substantially smaller than estimates obtained from less complete specifications, the effect is still large and only somewhat less than a change of two standard deviations in ability or class rank.

There are some differences in these results among black, Hispanic, and white women, as indicated in table 5. The specification with no controls appears to reveal substantial differences in the effect of vocational education on different racial groups. The association between vocational education and choice of postsecondary alternatives is much stronger for white women than for Hispanic or black women. These differences, however, diminish dramatically, although not completely, when control variables are added to the model. Apparently, vocational education is a better proxy for prior postsecondary plans for white women than for other women.

The results in table 6 indicate a similar phenomenon with men. With control variables in the equation, large differences between black, Hispanic, and white men in the effect of vocational education decline. There is weak evidence that the independent effect of vocational education on college attendence is smaller for black and Hispanic men than for white men. The effects of vocational education on enrollment in a junior college or vocational school are large and of borderline significance for Hispanic males. The Hispanic coefficient is -.23 for junior college and .10 for postsecondary vocational school. By contrast, the corresponding coefficients for white and black men are essentially zero. Thus, except for Hispanic men, we find that after controlling for personal and family characteristics and parental schooling desires, high school vocational education

Table 5

Estimates of Vocational Education Coefficients with Different Control Variables By Race: Women

Variable	(1) Never in School	(2) College	(3) Jr. College	(4) Vocational School
I. No Controls				
Black	0.6570**	-0.6926**	-0.0453	0.0859
	(0.0768)	(0.0703)	(0.0547)	(0.0565)
Hispanic	0.6518**	-0.6488**	-0.0246	0.0217
	(0.1463)	(0.1107)	(0.1214)	(0.0868)
White	0.1009**	-1.0514**	-0.1465**	0.0970**
	(0.0272)	(0.0252)	(0.0215)	(0.0186)
II. Basic Controls				
Black	0.4310**	-0.4174**	-0.0550	0.0414
	(0.079)	(0.0695)	(0.0580)	(0.0602)
Hispanic	0.3839**	-0.4445**	0.0889	0.0284
	(0.1501)	(0.1106)	(0.1271)	(0.0922)
White	0.7172**	-0.6212**	-0.1286**	0.0327
	(0.0293)	(0.0264)	(0.0243)	(0.0212)
III. All Controls				
Black	0.2843**	-0.2698**	-0.0035	-0.0110
	(0.0771)	(0.0667)	(0.0590)	(0.0611)
Hispanic	0.2592*	-0.3489**	0.1314	-0.0417
	(0.1536)	(0.1105)	(0.1320)	(0.0946)
White	0.3791**	-0.3149**	-0.0140	0.0502**
	(0.0293)	(0.0261)	(0.0257)	(0.0219)

Sample Size

Total	8,674
Black	1,295
Hispanic	370
White	7,019

*significant at the .10 level.
**significant at the .05 level.
a. Standard errors are in parentheses. Basic controls are listed in column 1 of appendix table A.1. All controls are listed in column 2 of the same table.

Table 6

Estimates of Vocational Education Coefficients with Different Control Variables By Race: Men

Variable	(1) Never in School	(2) College	(3) Jr. College	(4) Vocational School
I. No Controls				
All	0.9976**	-1.0246**	-0.0824**	0.01094**
	(0.0267)	(0.0252)	(0.0220)	(0.0156)
Black	0.6092**	-0.6212**	-0.0751	0.0871
	(0.0880)	(0.0749)	(0.0612)	(0.0548)
Hispanic	0.8103**	-0.5614**	-0.3454**	0.0964
	(0.1372)	(0.1122)	(0.1210)	(0.0713)
White	1.0462**	-1.0852**	-0.0736**	0.1126**
	(0.0284)	(0.0274)	(0.0240)	(0.0167)
II. Basic Controls				
All	0.5219**	-0.5205**	-0.0713**	0.0699**
	(0.0284)	(0.0262)	(0.0248)	(0.0179)
Black	0.3603**	-0.3778**	-0.0401	0.0576
	(0.0886)	(0.0736)	(0.0635)	(0.0582)
Hispanic	0.6395**	-0.3951**	-0.3543**	0.1099
	(0.1409)	(0.1132)	(0.1289)	(0.0786)
White	0.5294**	-0.5297**	-0.0682**	0.0685**
	(0.0308)	(0.0289)	(0.0276)	(0.0195)
III. All Controls				
All	0.3079**	-0.3217**	0.0117	0.0021
	(0.0279)	(0.0257)	(0.0254)	(0.0182)
Black	0.2693**	-0.2896**	-0.0132	0.0335
	(0.0865)	(0.0716)	(0.0638)	(0.0584)
Hispanic	0.3759**	-0.2506**	-0.2287*	0.1034
	(0.1347)	(0.1115)	(0.1323)	(0.0792)
White	0.3005**	-0.3128**	-0.0206	-0.0083
	(0.0302)	(0.0284)	(0.0284)	(0.0197)
Sample Size				
Total	9,222			
Black	1,143			
Hispanic	404			
White	7,675			

*significant at the .10 level.
**significant at the .05 level.
a. Standard errors are in parentheses. Basic controls are listed in column 1 of appendix table A.1. All controls are listed in column 2 of the same table.

does not increase the likelihood of enrollment in postsecondary vocational school. For women, in fact, there is some evidence of substitutability of high school and postsecondary vocational school, controlling for these other factors. When parental schooling desires are omitted from the model, however, the vocational education coefficient absorbs some of the effects of parental schooling desires and becomes positive.

Although we cannot be sure that sufficient control variables have been included in the equations presented in this section,[11] we conclude that vocational education has an important effect on the choice of postsecondary activity, particularly on the decision to attend college. Our results indicate that this effect may be as large as a 3-percent drop in the probability of attending college for every increase of 10 percentage points in vocational education. Tests that this effect may be nonlinear were decidedly negative for both men and women.[12] Thus, we could find no evidence that there is a critical threshold beyond which additional vocational education sharply decreases the probability of college attendance.

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[11]As mentioned, there is a distinct possibility that some of the variables we have used as controls (e.g., parental schooling desires) overcompensate for biases in $\hat{\gamma}$.

[12]These results are not reported here but are available separately from the author.

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APPENDIX TABLE A.1.a

ESTIMATES OF MODEL OF POSTSECONDARY CHOICE: WOMEN

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
Occupational Courses	0.6715** (0.0278)[a]	0.3826** (0.0275)	-0.5850** (0.0247)	-0.3166** (0.0241)	0.2376 (0.1811)
Home Economics	0.7490** (0.0749)	0.4230** (0.0710)	-0.6321** (0.0667)	-0.3382** (0.0623)	0.0532 (0.0667)
College Ability (Self-Assessment)		0.0741** (0.0069)	0	-0.0137** (0.0060)	1.6517 (0.9438)
Father's School Desires (Years of School)		-0.0241** (0.0038)		0.0257** (0.0034)	13.9573 (1.7526)
Mother's School Desires (Years of School)		-0.0577** (0.0041)		0.0602** (0.0036)	14.1231 (1.7009)
Father's Postsecondary Vocational School Desires		0.0021 (0.0151)		-0.0571** (0.0133)	0.1833
Mother's Postsecondary Vocational School Desires		0.0054 (0.0144)		-0.0767** (0.0127)	0.2205
Friends Will Attend College		-0.1286** (0.0100)		0.0695** (0.0088)	0.5717
High School Work Experience					
0-10	-0.0266** (0.0124)	-0.0242** (0.0116)	0.0080 (0.0102)	0.0070 (0.0102)	0.2487
10-20	0.0097 (0.0129)	0.0068 (0.0121)	-0.0285** (0.0114)	-0.0231** (0.0106)	0.2286
20+	0.0620** (0.0133)	0.0486** (0.0125)	-0.0666** (0.0119)	-0.0524** (0.0110)	0.1993
Black	-0.1727** (0.0153)	-0.1070** (0.0145)	0.1494** (0.0136)	0.0903** (0.0127)	0.1491
Hispanic	-0.1034** (0.0243)	-0.0533** (0.0228)	0.0827** (0.0216)	0.0396** (0.0201)	0.0426
Test	-0.1347** (0.0160)	-0.0209 (0.0154)	0.1644** (0.0142)	0.0756** (0.0135)	3.0274 (0.4464)

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Appendix Table A.1.a (cont.)

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
Class Rank	-0.2709**	-0.1233**	0.3311**	0.2184**	0.5838
	(0.0230)	(0.0222)	(0.0204)	(0.0195)	(0.2718)
Parents' Income ($ thousands)	-0.0039**	-0.00002	0.0062**	0.0027**	10.3053
	(0.0012)	(0.0011)	(0.0010)	(0.0010)	(5.3841)
Education of Mother - Less Than High School	0.0920**	0.0630**	-0.0470**	-0.0216**	0.3280
	(0.0114)	(0.0108)	(0.0102)	(0.0094)	(0.4695)
Education of Mother - College Degree or More	-0.1063**	-0.0725**	0.1075**	0.0692**	0.1003
	(0.0172)	(0.0162)	(0.0153)	(0.0142)	(0.3004)
Education of Father - Less Than High School	0.0705**	0.0345**	-0.0477**	-0.0173*	0.3672
	(0.0114)	(0.0107)	(0.0101)	(0.0094)	(0.4821)
Education of Father - College Degree or More	-0.0584**	-0.0227	0.1244**	0.0888**	0.1654
	(0.0148)	(0.0140)	(0.0132)	(0.0122)	(0.3715)
Area Wage Rate	0.0415**	0.0227	-0.0567**	-0.0432**	3.5864
	(0.0168)	(0.0158)	(0.0150)	(0.0139)	(0.5012)
Area Unemployment Rate	-0.0033	0.0029	-0.0041	-0.0103**	5.9245
	(0.0046)	(0.0044)	(0.004)	(0.0038)	(1.5446)
Rural	-0.0107	-0.0251*	-0.0188	-0.0033	0.2249
	(0.0149)	(0.0140)	(0.0133)	(0.0123)	(0.4175)
Town	-0.0280**	-0.0208	0.0014	0.0002	0.2706
	(0.0138)	(0.0129)	(0.0122)	(0.0113)	(0.4443)
Urban	-0.0008	0.0022	-0.0088	-0.0104	0.2956
	(0.0136)	(0.0128)	(0.0121)	(0.0112)	(0.4563)
South	0.0386**	0.0505**	-0.9758**	-0.0883**	0.3460
	(0.0189)	(0.0177)	(0.0168)	(0.0156)	(0.4757)
East	0.0232	0.0076	-0.0391**	-0.0261*	0.2250
	(0.0163)	(0.0153)	(0.0145)	(0.0134)	(0.4176)

Appendix Table A.1.a (cont.)

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
West	-0.0082	-0.0119	-0.0849**	-0.0822**	0.1665
	(0.0186)	(0.0175)	(0.0166)	(0.0153)	(0.3726)
Intercept	0.6903**	1.4254**	-0.0025	-0.9201**	--
	(0.0786)	(0.0904)	(0.0699)	(0.0793)	--
R^2	0.2516	0.3430	0.3091	0.4104	--
Sample Size	8,684	8,684	8,684	8,684	8,684

* Significant at the .10 level.
** Significant at the .05 level.
a. Standard errors are in parentheses.

APPENDIX TABLE A.1.b

ESTIMATES OF MODEL OF POSTSECONDARY CHOICE: WOMEN

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Occupational Courses	-0.1048** (0.0226)[a]	-0.0073 (0.0236)	0.0182 (0.0201)	-0.0587** (0.0206)
Home Economics	-0.2222** (0.0608)	-0.1063* (0.0608)	0.1053* (0.0541)	0.0215 (0.0531)
College Ability (Self-Assessment)		-0.0335** (0.0059)		-0.0269** (0.0052)
Father's School Desires (Years of School)		0.0042 (0.0033)		-0.0059** (0.0029)
Mother's School Desires (Years of School)		0.0007 (0.0035		-0.0032 (0.0031)
Father's Postsecondary Vocational School Desires		-0.0258** (0.0130)		0.0808** (0.0113)
Mother's Postsecondary Vocational School Desires		-0.0492** (0.0124)		0.1205** (0.0108)
Friends Will Attend College		0.0686** (0.0086)		-0.0095 (0.0075)
High School Work Experience				
0-10	0.0098 (0.0101)	0.0098 (0.0100)	0.0089 (0.0090)	0.0073 (0.0087)
10-20	0.0083 (0.0104)	0.0091 (0.0103)	0.0105 (0.0093)	0.0072 (0.0090)
20+	-0.0071 (0.0108)	-0.0024 (0.0107)	0.0117 (0.0096)	0.0063 (0.0094)
Black	0.00003 (0.0124)	-0.0188 (0.0124)	0.0232** (0.0110)	0.0354** (0.0108)
Hispanic	0.0312 (0.0198)	0.0157 (0.0196)	-0.0105 (0.0176)	-0.0019 (0.0171)
Test	-0.0010 (0.0130)	-0.0322** (0.0132)	-0.0288** (0.0115)	-0.0224* (0.0115)

Appendix Table A.1.b (cont.)

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Class Rank	-0.0185	-0.0712**	-0.0418**	-0.0240
	(0.0186)	(0.0190)	(0.0166)	(0.0166)
Parents' Income ($ thousands)	-0.0002	-0.0012	-0.0020**	-0.0015*
	(0.0009)	(0.0009)	(0.0008)	(0.0008)
Education of Mother- Less Than High School	-0.0227**	-0.0172*	-0.0224**	-0.0242**
	(0.0093)	(0.0092)	(0.0082)	(0.0080)
Education of Mother- College Degree or More	0.0148	0.0073	-0.0160	-0.0040
	(0.0140)	(0.0138)	(0.0124)	(0.0121)
Education of Father- Less Than High School	-0.0205**	-0.0106	-0.0023	-0.0066
	(0.0092)	(0.0092)	(0.0082)	(0.0080)
Education of Father- College Degree or More	-0.0321**	-0.0435**	-0.0339**	-0.0227**
	(0.0120)	(0.0120)	(0.0107)	(0.0104)
Area Wage Rate	0.0340**	0.0368**	-0.0188	-0.0162
	(0.0137)	(0.0135)	(0.0122)	(0.0118)
Area Unemployment Rate	0.0156**	0.0125**	-0.0081**	-0.0051
	(0.0038)	(0.0037)	(0.0034)	(0.0033)
Rural	-0.0092	-0.0015	0.0387**	0.0300**
	(0.0121)	(0.0120)	(0.0108)	(0.0105)
Town	0.0111	0.0120	0.0155	0.0087
	(0.0112)	(0.0111)	(0.0099)	(0.0097)
Urban	0.0069	0.0064	0.0027	0.0018
	(0.0111)	(0.0110)	(0.0098)	(0.0096)
South	0.0722**	0.0653**	-0.0350**	-0.0276**
	(0.0153)	(0.0152)	(0.0136)	(0.0132)
East	0.0174	0.0170	-0.0015	0.0015
	(0.0132)	(0.0131)	(0.0118)	(0.0114)
West	0.1200**	0.1170**	-0.0268**	-0.0229*
	(0.0151)	(0.0150)	(0.0134)	(0.0131)

Appendix Table A.1.b (cont.)

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Intercept	-0.0479	0.0368	0.3601**	0.4579**
	(0.0638)	(0.0774)	(0.0567)	(0.0676)
R^2	0.0370	0.0589	0.0216	0.0793
Sample Size	8,684	8,684	8,684	8,684

* Significant at the .10 level.
** Significant at the .05 level.
a. Standard errors are in parentheses.

APPENDIX TABLE A.2.a

ESTIMATES OF MODEL OF POSTSECONDARY CHOICE: MEN

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
Total Vocational	0.5219** (0.0284)[a]	0.3079** (0.0278)	-0.5205** (0.0262)	-0.3217** (0.0257)	0.2463 (0.1792)
College Ability (Self-Assessment)		0.0626** (0.0667)		-0.0282** (0.0062)	1.5340 (1.0190)
Father's School Desires (Years of School)		-0.0207** (0.0039)		0.0232** (0.0036)	14.2244 (1.7767)
Mother's School Desires (Years of School)		-0.0387** (0.0040)		0.0386** (0.0037)	14.3571 (1.7481)
Father's Post-secondary Vocational School Desires		0.0412** (0.0168)		-0.0478** (0.0156)	0.1696 (0.3753)
Mother's Post-secondary Vocational School Desires		-0.0118 (0.0172)		-0.0519** (0.0159)	0.1622 (0.3687)
Friends Will Attend College		-0.1598** (0.0099)		0.1005** (0.0091)	0.5480 (0.4977)
High School Work Experience					
0-10	0.0075 (0.0137)	0.0174 (0.0130)	-0.0155 (0.0127)	-0.0225* (0.0120)	0.2120 (0.4087)
10-20	0.0202 (0.0135)	0.0277** (0.0128)	0.0297** (0.0125)	-0.0355** (0.0118)	0.2223 (0.4158)
20+	0.0826* (0.0125)	0.0673** (0.0118)	-0.0840** (0.0115)	-0.0724** (0.0110)	0.3509 (0.4773)
Black	-0.0343** (0.0152)	-0.0060 (0.0145)	0.0350** (0.0140)	0.0126 (0.0134)	0.1239 (0.3295)

Appendix Table A.2.a (cont.)

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
Hispanic	-0.0880**	-0.0543**	0.0515**	-0.0198	0.0438
	(0.0229)	(0.0218)	(0.0211)	(0.0201)	(0.2047)
Test	-0.1751**	-0.0440**	0.1636**	0.0584**	2.9772
	(0.0150)	(0.0149)	(0.0138)	(0.0138)	(0.4530)
Class Rank	-0.3668**	-0.2374**	0.4543**	0.3506**	0.4667
	(0.0219)	(0.0213)	(0.0202)	(0.0197)	(0.2763)
Parents' Income ($ thousands)	0.0035**	-0.0008	0.0045**	0.0020**	11.2469
	(0.0010)	(0.0010)	(0.0009)	(0.0009)	(15.3855)
Education of Mother - Less Than High School	0.0655**	0.0378**	-0.0245**	-0.0027	0.2823
	(0.0116)	(0.0110)	(0.0107)	(0.0102)	
Education of Mother - College Degree or More	-0.0540**	-0.0442**	0.0732**	0.0650**	0.1116
	(0.0158)	(0.0150)	(0.0146)	(0.0138)	
Education of Father - Less Than High School	0.0878**	0.0630**	-0.0442**	-0.0233**	0.3427
	(0.0112)	(0.0106)	(0.0103)	(0.0098)	
Education of Father - College Degree or More	-0.0721**	-0.0441**	0.1253**	0.0983**	0.1739
	(0.0140)	(0.0133)	(0.0129)	(0.0123)	
Area Wage Rate	0.0232	0.0320**	-0.0217	-0.0304**	3.5882
	(0.0163)	(0.0154)	(0.0150)	(0.0143)	(0.4975)
Area Unemployment Rate	0.000002	0.0029	-0.0092**	-0.0123**	5.9512
	(0.0045)	(0.0043)	(0.0042)	(0.0040)	(1.5732)
Rural	0.0544**	0.0272**	-0.0293**	-0.0025	0.2384
	(0.0140)	(0.0133)	(0.0129)	(0.0123)	
Town	0.0264**	0.0176	0.0027	0.0132	0.2716
	(0.0130)	(0.0123)	(0.0120)	(0.0114)	

Appendix Table A.2.a (cont.)

Variable	(1) Never in School		(2) College		Mean (S.D.)
	Basic Controls	All Controls	Basic Controls	All Controls	
Urban	0.0200	0.0234*	0.0019	0.0001	0.2726
	(0.0131)	(0.0124)	(0.0121)	(0.0115)	
South	0.0185	0.0514**	-0.0448**	-0.0784**	0.3457
	(0.0178)	(0.0169)	(0.0164)	(0.0156)	
East	-0.0036	0.0054	-0.0077	-0.0160	0.2017
	(0.0158)	(0.0150)	(0.0146)	(0.0139)	
West	0.00003	0.0124	-0.1136**	-0.1261**	0.1846
	(0.0179)	(0.0170)	(0.0165)	(0.0157)	
Intercept	0.8514**	1.1880**	-0.0893	-0.5650*	1.0000
	(0.0736)	(0.0847)	(0.0678)	(0.0783)	
R^2	0.2613	0.3385	0.3120	0.3807	
Sample Size	9,222	9,222	9,222	9,222	9,222

* Significant at the .10 level.
** Significant at the .05 level.
a. Standard errors are in parentheses.

APPENDIX TABLE A.2.b

ESTIMATES OF MODEL OF POSTSECONDARY CHOICE: MEN

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Total Vocational	-0.0713**	0.0117	0.0699**	0.0021
	(0.0248)	(0.0254)	(0.0179)	(0.0182)
College Ability (Self-Assessment)		-0.0327**		-0.0017
		(0.0062)		(0.0044)
Father's School Desires (Years of School)		0.0042		-0.0068**
		(0.0035)		(0.0025)
Mother's School Desires (Years of School)		0.0031		-0.0030
		(0.0036)		(0.0026)
Father's Postsecondary Vocational School Desires		-0.0434**		0.0500**
		(0.0154)		(0.0110)
Mother's Postsecondary Vocational School Desires		-0.0355**		0.0992**
		(0.0157)		(0.0112)
Friends Will Attend College		0.0652**		-0.0059
		(0.0090)		(0.0065)
High School Work Experience				
0-10	0.0178	0.0152	-0.0097	-0.0102
	(0.0120)	(0.0119)	(0.0087)	(0.0085)
10-20	0.0184	0.0185	-0.0088	-0.0107
	(0.0118)	(0.0117)	(0.0085)	(0.0084)
20+	-0.0016	0.0062	0.0058	-0.0011
	(0.0109)	(0.0108)	(0.0079)	(0.0077)
Black	-0.0188	-0.0342**	0.0181*	0.0277**
	(0.0132)	(0.0132)	(0.0096)	(0.0095)
Hispanic	0.0476**	0.0349*	-0.0111	-0.0004
	(0.0200)	(0.0199)	(0.0145)	(0.0142)
Test	0.0196	-0.0246*	-0.0081	0.0103
	(0.0131)	(0.0136)	(0.0094)	(0.0097)

Appendix Table A.2.b (cont.)

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Class Rank	-0.0621**	-0.1147**	-0.0253*	0.0015
	(0.0191)	(0.0194)	(0.0138)	(0.0139)
Parents' Income ($ thousands)	-0.0005	-0.0013	-0.0005	0.0001
	(0.0009)	(0.0009)	(0.0007)	(0.0007)
Education of Mother-Less Than High School	-0.0360**	-0.0278**	-0.0050	-0.0074
	(0.0101)	(0.0101)	(0.0073)	(0.0072)
Education of Mother-College Degree or More	-0.0209	0.0250*	0.0017	0.0043
	(0.0138)	(0.0137)	(0.0100)	(0.0098)
Education of Father-Less Than High School	-0.0483**	-0.0419**	0.0047	0.0013
	(0.0098)	(0.0097)	(0.0070)	(0.0069)
Education of Father-College Degree or More	-0.0300**	-0.0419**	-0.0232**	-0.0123
	(0.0122)	(0.0121)	(0.0088)	(0.0087)
Area Wage Rate	0.0563**	0.0487**	-0.0579**	-0.0504**
	(0.0142)	(0.0141)	(0.0103)	(0.0101)
Area Unemployment Rate	0.0069*	0.0062	0.0023	0.0031
	(0.0040)	(0.0039)	(0.0028)	(0.0028)
Rural	-0.0464**	-0.0339**	0.0214**	0.0091
	(0.0122)	(0.0122)	(0.0088)	(0.0087)
Town	-0.0357**	0.0317**	0.0066	0.0009
	(0.0114)	(0.0113)	(0.0082)	(0.0085)
Urban	-0.0276**	-0.0284**	0.0057	0.0048
	(0.0114)	(0.0113)	(0.0083)	(0.0081)
South	0.0964**	0.0823**	-0.0701**	-0.0552**
	(0.0156)	(0.0155)	(0.0113)	(0.0111)
East	0.0401**	0.0352**	-0.0288**	-0.0246**
	(0.0139)	(0.0137)	(0.0100)	(0.0098)
West	0.1614**	0.1541**	-0.0478**	-0.0404**
	(0.0157)	(0.0155)	(0.0113)	(0.0111)

Appendix Table A.2.b (cont.)

Variable	(3) Junior College		(4) Vocational School	
	Basic Controls	All Controls	Basic Controls	All Controls
Intercept	-0.0936	0.0173	0.3316**	0.3597**
	(0.0643)	(0.0774)	(0.0465)	(0.0553)
R^2	0.0462	0.0661		
Sample Size	9,222	9,222	9,222	9,222

* Significant at the .10 level.
** Significant at the .05 level.
a. Standard errors are in parentheses.

Chapter 4

The Labor Market Effects Of Vocational Education

This chapter analyzes the effects of vocational education in the labor market. Our research differs from previous evaluations of vocational education in three major respects. First, we report results based on a measure of vocational education that is in many ways more accurate and informative than previous measures of vocational education. Our definition is based on actual course enrollment data available in the National Longitudinal Study of the High School Class of 1972.[1]

Second, we report estimates of the effects of vocational education on individual wages, hours, and employment for 8 consecutive years following high school graduation. Consequently, we are able to construct estimates of earnings profiles associated with different levels of vocational education.

Third, we summarize differences in the economic effects of vocational education for the first 8 years in the work force by estimating the present discounted value of income associated with different levels of vocational education. Furthermore, these present value estimates are separated into components attributable to wages, hours, employment, and interactions among the three outcomes. Separate results are presented for men and women and for blacks and Hispanics, by sex.

We found evidence of important positive effects of commercial coursework for women and modest benefits from trade and industrial arts courses for men. Coursework in home economics is associated with a significant decline in earnings for women. Weak evidence suggests that Hispanic women gain more from commercial training than either black or white women.

The first section presents a framework for analyzing the economic effects of vocational education. We then present calculations of average earnings and employment associated with different levels of vocational education and econometric

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[1] In chapter 1, we compare alternative measures of vocational education. Definitions based on high school programs (e.g., academic, general, or vocational) were found to be poor measures of coursework in vocational subjects.

estimates of the effect of vocational education on labor market outcomes, and constructs estimates of age-earnings profiles associated with different curriculums. We close the chapter with a brief set of conclusions.

A Framework for Analyzing Vocational Education

Within the past 20 years, economists have devoted a great deal of attention to studying the economics of education, and, in particular, the rate of return to schooling. Equations of the following type have typically been estimated:

$$(1) \quad \log Y_i = X_i B + \delta S_i + e_i,$$

where Y_i measures wages, earnings, or income of the ith person; S_i measures years of schooling;[2] X_i contains other determinants of wages, such as ability and experience; and e_i is a random error. Variations of this equation have allowed for nonlinearities in the return to schooling, large threshold effects of obtaining a high school or college degree, endogeneity of the choice of schooling, the problem of omitted variable bias, especially with respect to omitted measures of ability, and sample selectivity.[3] In general, the evidence points to a substantial return to high school and college education, perhaps in excess of the rate of return to capital investment.[4]

Improvements in the quality of instruction, and the introduction of new subjects that are more efficiently taught in the classroom than in the labor market can be expected to increase the rate of return to schooling.[5] Federal, State, and local

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[2]Alternatively, S_i can be measured as the total number of academic credits.

[3]See, for example, Rose (1977) and Griliches (1977) for a survey of some of these issues, and Griliches, Hall, and Hausman (1977), and Willis and Rosen (1979) for specific examples.

[4]Followers of the human capital school interpret this finding as providing evidence that schooling increases skills and productivity. Advocates of the screening hypothesis suggest that schooling merely serves to identify highly productive individuals from less productive individuals.

[5]In the long run, of course, short-run changes in rates of return to education can be expected to trigger changes in the behavior of individuals, thus inducing a general rise in the return to all investment.

policies to change student-teacher ratios, provide better facilities, and make coursework more relevant to the labor market are presumably motivated by this desire. Here, we are concerned with whether increasing the availability of vocational education in high school enhances the economic return to a high school education.

Two types of information can be used to investigate this issue. First, changes over time or across different school systems in the availability and quality of vocational education can be compared with corresponding changes in the economic return to high school education. But because other factors may also affect the return to education (for example, returns to alternative capital investments, the availability of student loans, the demand for schooling, the quality of instruction, and demographic cycles), the independent contribution of vocational education may be difficult to identify. A second approach, which will be used here, is based on the comparison of different individuals with different levels of vocational coursework. In this section, we will examine what can be learned about vocational education with these data.

Suppose that academic and vocational courses differ in their economic benefits. The effects of academic (A_i) and vocational (V_i) coursework are measured by δ and θ, respectively, in this equation:

$$(2) \quad Y_i = X_i B + \delta A_i + \theta V_i + e_i,$$

where Y_i is an appropriate measure of economic gain, such as the present discounted value of lifetime income or annual income.[6] Because total schooling is the sum of academic and vocational courses, we can rewrite equation 2 as

$$(3) \quad Y_i = X_i B + \delta S_i + (\theta - \delta) V_i + e_i.$$

In models that limit analysis to individuals with a fixed level of schooling (e.g., $S_i = 12$, a high school degree), the coefficient on vocational education measures the benefits of vocational education relative to academic courses.[7] If this

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[6]The appropriate measure of economic gain depends on whether the gains (or losses) from vocational education vary over time. This issue will be discussed later.

[7]Most evaluations of vocational education fall into this category, for example, Grasso and Shea (1979), Meyer and Wise (1979), Hofferth (1980), and Gustman and Steinmeier (1981).

coefficient is positive, there are benefits to increasing the percentage of coursework devoted to vocational coursework. Consequently, estimates of equation 3 provide evidence of whether it would be efficient to shift individuals into additional vocational coursework.[8]

As individuals take more vocational courses, however, satisfying the excess demand for vocational skills, the relative advantage of vocational education will fall. In the absence of barriers to taking more vocational education, individuals have a powerful incentive to shift to vocational courses up to the point where the gains of increased vocational coursework are exhausted. Consequently, estimates of equation 3 also provide evidence of (1) whether individuals respond to differences in the benefits of alternative curriculums or (2) the existence of barriers to enrollment in different curriculums.[9]

So far we have treated the process of acquiring skills in high school as a black box. Presumably the kinds of skills acquired in vocational education, if any, differ substantially from those acquired in academic courses. In the ensuing analysis we will distinguish three skills that are potentially acquired in high school:

1. Distinct job skills that are of immediate use in the labor market, for example, typing, computer programming, or auto mechanics;

2. General learning skills that enable individuals to learn job skills rapidly and adjust quickly to changing job demands; and

3. Behavioral skills, such as discipline, good work habits, and the ability to perform in a competitive, regimented environment.

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[8]We may want to complicate the analysis by allowing for increasing or decreasing returns to concentration in vocational education. If there are increasing benefits to vocational coursework, then it would be efficient to increase the number of individuals taking a high level of coursework without increasing the number taking one or two courses.

[9]Explicit tracking of individuals into vocational or academic programs or into accelerated and regular courses, and limitations on entry to special area high schools or programs, are examples of potential barriers.

Vocational education presumably puts the most emphasis on teaching distinct job skills, whereas academic subjects presumably have a comparative advantage in teaching general learning skills. Academic and vocational courses may not differ systematically in their instruction in behavioral skills. Of course, particular vocational or academic courses may excel in all three areas.

Within this framework, the economic benefits of a high school education are a function of the total level of skills acquired in each category. A large estimated rate of return to schooling does not necessarily imply that vocational education teaches distinct job or general learning skills. These returns could be generated solely by academic training or behavioral skills that are taught in either curriculum. However, if we accept the hypothesis that courses in mathematics, sciences, English, and other academic subjects teach distinct job or general learning skills, then estimates of the relative effect of vocational education ($\theta - \delta$) in equation 3 provide a test of whether vocational education provides unique market skills.[10] Estimates of ($\theta - \delta$) that are close to zero provide evidence that academic and vocational skills are valued equally in the labor market. Under these conditions, the hypothesis that vocational courses convey no unique skills automatically implies that academic courses also convey no unique skills.

Although academic or vocational coursework may be relatively more or less valued in the labor market over a person's lifetime, our characterization of the two curriculums implies vastly different earnings profiles over time. To illustrate, make the strong assumption that vocational education teaches only distinct job skills and behavioral skills and that academic courses teach only general learning skills and behavioral skills. It is also realistic to assume that academic and vocational students work in different occupations, which offer different opportunities for on-the-job training. Jobs that offer good opportunities for on-the-job training will be referred to as Type I jobs. Jobs that offer fewer opportunities for such training will be called Type II jobs. The implications of these assumptions are illustrated in graph 1, which shows the earnings profiles of vocational and academic students in different occupations.

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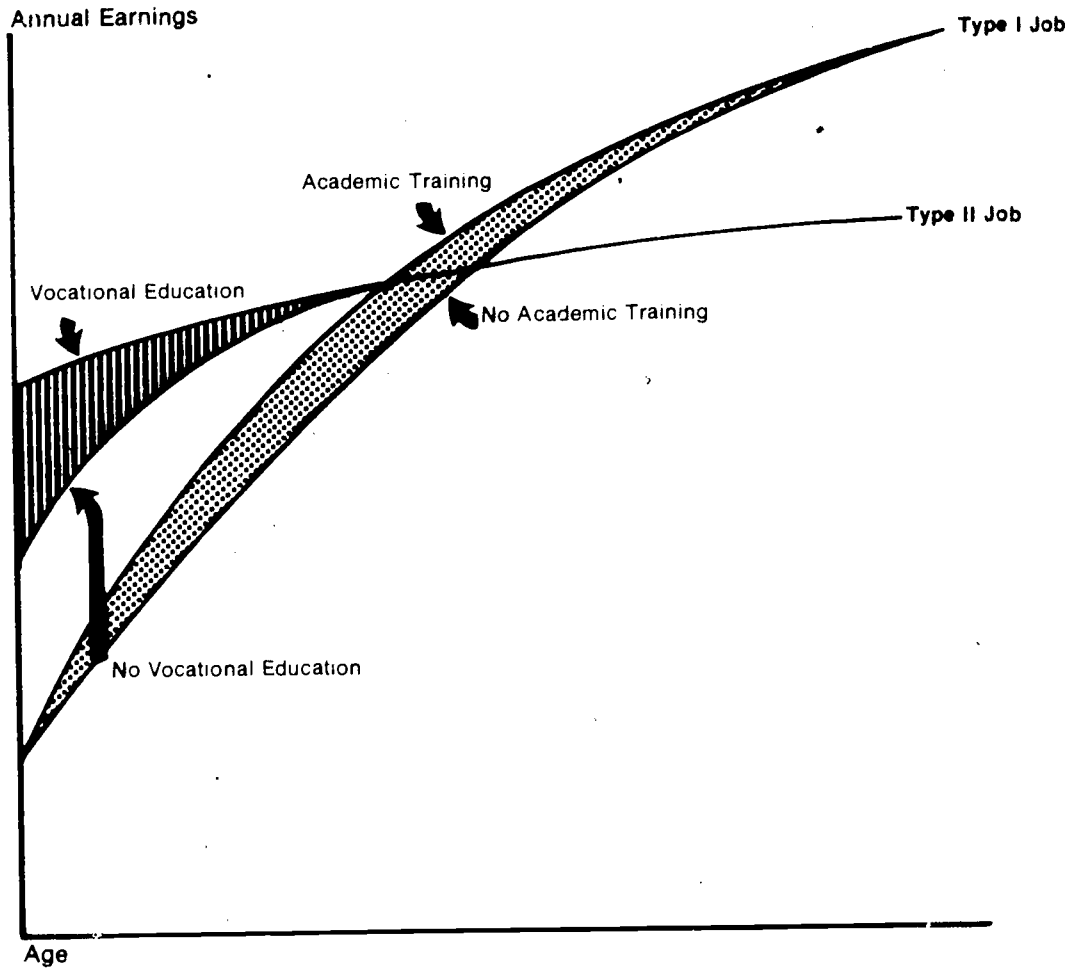
[10]The hypothesis that academic or vocational courses teach unique skills not available in other courses cannot be directly tested with the data used in this research.

Graph 1: Age earnings profiles for individuals in different occupations and with different training.



In Type II occupations, vocational education students have an earnings profile that is initially higher than the profile for students without vocational education. The difference represents lower on-the-job training costs for individuals with distinct job skills acquired in high school.[11] Similarly, in Type I occupations, academic students learn job skills at a faster rate than do nonacademic students, thus lowering their cost of training. Vocational students in Type II occupations and academic students in Type I occupations will have radically different earnings profiles even though their lifetime incomes may be the same.[12] The model can be easily generalized to a large number of occupations characterized by different opportunities for on-the-job training.

This analysis implies that vocational education should be evaluated on the basis of lifetime earnings profiles rather than on the basis of a single estimate of the effect of vocational education.[13] Unfortunately, almost all previous evaluations of vocational education have ignored the possibility of differences over time in earnings effects. Such differences can be compared by calculating the present discounted value (PV) of earnings differentials over the life of the individual:[14]

$$(4) \quad PV = \sum_{t=0}^{T} \frac{\Delta Y_t}{(1+r)^t}$$

Where Y_t is the difference in earnings in year t, and r is the rate at which earnings are discounted back to the present.

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[11]Gustman and Steinmeier (1980) analyzed this possibility.

[12]If discount rates are not the same for all individuals, then only some individuals will be exactly indifferent between alternative income streams. Individuals with high discount rates will prefer income sooner rather than later.

[13]Other factors, in addition to the ones mentioned here, may also contribute to differences in earnings profiles, for example, different rates of skill obsolescence, differences in implicit long-term contracts, and differences in the role of seniority in collective bargaining agreements.

[14]Hanoch (1967) constructed estimates of earnings profiles associated with different levels of schooling. He produced estimates of the internal rate of return attributable to changes in the number of years of schooling.

Finally, we consider the fact that many individuals do not enter the labor market directly after high school, but rather attend postsecondary vocational school, junior college, or college. The relative value of vocational education may differ substantially depending on the individual's postsecondary activity. Students with distinct job skills acquired in vocational education may effectively diminish the value of their vocational training by entering the labor market for college graduates. Moreover, students without substantial academic training may gain less from college than would individuals with more academic training. The issue is important because individuals with differing levels of vocational education are found in all four postsecondary activities (chapter 3). For policy purposes, the average value of vocational education over all four labor markets is a more relevant measure of its effectiveness than an evaluation based on a single labor market.[15] This can be written symbolically as

$$(5) \quad \overline{PV} = \sum_{i=1}^{4} p_i \, PV_i,$$

where $\overline{PV}$ is the average valuation of vocational education, PV_i is the present value of earnings differentials in the ith labor market, and p_i is the percentage of the population in the ith activity. This formulation implies that if vocational education has a relatively negative effect on the income of college graduates, it could be counterbalanced, more or less, by a positive effect in other postsecondary activities. In fact, if an equilibrium is reached, differences in expected benefits from vocational education are likely to be exactly offsetting for those individuals on the margin.[16] Consequently, evidence that vocational education generates economic gains in a particular labor market does not, by itself, prove that, overall, individuals would gain from additional vocational education. This conclusion depends on evidence from all labor markets. Following most of the previous research on vocational education, this

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[15]However, knowledge of the effectiveness of vocational education in different labor markets is an important source of information for designing vocational education for different types of people with different interests and needs.

[16]Equilibrium is defined here as a situation in which individuals have no economic incentive to change their level of vocational coursework.

chapter will focus on the economic effects of vocational education for individuals who directly enter the labor force after high school. In future work, we will examine the effects of vocational education in alternative labor markets and obtain estimates of the average valuation of vocational education.

The analysis in this section has reached three main conclusions that will influence the empirical analysis in later sections.

1. We should evaluate the economic benefits of vocational education on the basis of differences in the present value of lifetime income, rather than on differences in income for a single arbitrary year.

2. We should test the hypothesis that there are differences in earnings profiles between individuals with different levels of vocational education. This is implied by the assumption that vocational education emphasizes teaching distinct job skills as opposed to general learning skills.

3. Estimates of the effect of vocational education in individual labor markets (e.g., the labor markets for high school or college graduates) are only one part of the overall evaluation of vocational education in the labor market. A complete evaluation of vocational education depends on evidence of the relative effectiveness of vocational education in all labor markets.

Average Labor Market Outcomes by Race and Sex

As noted, the empirical analysis is based on the National Longitudinal Survey of the High School Class of 1972 (NLS72), a data set that consists of a single cohort of 23,000 men and women, all of whom were seniors in the spring of 1972. Individuals were sampled randomly from about 1,300 high schools. Schools were selected as a stratified random sample in order to overrepresent minority and disadvantaged students.

Theoretical considerations suggest the importance of observations on the lifetime earnings of individuals. Most longitudinal data sets fail to satisfy this requirement, and the NLS72 is no exception. However, annual data on wages, hours, earnings, and weeks worked are available for 8 consecutive years after high school graduation. Our analysis is based on these 8 years of data.

Individuals were asked to report their hours and weekly earnings in October and the number of weeks employed from October to October of each year. Wages and earnings have been deflated by the October consumer price index for each year so that changes over time in income reflect real, as opposed to nominal, earnings growth. Although we allow vocational education to have different effects on the three components of annual earnings (hourly wages, weekly hours, and annual weeks worked), these estimates are combined to obtain a single estimate of the effect of vocational education on annual earnings. Individuals were also asked to estimate their calendar year earnings from January through December of each year. Because individuals were surveyed in October, this estimate of annual earnings is, in part, based on a forecast of individual earnings in the fourth quarter. Estimates based on this model are likely to be less reliable than our other estimates. Nevertheless, they provide a convenient check on the consistency of the empirical results.

Vocational education is measured by the number of courses in vocational subjects as a percentage of total courses. Chapter 1 analyzed a variety of measures of vocational education, and concluded that the best measure of participation in vocational education is based on actual course enrollment data. Categorical measures of vocational education, which have been used extensively in previous research on vocational education, were found to be prone to substantial measurement error. In particular, many individuals identified as being in an academic program were found to take more vocational coursework than did individuals in a vocational program. The premise that individuals fit neatly into one of three or more standard programs (e.g., academic, general, commercial, technical) appears to be false (chapter 1).[17,18]

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[17]A measure of vocational education based on the level of vocational coursework also permits a number of new questions to be asked: Does the intensity or level of vocational education affect earnings? Are these effects diminishing or increasing with the level of vocational education? Are there interactions between coursework in vocational subjects, math, science, and English?

[18]Although we will not comment extensively on the results, appendix table A-3 presents econometric estimates of earnings and weeks worked equations for alternative definitions of vocational education.

Table 1 presents calculations of average weekly earnings and average annual weeks worked by level of vocational coursework for selected years over the period 1972 to 1979. Individuals are grouped into three categories on the basis of their vocational coursework: (1) low participation in vocational education, 0 to 15 percent; (2) medium participation, 15 to 35 percent; and (3) high participation, 35 percent and over. Of course, differences in earnings and employment depend on a variety of other factors such as ability, motivation, and family background. Consequently, differences in unconditional means cannot be attributed solely to differences in vocational education. Nevertheless, simple averages of earnings and employment provide a rough indication of whether vocational education has any effects in the labor market. Causal estimates of the effect of vocational education on income will be presented in the next section.

Results for all women are presented in the top half of table 1.a, and table 1.c shows the results for black, Hispanic, and white women. In general, vocational education seems to be associated with gains in weekly earnings and weeks worked, although differences in employment vanish by 1979. Employment differences associated with vocational education seem to be much larger for Hispanic women than for black and white women. In 1976, Hispanic women in the high category worked 42 weeks a year, compared with 32 weeks a year in the low category, a difference of 10 weeks a year. Comparable differences between the high and low categories in 1976 were 7 weeks and 5 weeks for black women and white women, respectively. These gains were almost completely eroded by 1979 for all ethnic groups.

For all three ethnic groups, differences in earnings seemed to fluctuate over time. In general, earnings differentials tended to be quite large in 1972 and in 1976. For example, in 1972 Hispanic women in the high category earned $23 more per week than did individuals in the low category. After 1972, however, earnings differentials fell rapidly for Hispanic women. In 1979, differences in weekly earnings for high and low individuals were $2, $4, and $8, for black, Hispanic, and white women, respectively.

The results for men look different. Vocational education was associated with both large gains and large losses for Hispanic men. Differences in weekly earnings between individuals in the high and low categories ranged from $19 to $21 over the years 1972, 1974, and 1976. By 1979, however, the earnings differential was negative. Employment differentials were large and negative for Hispanic men, except in 1979. In 1973, Hispanic men in the high category worked 7 fewer weeks

Table 1.a

Average Weekly Earnings and Annual Weeks Worked by Level of Participation in Vocational Education

Vocational Level by Group(%)	Weekly Earnings ($ 1972)				Annual Weeks Worked			
	1972	1974	1976	1979	1973	1974	1976	1979
Women								
Low 0-15	75.41 (36.70)[a] 616	87.57 (37.80) 576	87.73 (37.65) 557	86.21 (40.01) 488	32.54 (19.42) 892	30.78 (20.98) 882	29.24 (21.82) 848	32.44 (21.67) 607
Medium 15-35	75.37 (33.24) 754	86.01 (30.95) 741	94.04 (39.77) 709	89.99 (42.09) 650	33.71 (18.95) 1,108	31.80 (21.07) 1,104	31.12 (21.53) 1,073	32.61 (21.66) 831
High 35+	81.91 (32.15) 984	89.47 (27.47) 930	98.78 (36.97) 877	92.74 (40.58) 725	37.51 (18.14) 1,282	35.76 (20.36) 1,264	34.31 (21.28) 1,235	33.84 (21.81) 962
Men								
Low 0-15	105.10 (48.53) 505	130.33 (58.84) 531	140.23 (55.18) 523	151.56 (61.73) 341	40.86 (15.73) 614	44.57 (13.47) 560	44.64 (13.12) 557	47.27 (10.52) 352
Medium 15-35	108.73 (51.94) 870	129.28 (54.72) 937	141.52 (57.59) 947	152.92 (63.03) 656	41.80 (15.25) 1,043	45.20 (12.70) 983	44.91 (13.06) 972	47.63 (10.46) 674
High 35+	114.05 (51.45) 1,115	133.54 (56.73) 1,167	146.04 (62.25) 1,154	159.40 (67.01) 843	42.17 (14.50) 1,263	44.20 (13.37) 1,219	44.89 (12.74) 1,216	47.42 (10.35) 878

a. Standard errors are in parentheses. The sample size for each statistic is shown below the standard error.

The vocational level for women does not include courses in home economics. The sample includes individuals with 12 years of schooling as of 1976. A number of individuals who attended school for the first time after 1976 were also excluded from the 1979 calculations.

Table 1.b

Average Weekly Earnings and Annual Weeks Worked by Level of Participation in Vocational Education: Men

Vocational Level by Group(%)	Weekly Earnings ($ 1972) 1972	1974	1976	1979	Annual Weeks Worked 1973	1974	1976	1979
Black Men								
Low 0-15	99.67 (49.31)[a] 87	121.00 (64.30) 86	125.82 (56.01) 89	123.68 (60.98) 55	36.18 (17.97) 110	39.33 (18.49) 100	43.53 (14.85) 94	45.56 (13.61) 57
Medium 15-35	101.69 (53.03) 166	118.51 (52.36) 181	125.25 (55.35) 184	129.08 (55.26) 129	37.98 (17.85) 208	44.41 (13.48) 189	44.07 (14.19) 181	45.91 (13.26) 128
High 35+	109.41 (46.35) 121	120.75 (55.14) 142	119.24 (54.93) 141	138.05 (61.76) 95	37.00 (17.71) 153	41.03 (15.89) 154	40.53 (17.39) 155	44.87 (14.22) 95
Hispanic Men								
Low 0-15	87.00 (36.45) 22	112.57 (45.73) 24	124.00 (45.24) 27	152.66 (48.31) 15	41.62 (14.40) 29	44.89 (12.86) 27	48.26 (10.96) 23	43.62 (17.15) 16
Medium 15-35	105.30 (69.10) 40	125.69 (56.32) 49	135.72 (58.54) 50	148.10 (50.03) 31	41.64 (15.67) 50	45.26 (11.74) 53	45.16 (12.13) 51	47.55 (11.70) 29
High 35+	108.26 (51.22) 55	131.21 (61.12) 65	144.17 (68.62) 59	149.84 (74.38) 49	34.65 (19.40) 69	38.82 (18.54) 66	43.00 (13.75) 62	47.28 (12.41) 53

table 1.b (cont.)

Vocational Level by Group (%)	Weekly Earnings ($ 1972)				Annual Weeks Worked			
	1972	1974	1976	1979	1973	1974	1976	1979
White Men								
Low	107.31	133.25	144.46	157.16	41.90	45.76	44.69	48.39
0-15	(48.73)	(58.08)	(54.98)	(61.19)	(15.08)	(11.78)	(12.82)	(9.17)
	396	421	407	271	475	433	440	279
Medium	110.69	132.28	146.09	159.43	42.82	45.40	45.10	48.06
15-35	(50.39)	(54.91)	(57.37)	(64.21)	(14.31)	(12.56)	(12.78)	(9.54)
	664	707	714	496	785	741	740	517
High	114.98	135.59	150.12	162.97	43.43	45.04	45.68	47.76
35+	(52.08)	(56.46)	(61.93)	(66.64)	(13.24)	(12.36)	(11.65)	(9.53)
	939	960	954	699	1,041	999	999	730

a. Standard errors are in parentheses.
The sample size is shown below the standard error.

Table 1.c

Average Weekly Earnings and Annual Weeks Worked by
Level of Participation in Vocational Education: Women

Vocational Level by Group(%)	Weekly Earnings ($ 1972)				Annual Weeks Worked			
	1972	1974	1976	1979	1973	1974	1976	1979
Black Women								
Low	74.98	88.32	88.62	90.44	27.09	27.90	29.48	35.29
0-15	(36.55)[a]	(41.77)	(39.28)	(38.19)	(20.04)	(20.44)	(21.61)	(20.56)
	107	115	126	98	162	178	172	117
Medium	77.26	86.94	93.98	97.44	27.48	26.99	32.29	40.19
15-35	(31.81)	(33.42)	(36.88)	(49.83)	(19.46)	(21.67)	(21.21)	(18.52)
	97	112	133	120	172	174	171	134
High	86.08	92.24	103.24	91.98	30.75	32.75	36.47	35.36
35+	(29.60)	(27.15)	(42.48)	(35.97)	(20.51)	(20.34)	(20.68)	(20.90)
	90	95	98	65	130	126	119	77
Hispanic Women								
Low	65.19	87.71	81.53	86.73	27.76	29.04	32.26	36.73
0-15	(39.76)	(37.88)	(22.06)	(23.58)	(19.30)	(21.49)	(22.48)	(19.34)
	26	30	25	22	46	44	38	25
Medium	75.06	88.73	99.97	84.24	29.47	29.73	31.83	35.00
15-35	(46.80)	(34.80)	(41.44)	(36.19)	(19.05)	(21.19)	(20.90)	(20.20)
	34	39	38	35	55	52	52	40
High	88.34	94.36	103.10	90.13	35.23	38.80	41.97	38.34
35+	(33.08)	(26.64)	(32.82)	(35.03)	(19.13)	(18.71)	(16.74)	(17.99)
	44	53	51	43	62	64	58	50

table 1.c (cont.)

Vocational Level by Group (%)	Weekly Earnings ($1972) 1972	1974	1976	1979	Annual Weeks Worked 1973	1974	1976	1979
White Women								
Low 0-15	74.91 (36.58) 483	87.36 (36.76) 431	87.83 (37.93) 406	85.05 (41.24) 368	34.15 (19.02) 684	31.69 (21.04) 660	28.99 (21.86) 638	31.49 (22.01) 465
Medium 15-35	75.09 (32.62) 623	85.66 (30.23) 590	93.64 (40.37) 538	88.60 (40.26) 495	35.19 (18.57) 881	32.88 (20.82) 878	30.85 (21.64) 850	30.91 (22.02) 657
High 35+	81.14 (32.33) 850	88.80 (27.54) 782	97.88 (36.43) 728	93.00 (41.44) 617	38.45 (17.60) 1,090	35.93 (20.44) 1,074	33.65 (21.49) 1,058	33.43 (22.08) 835

a. Standard errors are in parentheses.
The sample size is shown below the standard error.

than did individuals with less vocational education. Employment differentials were somewhat negative for black men and essentially zero for white men throughout the period. Earnings differentials fluctuated between positive and negative values for both black and white men.

Next we will present estimates of the effect of vocational education on wage rates, hours, and annual weeks worked that control for other important determinants of these outcomes.

Empirical Estimates of the Relative Effects of Vocational Education on Income

Most of the previous research on vocational education has defined the high school curriculum in terms of mutually exclusive, categorical variables (e.g., academic, general, commercial, or technical programs). Earlier, however, we argued that it is preferable to define vocational education on the basis of actual course enrollment data.[19] Use of such data allows us to test the hypothesis that the effect of vocational education on earnings and employment is nonlinear, that is, increasing or decreasing with the level of vocational education. Also, vocational education may interact with other subjects such as mathematics, science, and English in the determination of earnings and employment. Of course, the interpretation of the estimated effect of vocational education on income will be highly dependent on which course variables are included in the equation. In the results reported in this chapter, measures of vocational education are the only course variables included in the equations. Thus, the coefficient on the percentage of courses taken in vocational education should be interpreted as the change in income that is associated with an increase in vocational coursework and an equivalent decrease in academic coursework.[20,21]

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[19] See also chapter 1.

[20] Since all individuals in our data set are high school graduates and took approximately the same number of courses, vocational coursework can be increased only at the expense of academic coursework.

[21] The effect of an increase in vocational education (decrease in academic coursework) of 20 percentage points can be found by multiplying our vocational education coefficients by 0.20.

The estimates reported in all tables are based on a specification that includes individual ability, class rank, parents' income, marital status, number of dependents, area wages and unemployment, high school work experience, and a set of regional indicators. For the most part, these variables are determined prior to, or independently of, vocational education. We have excluded, however, accumulated work experience, on-the-job training, job tenure, and a union indicator from the specification because these variables are likely to be determined, in part, by vocational education. The theoretical discussion earlier suggested the existence of an important link between the level of vocational education and subsequent on-the-job training. Although estimates of the complete equations are of interest in their own right, we will focus primarily on the results pertaining to vocational education. Estimates of the complete equations are presented in appendix tables A.1 and A.2 for women and men. Simple statistics for all variables are given in appendix table A.4. The tables presented in the text contain estimates of the effect of vocational education on log wages, log hours, and annual weeks worked. Together, these three outcomes determine annual income. We also present estimates based on an alternative measure of annual income to provide a check on the consistency of the empirical results.[22]

Estimates of the effects of vocational education on women are presented in table 2. Three different types of vocational education were distinguished: commercial, technical,[23] and home economics. Commercial coursework is by far the dominant vocational subject for women--over 80 percent of all women take some commercial coursework.[24] In our sample, the average level of commercial coursework was 29 percent.

The data in table 2 strongly suggest that commercial courses raise the income of women during the first decade after high school. Although the estimates for technical and home economics courses are frequently imprecise, it seems likely that coursework in home economics is associated with a significant decrease in income, throughout the period 1972 to 1979. Coursework in

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[22]See page 93 for a discussion of the different labor market outcomes.

[23]Technical subjects include trade, industrial arts, agriculture, health, and distributive education.

[24]See chapter 1 for a detailed analysis of the typical course profiles for men and women.

Table 2

Estimates of the Effects of Vocational Education on Labor Market Outcomes: Women

	1972	1973	1974	1975	1976	1977	1978	1979
Log Wage Eq.								
Commercial	0.1754** (0.0449)[a]	0.1599** (0.0461)	0.0551 (0.0404)	0.0129 (0.0442)	0.1567** (0.0430)	0.0595 (0.0521)	0.0825 (0.0523)	0.0412 (0.0555)
Technical	0.3530** (0.1159)	0.2198* (0.1209)	-0.1143 (0.1019)	-0.1953* (0.1129)	-0.0914 (0.1115)	0.0290 (0.1428)	-0.1233 (0.1417)	-0.1134 (0.1504)
Home Economics	0.0060 (0.1165)	-0.0534 (0.1199)	-0.1276 (0.1030)	-0.3449** (0.1113)	-0.4014** (0.1077)	-0.3804** (0.1288)	-0.4225** (0.1298)	-0.5153** (0.1367)
R^2	0.0715	0.0815	0.0916	0.0955	0.1261	0.0829	0.0944	0.1004
Sample Size	1,813	1,757	1,797	1,804	1,765	1,452	1,456	1,412
Log Hours Eq.								
Commercial	0.1109** (0.0476)	0.0302 (0.0390)	0.0406 (0.0336)	0.0752** (0.0380)	0.1423** (0.0400)	0.0084 (0.0454)	0.0362 (0.0480)	0.1042* (0.0581)
Technical	-0.3304** (0.1228)	-0.1081 (0.1024)	-0.0518 (0.0847)	-0.1496 (0.0971)	0.0505 (0.1039)	0.0925 (0.1242)	0.0594 (0.1299)	0.1049 (0.1573)
Home Economics	0.0778 (0.1235)	0.1237 (0.1016)	0.0206 (0.0856)	-0.0482 (0.0957)	0.1061 (0.1004)	-0.1309 (0.1120)	0.0647 (0.1191)	0.2346 (0.1430)
R^2	0.0425	0.0236	0.0340	0.0230	0.0283	0.0340	0.0573	0.0419
Sample Size	1,813	1,757	1,797	1,804	1,765	1,452	1,456	1,412

Table 2 (cont.)

	1972	1973	1974	1975	1976	1977	1978	1979
Weeks Worked Eq.								
Commercial	--	8.0364** (2.0429)	8.9275** (2.1538)	12.0211** (2.3832)	10.6892** (2.3132)	6.3166** (2.8277)	7.4002** (2.7983)	2.8991 (2.8278)
Technical	--	-4.9843 (5.1063)	-1.5007 (5.2546)	10.6620* (5.9744)	4.1391 (5.8838)	-9.5097 (7.3343)	-3.4137 (7.2664)	-9.8187 (7.3403)
Home Economics	--	-5.6015 (5.0869)	-2.5420 (5.2962)	1.7073 (5.9052)	-2.8013 (5.7167)	-4.9113 (6.9776)	-5.5199 (6.8944)	-3.3233 (6.9218)
R^2	--	0.1877	0.1830	0.1170	0.1402	0.1121	0.1298	0.1347
Sample Size	--	2,431	2,643	2,575	2,624	1,966	1,965	1,854
Annual Income								
Commercial	--	1278.285** (344.6485)	1282.068** (258.7165)	1480.162** (289.612)	1542.34** (303.8967)	1195.823** (378.3249)	1312.702** (395.8181)	622.9515 (412.2374)
Technical	--	-116.8872 (933.6934)	861.2560 (635.9072)	642.6248 (723.6553)	-170.5490 (768.5397)	-1154.41 (995.1213)	-1040.83 (1051.701)	-540.5251 (1100.075)
Home Economics	--	355.4147 (852.3285)	-536.3367 (643.4977)	-871.7802 (728.2574)	-1234.69 (760.6394)	-1692.99** (928.5117)	-726.0629 (975.5432)	-507.7139 (1012.953)
R^2	--	0.1738	0.1471	0.1046	0.1126	0.1029	0.1012	0.0970
Sample Size		1,087	2,362	2,503	2,510	1,909	1,913	1,779

*Significant at the .10 level.
**Significant at the .05 level.

a. Standard errors are in parentheses.

Notes: The regressions for 1972-1976 include individuals with 12 years of schooling as of 1976. A number of individuals who attended school for the first time after 1976 were also excluded from the 1977-1979 regressions. The regressions also include the set of variables listed in appendix table A.1.

technical subjects tends to generate some gains in wages in 1972 and 1973 and losses throughout the remaining 6 years. The effect of technical coursework on employment is, for the most part, negative. This latter finding may reflect difficulties faced by women in obtaining employment in fields traditionally dominated by men.

The effects of commercial coursework on wages, hours, and weeks worked follow a general pattern that is consistent with the theoretical model presented earlier. In 1972, an increase in commercial coursework of 40 percentage points (about two standard deviations) stimulated an increase in wages of 7 percent, an increase in hours worked of 4.5 percent, and an increase in employment of 3 weeks per year. By 1979, these effects had declined substantially. An identical increase in commercial coursework was associated with an increase in wages of 1.5 percent and an increase in employment of 1 week per year. These effects are presented in graph 2. Although the effect of commercial courses on weekly hours is somewhat unstable, the effect on wages and employment clearly declines over time.[25]

These results are consistent with the hypothesis that individuals initially receive significant economic benefits from acquiring distinct commercial skills in vocational education. Furthermore, these benefits decline over time, as predicted by the model. Because we observed only 8 years of a typical 40- to 45-year working life, we are not yet able to observe whether negative earnings differentials arise between individuals with different amounts of commercial education. Confirmation of this theoretical prediction will have to await the availability of additional data.

Estimates of the effects of vocational education on men are presented in table 3. Three different types of vocational education were distinguished: commercial, trade and industrial arts, and other technical courses. Over 60 percent of all men take some coursework in trade and industrial arts. Somewhat less than 60 percent of all men take commercial courses.[26] As

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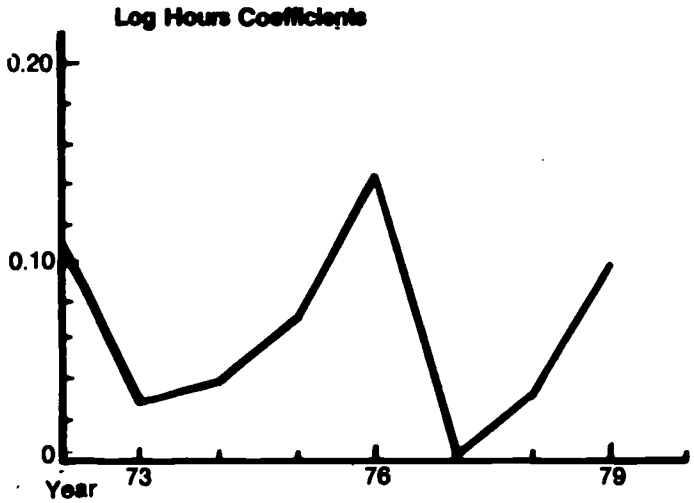
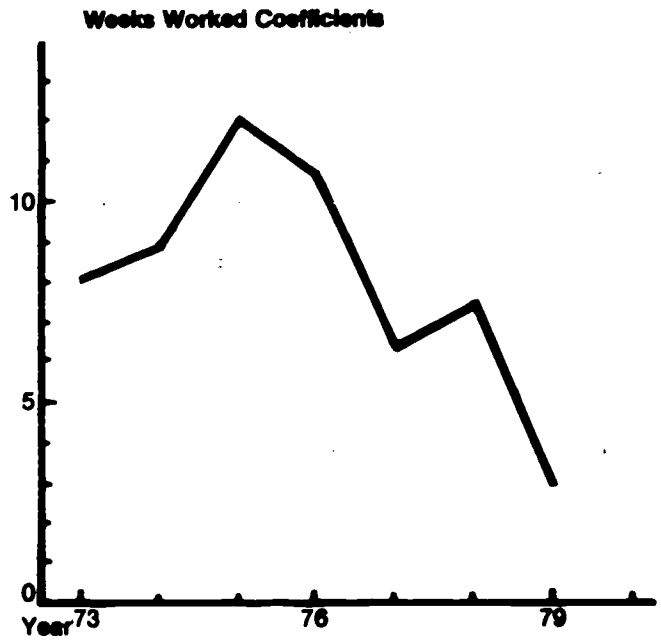
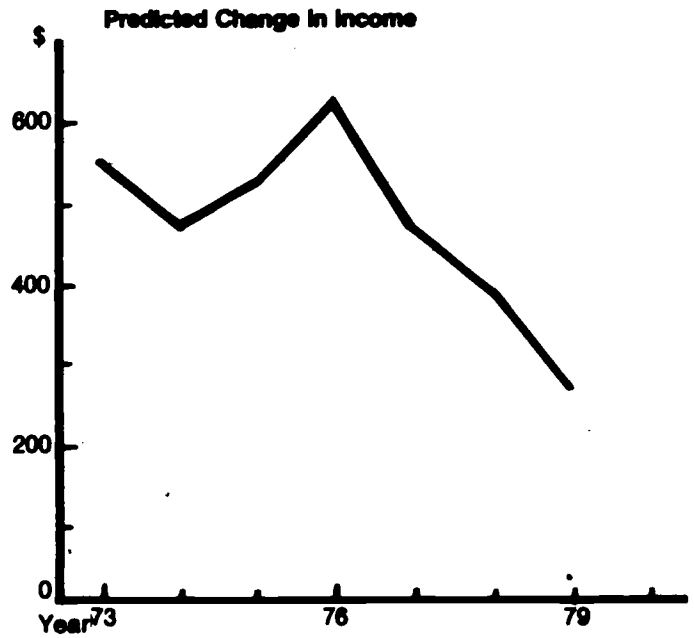
[25]The fact that the coefficients exhibit some instability is to be expected since they are estimates of unknown population parameters with some variance. This lends additional support to the strategy of evaluating vocational education on the basis of a large number of years.

[26]For more details, see chapter 1.

Graph 2: The effect of commercial courses on wages, hours, and weeks worked by women.







Source: Table 2

Table 3

Estimates of the Effects of Vocational Education on Labor Market Outcomes: Men

	1972	1973	1974	1975	1976	1977	1978	1979
Log Wage Eq.								
Commercial	0.0309 (0.0793)[a]	0.0420 (0.0797)	-0.1739** (0.0792)	-0.0242 (0.0775)	-0.0599 (0.0767)	0.0612 (0.0936)	0.1337 (0.0953)	0.1280 (0.0991)
Trade & Industrial Arts	0.2055** (0.0549)	0.0815 (0.0557)	0.0497 (0.0559)	0.0743 (0.0540)	0.0929* (0.0525)	0.0074 (0.0664)	0.0871 (0.0665)	0.0706 (0.0690)
Other Technical	0.3903** (0.1156)	0.1094 (0.1186)	-0.2518** (0.1119)	-0.0241 (0.1076)	-0.1969* (0.1079)	0.1146 (0.1271)	-0.0678 (0.1279)	-0.1781 (0.1311)
R^2	0.0436	0.0691	0.1016	0.0826	0.1174	0.1096	0.1277	0.1449
Sample Size	1,891	1,825	1,977	2,003	2,084	1,422	1,429	1,372
Log Hours Eq.								
Commercial	0.0962 (0.0666)	-0.0570 (0.0476)	0.0256 (0.0444)	0.0095 (0.0397)	0.0159 (0.0382)	-0.0053 (0.0417)	-0.0603 (0.0395)	-0.0444 (0.0472)
Trade & Industrial Arts	0.0559 (0.0461)	0.0644* (0.0333)	0.0294 (0.0313)	-0.0117 (0.0276)	-0.0531** (0.0262)	-0.0179 (0.0296)	-0.0223 (0.0276)	-0.0026 (0.0328)
Other Technical	-0.0128 (0.0971)	0.0950 (0.0709)	0.0760 (0.0627)	0.0359 (0.0551)	0.0396 (0.0537)	-0.0200 (0.0567)	0.0166 (0.0530)	0.1313** (0.0624)
R^2	0.0292	0.0438	0.0485	0.0237	0.0381	0.0324	0.0453	0.0517
Sample Size	1,891	1,825	1,977	2,003	2,084	1,422	1,429	1,372

Table 3 (cont.)

	1972	1973	1974	1975	1976	1977	1978	1979
Weeks Worked Eq.								
Commercial	--	1.0811 (3.0336)	0.8594 (2.4641)	-2.2645 (2.6752)	1.3428 (2.5302)	5.3395* (2.8190)	3.6234 (2.6767)	1.8346 (2.6062)
Trade & Industrial Arts		3.3753 (2.1051)	-1.2317 (1.7505)	1.9657 (1.8466)	0.7075 (1.7437)	2.4780 (1.9733)	0.1038 (1.8745)	-0.3777 (1.8015)
Other Technical		6.3600 (4.4751)	-0.1501 (3.5409)	5.1606 (3.6990)	2.5160 (3.4965)	2.7750 (3.7796)	-1.4203 (3.5684)	-0.9068 (3.4388)
R^2	--	0.0997	0.0628	0.0686	0.0547	0.0407	0.0344	0.0497
Sample Size	--	2,022	2,234	2,160	2,249	1,531	1,534	1,461
Annual Income								
Commercial	--	258.9923 (761.6318)	175.9560 (567.6735)	88.5688 (605.9548)	120.2276 (622.8759)	1292.2590 (853.5290)	336.9118 (906.4548)	-52.3207 (911.2219)
Trade and Industrial Arts	--	1478.1510** (526.9718)	742.2461* (398.5082)	667.0988 (420.3137)	845.0077** (427.9745)	670.2267 (598.3049)	258.8872 (636.0003)	-449.3947 (633.4236)
Other Technical	--	1472.411 (1106.5190)	-279.3533 (818.6724)	928.2342 (835.9739)	-110.9021 (855.6780)	518.5247 (1160.9190)	66.9721 (1226.4730)	-620.8011 (1215.323)
R^2	--	0.1146	0.1264	0.1006	0.1164	0.1307	0.1398	0.1542
Sample Size		1,207	2,130	2,149	2,215	1,446	1,448	1,377

*Significant at the .10 level.
**Significant at the .05 level.

a. Standard errors are in parentheses.

Notes: see table 2.

is evident in table 3, the results for men are much less clear-cut than is the case for women. The standard errors of the coefficient estimates are fairly large. Thus, the estimates are unstable and few coefficients are statistically significant by conventional standards. The coefficients for commercial courses and for trade and industrial arts are also presented in graphs 3 and 4, respectively.

The commercial coefficients tend to fluctuate fairly randomly around zero. They fail to provide evidence that commercial coursework has a large and systematic effect on income. Apparently, men with commercial training do not take (or are unable to take) jobs that allow them to make major use of their vocational training. Nevertheless, the pattern of coefficients for trade and industrial arts roughly supports the notion that these courses generate initial income gains for men. Wage effects are large for the first few years after high school. Results based on the alternative measure of annual income confirm the pattern of large but declining benefits of coursework in trade and industrial arts. In fact, by 1979 trade and industrial arts had a negative (although statistically insignificant) effect on annual income.

In the remainder of this chapter, we will summarize our empirical results for men and women in terms of the present value of the income differentials associated with different levels of coursework in each vocational subject. Because our data span 8 years, or about 20 percent of the working life of a typical individual, these estimates obviously do not incorporate information on the entire income profiles associated with different course levels. Consequently, our estimates of the present value of income differentials will appear to be high for vocational fields that follow the theoretically predicted pattern of large initial, and subsequent declining, economic benefits. Commercial courses for women and trade and industrial arts courses for men fall into this category.

Two different estimates of the effect of vocational education on annual income have been used in this analysis. Our primary results are based on empirical estimates of the wage, hours, and employment equations presented in tables 2 and 3. The effect of vocational education on these three components of income are combined to obtain a single estimate of the effect of vocational education of annual income.[27] These estimates are presented for each year in the lower right-hand side of graphs 2, 3, and 4.

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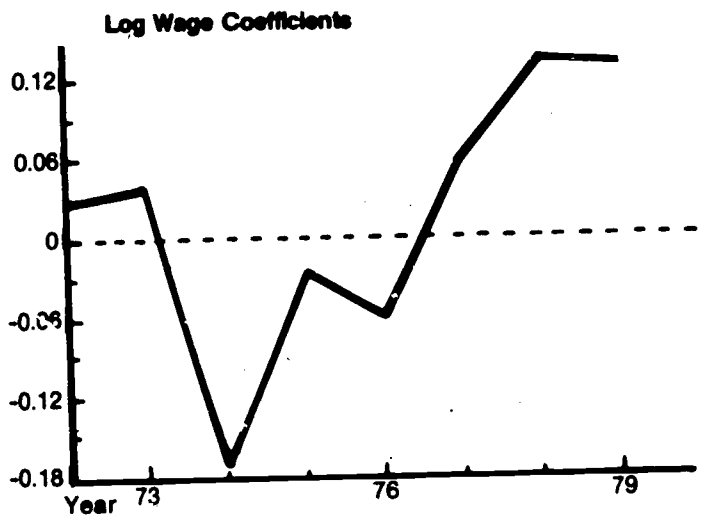
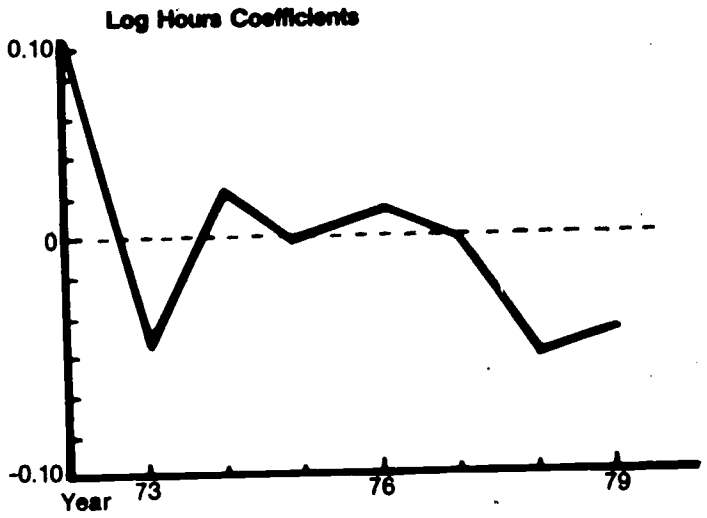
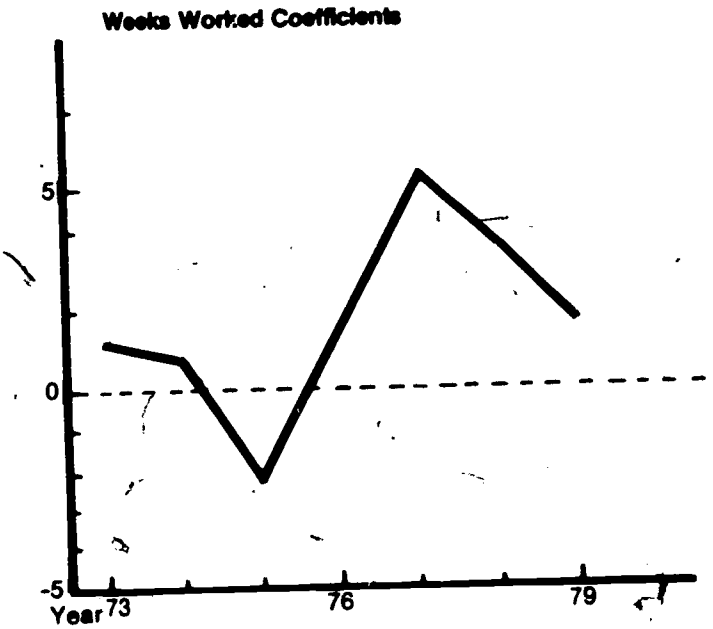
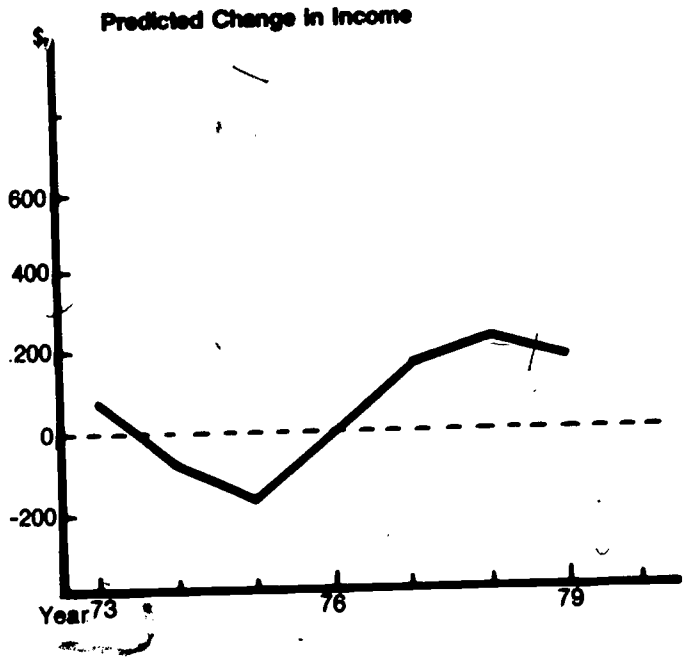
[27]The procedure for calculating the combined effects of vocational education on calculated annual income is described in appendix B. All estimates are based on a simulated increase in vocational education of two standard deviations. Appendix table A.4 contains means and standard deviations of each vocational course variable.

Graph 3: The effect of commercial courses on wages, hours, and weeks worked by men.



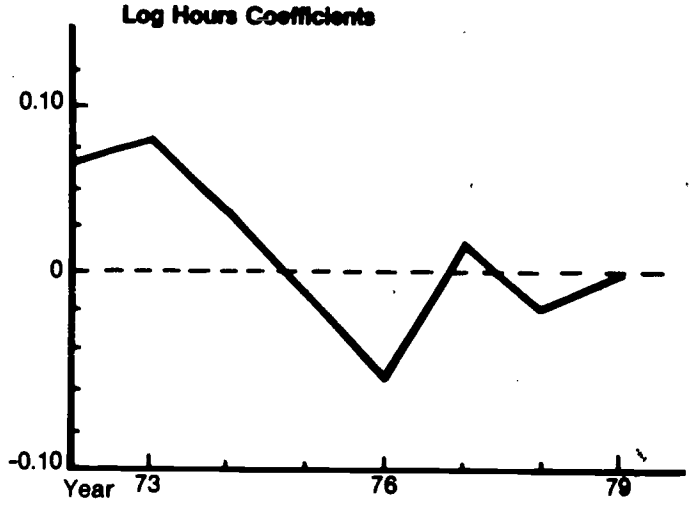


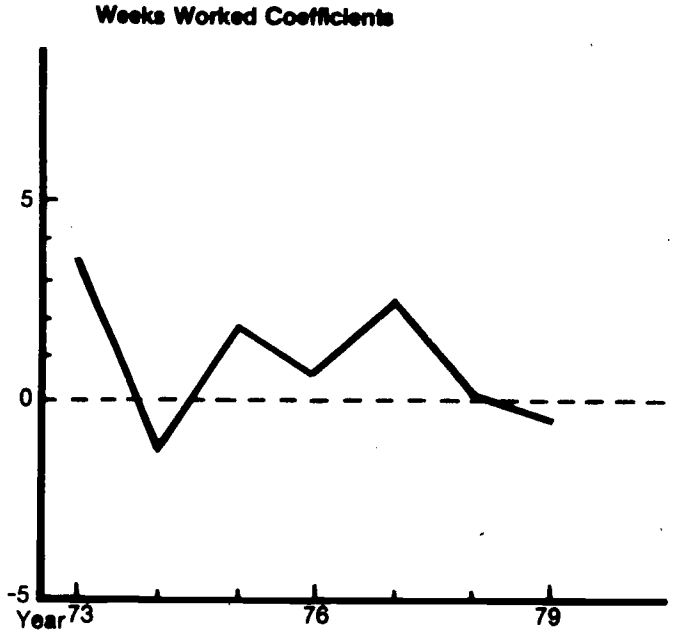


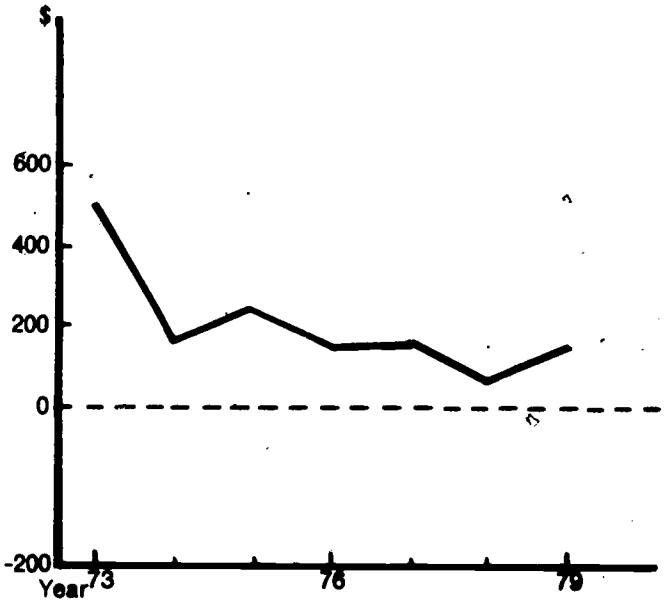


Source: Table 3

Graph 4: The effect of trade and industrial arts courses on wages, hours, and weeks worked by men.







Source: Table 3

The income profiles generated by either approach are conveniently summarized by calculating the present value of the differences in income generated by vocational education. To provide a more accurate idea of the size of the present value of the income differentials, we have also calculated "standardized" estimates that divide the present value of income differentials by the present value of average income in each year. Standardized estimates measure the percentage change in total discounted income corresponding to an increase in vocational education.

Results for women and men are presented in tables 4 and 5, respectively. Results for blacks and Hispanics are presented in table 6. An increase of two standard deviations in commercial coursework increases total discounted income by about 16 percent for women. Calculations based on the two different measures of income are in surprisingly close agreement. Over half of this effect can be attributed to increased employment; however, wage effects are responsible for an increase in discounted income of about 3.5 percent. Technical and home economics courses have a negative effect on discounted income, about 1 percent for the former and 4 percent for the latter.

In contrast, gains from vocational education in all three areas are uniformly small but positive for men. Commercial and technical courses increase discounted income by about 1 percent. Courses in trade and industrial arts increase discounted income by about 3.5 percent. Although estimates of these effects are imprecise for blacks and Hispanics, due to small sample sizes, both black and Hispanic men appear to gain modestly from vocational education over this period. Hispanic women, however, appear to gain more from commercial coursework than do either black or white women. Our estimates indicate that the discounted income of Hispanic women with high levels of commercial training may be 20 to 30 percent higher over this period due to vocational education. There is evidence, however, that Hispanic and black women who take high levels of home economics earn substantially less than do individuals who take fewer home economics courses.

Table 4

Estimates of the Present Discounted Value of Annual Income Differentials Associated with Differences in Vocational Education, 1972-1979: Women

		Commercial	Technical	Home Economics
A.	Present Discounted Value of Predicted Income Differentials ($)	3,065	-318	-889
B.	Standardized Value of Predicted Income Differentials (%)	15.74	-1.63	-4.56
C.	Standardized Value of Predicted Income Differentials, Alternative Model (%)	16.25	-0.95	-3.52
D.	Decomposition of Standardized Estimates in line B, into Component Effects (%)			
1.	Wage Effects	3.51	-0.24	-3.79
2.	Hours Effects	2.39	-0.49	0.58
3.	Employment Effects	9.21	-0.85	-1.38
4.	Interactions	0.63	-0.06	0.02
5.	Total (identical to line B)	15.74	-1.63	-4.56

Notes: These calculations are based on the coefficients presented in table 2. The standardized value of income differentials in the present discounted value of income differentials reported on line A as a percentage of the present discounted value of average income in each year.

Table 5

Estimates of the Present Discounted Value of Annual Income Differentials Associated with Differences in Vocational Education, 1972-1979: Men

		Commercial	Trade & Industrial Arts	Other Technical
A.	Present Discounted Value of Predicted Income Differentials ($)	447	1,372	305
B.	Standardized Value of Predicted Income Differentials (%)	0.92	3.32	0.80
C.	Standardized Value of Predicted Income Differentials, Alternative Model (%)	1.13	3.46	0.77
D.	Decomposition of Standardized Estimates in line B into Component Effects (%)			
1.	Wage Effects	0.25	2.55	-0.53
2.	Hours Effects	-0.17	0.01	0.66
3.	Employment Effects	0.84	0.73	0.68
4.	Interactions	0.00	0.03	-0.01
5.	Total (identical to line B)	0.92	3.32	0.80

Notes: These calculations are based on the coefficients presented in table 3. The standardized value of income differentials is the present discounted value of income differentials reported on line A as a percentage of the present discounted value of average income in each year.

Table 6

Percentage Estimates of the Present Discounted Value of Annual Income Differentials Associated with Differences in Vocational Education by Race, 1972-1979

WOMEN	Commercial	Technical	Home Economics
Black			
B. Primary Model	1.95	-12.51	-12.75
C. Alternative Model	18.62	-10.57	- 9.73
Hispanic			
B. Primary Model	33.19	7.19	- 5.31
C. Alternative Model	22.97	2.76	-19.66
All			
B. Primary Model	15.74	- 1.63	- 4.56
C. Alternative Model	16.25	- 0.95	- 3.52

MEN	All Vocational Courses
Black	
B. Primary Model	3.75
C. Alternative Model	-1.16
Hispanic	
B. Primary Model	6.21
C. Alternative Model	7.05

Notes: These calculations are based on regression results not reported in the paper. They are available from the author on request.

Conclusions

Our empirical results tend to confirm the findings of Grasso and Shea (1979) that women gain substantially from commercial education, at least in the first decade after high school graduation. Commercial curriculums appear to teach distinct job skills that are highly valued in the labor market. Evidence on the declining effectiveness of commercial coursework, suggests, however, that income differentials may eventually become negative. These findings are consistent with the predictions of the theoretical model.

Modest effects of trade and industrial arts courses were also found for men. Here again, income gains were significant in the years immediately after graduation from high school. By 1979, however, the effect of vocational education was zero or negative.

Our analysis suggests two important topics for future research. First, data on earnings and employment over a longer age span would permit estimates of the entire earnings profiles associated with different levels of vocational education. Ideally, vocational education should be evaluated on the basis of its contribution to lifetime income, rather than on the basis of income effects in selected years. Second, the analysis should be extended to individuals in other labor markets, for example, the market for college graduates or graduates of post-secondary vocational schools. The overall evaluation of vocational education should depend on its effects in <u>all</u> labor markets. The evidence in this chapter suggests that commercial education for women, and to a lesser degree, trade and industrial arts for men, generates positive benefits in the labor market for high school graduates, at least during the first decade following graduation from high school.

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Appendix Table A.1

Estimates of Models of Weekly Earnings
and Annual Weeks Worked: Women

Variable	Log Weekly Earnings 1973	1976	1979	Annual Weeks Worked 1973	1976	1979
Commercial	0.1900** (0.0515)[a]	0.2990** (0.0593)	0.1454* (0.0800)	8.0364** (2.0429)	10.6892** (2.3132)	2.8991 (2.8278)
Technical	0.1117 (0.1350)	-0.0409 (0.1540)	-0.0085 (0.2167)	-4.9843 (5.1063)	4.1391 (5.8838)	-9.8187 (7.3403)
Home Economics	0.0703 (0.1340)	-0.2953** (0.1488)	-0.2807 (0.1970)	-5.6015 (5.0869)	-2.8013 (5.7167)	-3.3233 (6.9218)
High School Work Experience						
0-10 hours	-0.0179 (0.0257)	-0.0374 (0.0290)	-0.0276 (0.0379)	5.2462** (1.0011)	-1.7767 (1.1090)	-0.5422 (1.3197)
10-20 hours	-0.0071 (0.0244)	0.0244 (0.0278)	0.0178 (0.0375)	6.3013** (0.9620)	3.9676** (1.0973)	3.6996** (1.3211)
20+ hours	0.0425* (0.0245)	0.0495* (0.0277)	0.0616* (0.0369)	6.9197** (0.9461)	2.6331** (1.0750)	3.4397** (1.3076)
Black	0.0660** (0.0310)	0.0780** (0.0325)	0.1103** (0.0441)	-6.4022** (1.1890)	2.2137** (1.3336)	2.9666* (1.6145)
Hispanic	-0.0028 (0.0436)	0.0354 (0.0478)	0.0117 (0.0627)	-4.4202** (1.6815)	6.3980** (1.9565)	6.4644** (2.3387)
Test	0.0550 (0.0324)	0.0722 (0.0364)	0.1000** (0.0484)	1.6437 (1.2664)	4.4156** (1.4113)	4.0161** (1.7205)
Class Rank	0.0998** (0.0454)	0.0911* (0.0514)	0.0786 (0.0671)	8.1330** (1.7826)	8.4897** (1.9956)	5.4402** (2.4008)

Appendix Table A.1 (cont.)

Variable	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Parents' Income ($ thousands)	0.0021 (0.0022)	0.0047* (0.0026)	0.0056 (0.0035)	0.2201** (0.0876)	0.1762* (0.1021)	0.0304 (0.1238)
Married	-0.0731** (0.0197)	-0.0842** (0.0209)	-0.1380** (0.0292)	-10.7469** (0.7272)	-13.3442** (0.8431)	-14.6107** (1.0829)
Dependents	0.0170 (0.0228)	0.0244* (0.0136)	0.0377** (0.0141)	0.0723 (0.8773)	-0.6686 (0.5247)	2.2965** (0.5024)
Area Wage Rate	0.0209 (0.0195)	0.0234 (0.0160)	0.0142 (0.0218)	-1.0274 (0.7531)	-2.1454** (0.6211)	-2.0798** (0.7716)
Area Unemployment Rate	-0.0115* (0.0060)	0.0063 (0.0072)	0.0278* (0.0148)	-0.4399* (0.2339)	-0.0876 (0.2812)	0.6448 (0.5263)
Rural	-0.1144** (0.0309)	-0.0640* (0.0328)	-0.1418** (0.0431)	-2.5134** (1.2075)	-3.4600** (1.2681)	-2.5680* (1.4960)
Town	-0.0937** (0.0285)	-0.0608* (0.0315)	0.0710* (0.0426)	-2.9634** (1.1207)	-1.4082 (1.2343)	-0.5086* (1.5060)
Urban	-0.0154 (0.0274)	0.0130 (0.0301)	-0.0081 (0.0412)	-1.3973 (1.0841)	-1.1391 (1.1891)	-1.0762 (1.4745)
South	0.0142 (0.0316)	0.0233 (0.0335)	0.0060 (0.0486)	-0.4577 (1.2217)	-0.9671 (1.3020)	-0.2012 (1.7003)
East	0.0961** (0.0291)	0.0457 (0.0383)	-0.0603 (0.0537)	0.6371 (1.1585)	-1.0368 (1.4743)	-3.5785* (1.8729)
West	0.0083 (0.0340)	0.0922** (0.0396)	0.0370 (0.0521)	-2.5833** (1.2944)	-3.3523** (1.4881)	-4.3799** (1.8336)

Appendix Table A.1 (cont.)

Variable	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Intercept	4.0889** (0.1399)	3.9453** (0.1529)	3.8649** (0.2128)	32.3922** (5.3761)	33.1100** (6.0198)	37.8432 (7.5620)
R^2	0.0694	0.0743	0.0687	0.1877	0.1402	0.1347
Sample Size	1,757	1,765	1,415	2,431	2,624	1,854

*Significant at the .10 level.
**Significant at the .05 level.

a. Standard errors are in parentheses.

Notes: The regressions for 1973 and 1976 include individuals with 12 years of schooling as of 1976. A number of individuals who attended school for the first time after 1976 were also excluded from the 1979 regressions.

Appendix Table A.2

Estimates of Models of Weekly Earnings and Annual Weeks Worked: Men

Variable	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Commercial	-0.0150 (0.0847)[a]	-0.0440 (0.0805)	0.0836 (0.0998)	1.0811 (3.0336)	1.3428 (2.5302)	1.8346 (2.6062)
Trade and Industrial Arts	0.1458** (0.0592)	0.0398 (0.0552)	0.0680 (0.0694)	3.3753 (2.1051)	0.7075 (1.7437)	-0.3777 (1.8015)
Other Technical	0.2044 (0.1260)	-0.1574 (0.1133)	-0.0468 (0.1320)	6.3600 (4.4751)	2.5160 (3.4965)	-0.9068 (3.4388)
High School Work Experience						
0-10 hours	0.0566* (0.0304)	0.0059 (0.0278)	0.0854** (0.0340)	3.2819** (1.0549)	3.1981** (0.8871)	-1.4239 (0.8960)
10-20 hours	0.0442 (0.0290)	0.0416 (0.0275)	0.0529 (0.0330)	6.5492** (0.9994)	2.6424** (0.8602)	0.0326 (0.8658)
20+ hours	0.0970** (0.0256)	0.0833** (0.237)	0.0984** (0.0290)	7.8198** (0.8826)	3.8566** (0.7526)	-0.2687 (0.7600)
Black	-0.0776** (0.0285)	-0.1072** (0.0264)	-0.1036** (0.0324)	-3.4165** (0.9959)	-2.3362** (0.8365)	-1.4761* (0.8521)
Hispanic	-0.0859** (0.0437)	-0.0484 (0.0393)	-0.0964* (0.501)	-2.7270* (1.4933)	0.2362 (1.2450)	-0.8072 (1.3215)
Test	0.0286 (0.0302)	0.0236 (0.0268)	0.0757** (0.0330)	2.3425** (1.0481)	0.9563 (0.8449)	1.3994 (0.8600)
Class Rank	-0.0020 (0.0486)	0.0369 (0.0430)	0.0689 (0.0537)	-0.0592 (1.6854)	2.2025 (1.3641)	1.4053 (1.4028)

Appendix Table A.2 (cont.)

Variable	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Parents' Income ($ thousands)	0.0072** (0.0021)	0.0117** (0.0020)	0.0180* (0.0024)	0.0979 (0.0743)	-0.0513 (0.0611)	0.0716 (0.0611)
Married	0.0916** (0.0329)	0.1080** (0.0222)	0.0274 (0.0264)	4.3030** (1.1623)	3.7580** (0.7010)	2.0919** (0.6939)
Dependents	0.0404** (0.0201)	0.0066 (0.0104)	0.0458** (0.0098)	-0.0766 (0.7046)	-0.3062 (0.3308)	0.5101** (0.2566)
Area Wage Rate	0.0758** (0.0198)	0.0828** (0.0133)	0.0610** (0.0166)	0.0550 (0.6876)	-0.3994 (0.4216)	-0.4366 (0.4355)
Area Unemployment Rate	-0.0069 (0.5059)	-0.0028 (-0.0058)	-0.0047 (0.0117)	-4.4055* (0.2071)	-0.4946** (0.1837)	0.0510 (0.3042)
Rural	0.0119 (0.0321)	0.0222 (0.0254)	-0.0455 (0.0322)	1.9137* (1.1185)	-1.6298** (0.8008)	-0.9046 (0.8441)
Town	0.0229 (0.0310)	0.0310 (0.0245)	0.0118 (0.0328)	0.4712 (1.0744)	-1.0707 (0.7775)	-1.3785 (0.85801)
Urban	0.0135 (0.0301)	0.0569** (0.0246)	0.0167 (0.0327)	-0.0443 (1.0451)	-0.9512 (0.7775)	-2.1650** (0.8556)
South	-0.0300 (0.0318)	0.0111 (0.0275)	-0.0020 (0.0366)	0.3974 (1.1097)	1.5321* (0.8736)	0.4084 (0.9557)
East	-0.0054 (0.0308)	-0.0002 (0.0315)	-0.0218 (0.0415)	0.5525 (1.0752)	1.7319* (0.9954)	-0.8451 (1.0836)
West	-0.0467 (0.0318)	0.0304 (0.0296)	0.0415 (0.0371)	-1.4695 (1.0994)	0.7024 (0.9364)	-1.3537 (0.9703)

Appendix Table A.2 (cont.)

Variable	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Intercept	4.2141**	4.1639**	4.0542**	28.7783**	43.5480**	45.2138**
	(0.1325)	(0.1165)	(0.1527)	(4.6503)	(3.6620)	(3.9559)
R^2	0.0890	0.1183	0.1626	0.0997	0.0547	0.0497
Sample Size	1,825	2,084	1,372	2,022	2,249	1,461

*Significant at the .10 level.
**Significant at the .05 level.

a. Standard errors are in parentheses.

Notes: The regressions for 1973 and 1976 include individuals with 12 years of schooling as of 1976. A number of individuals who attended school for the first time after 1976 were also excluded from the 1979 regressions.

Appendix Table A.3

Estimates of Alternative Models of Weekly Earnings and Annual Weeks Worked

	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Women						
All Occupational Courses	0.1873** (0.0512)[a]	0.2876** (0.0592)	0.1407* (0.0797)	7.4225** (2.0322)	10.3750** (2.2972)	2.3379 (2.8122)
Academic Program	-0.0256 (0.0284)	-0.0497 (0.0329)	0.0001 (0.0440)	0.8965 (1.1219)	0.5423 (1.2701)	0.7568 (1.5599)
Vocational Program	0.0428** (0.0428)	0.0578** (0.0225)	0.0568* (0.0298)	3.6822** (0.7836)	2.3451** (0.8767)	0.6566 (1.0500)
Academic Program	-0.0198 (0.0283)	-0.0455 (0.0327)	0.0062 (0.0438)	1.0498 (1.1164)	0.6414 (1.2661)	0.8616 (1.5563)
Commercial Program	0.0690** (0.0212)	0.0882** (0.0241)	0.0882** (0.0325)	4.9623** (0.8469)	3.2680** (0.9488)	0.9850 (1.1405)
Technical Program	-0.0474 (0.0378)	-0.0096 (0.0420)	0.0458 (0.0567)	0.0681 (1.4076)	0.4032 (1.6452)	1.5271 (2.0125)
Home Economics Program	0.0184 (0.0607)	-0.1438** (0.0583)	-0.1303* (0.0675)	-2.8217 (1.9803)	-3.3375 (2.0512)	-2.3033 (2.4348)

Appendix Table A.3 (cont.)

	Log Weekly Earnings			Annual Weeks Worked		
	1973	1976	1979	1973	1976	1979
Men						
All Vocational Courses	0.1124**	0.0052	0.0692	3.2167*	1.0766	0.6340
	(0.0534)	(0.0502)	(0.0624)	(1.9029)	(1.5797)	(1.6242)
Academic Program	-0.0160	0.0037	-0.0168	1.0295	-0.4038	0.7055
	(0.0264)	(0.0248)	(0.0312)	(0.9163)	(0.7815)	(0.8087)
Vocational Program	0.0190	0.0325*	0.0169	1.9715	-0.4024	1.4663**
	(0.0204)	(0.0187)	(0.0232)	(0.7177)	(0.5887)	(0.5985)
Academic Program	0.0067	0.0060	-0.0033	1.0858	-0.4415	0.7541
	(0.0248)	(0.0248)	(0.0310)	(0.9150)	(0.7809)	(0.8072)
Commercial Program	-0.0037	0.0422	0.0198	2.1770	-0.8549	0.2740
	(0.0424)	(0.0421)	(0.0540)	(1.6104)	(1.3141)	(1.4014)
Technical Program	0.0163	0.0390**	-0.0019	2.1699**	-0.4448	1.8569**
	(0.0200)	(0.0196)	(0.0241)	(0.7533)	(0.6155)	(0.6242)

*Significant at the .10 level.
**Significant at the .05 level.

a. Standard errors are in parentheses.

Notes: See table 2.

Appendix Table A.4

Simple Statistics

Variable	Women		Men	
	Mean	Standard Deviation	Mean	Standard Deviation
Commercial	0.2864	0.1876	0.0884	0.1108
Technical	0.0324	0.0728	--	--
Home Economics	0.0711	0.0875	--	--
Trade & Industrial Arts	--	--	0.1875	0.1696
Other Technical	--	--	0.0410	0.0773
Vocational Courses	0.3855	0.1784	0.3236	0.1729
Academic Program	0.1403	*	0.1444	*
Commercial Program	0.3309	*	0.0383	*
Technical Program	0.0737	*	0.2799	*
Home Economics Program	0.0337	*	--	*
High School Work Experience		*		
0-10 hours	0.1947	*	0.1682	*
10-20 hours	0.2276	*	0.2052	*
20+ hours	0.2374	*	0.4313	*
Black	0.1358	*	0.1558	*
Hispanic	0.0502		0.0509	
Test	2.8480	0.4092	2.7399	0.4091
Class Rank	0.4790	0.2609	0.3327	0.2312
Parents' Income ($ thousands)	9.0492	4.8600	9.7222	5.0228
Married, 1973	0.4253	*	0.1963	*
Married, 1979	0.7174	*	0.6099	*
Dependents, 1973	0.1229	0.4089	0.3229	0.6531
Dependents, 1979	0.5912	0.9774	1.4257	1.3250
Area Wage Rate, 1973	4.14	0.63	4.13	0.67
Area Wage Rate, 1979	6.65	0.96	6.65	0.96
Area Unemployment Rate, 1973	3.2041	1.7312	3.2864	1.7791
Area Unemployment Rate, 1979	5.8213	1.1651	5.7337	1.1251
Rural	0.2069	*	0.2488	*
Town	0.2916	*	0.2878	*
Urban	0.3497	*	0.3368	*
South	0.3677	*	0.3848	*
East	0.2217	*	0.1845	*
West	0.1382	*	0.1884	*
Sample Size	2,431	--	2,022	--

* Indicates a zero-one dummy variable.

APPENDIX B

METHODOLOGY FOR CONSTRUCTING INCOME PROFILES FOR INDIVIDUALS WITH DIFFERENT LEVELS OF VOCATIONAL EDUCATION

Let us define a set of equations for log wages, log hours, and annual weeks worked:

$$(1) \qquad \log W = XB_1 + c_1V + e_1,$$

$$(2) \qquad \log H = XB_2 + c_2V + e_2,$$

$$(3) \qquad E = XB_3 + c_3V + e_3.$$

Furthermore, let $\bar{W}$, $\bar{H}$, and $\bar{E}$ indicate the average labor market outcomes for individuals in the sample, and let W', H', and E' indicate the labor market outcomes associated with an increase in vocational education of h, holding all other variables constant. The relationships between these two sets of outcomes are given below:

$$(4) \qquad W' = e^{c_1 h} \cdot \bar{W}$$

$$(5) \qquad H' = e^{c_2 h} \cdot \bar{H}$$

$$(6) \qquad E' = \left(1 + \frac{c_3 h}{\bar{E}}\right) \cdot E .$$

Total income corresponding to the higher level of vocational education is:

$$(7) \qquad Y' = W'H'E' = e^{c_1 h} e^{c_2 h} \left(1 + \frac{c_3 h}{\bar{E}}\right) \bar{W}\,\bar{H}\,\bar{E}.$$

The difference in incomes is given by:

$$(8) \qquad Y' - Y = \left\{ e^{c_1 h} e^{c_2 h} \left(1 + \frac{c_3 h}{\bar{E}}\right) - 1 \right\} \bar{Y}.$$

The figure in brackets represents the increase in income that can be attributed to vocational education. It consists of the product of changes in wages, hours, and employment. Define g_1, g_2, and g_3 as the proportional increase in wages, hours, and employment, respectively, due to vocational education. The total change in income can be decomposed into the sum of first order changes in wages, hours, and employment, and interaction effects.

$$(9) \qquad Y' - \bar{Y} = \left\{(1 + g_1)\ (1 + g_2)\ (1 + g_3) - 1\right\} \bar{Y},$$

$$= \left\{g_1 + g_2 + g_3 + \text{interactions}\right\} \bar{Y},$$

where $g_1 = e^{c_1 h} - 1$,

$$(10) \qquad g_2 = e^{c_2 h} - 1 ,$$

$$g_3 = \frac{c_3 h}{\bar{E}} .$$

Separate estimates of income differentials ($Y'_t - \bar{Y}$) are calculated for each year. The present discounted value of the income differentials that can be attributed to an increase in vocational education of h is given by:

$$(11) \qquad PV' - \overline{PV} = \sum_{t=0}^{T} \frac{Y'_t - \bar{Y}}{(1+r)^t} ,$$

where r is the real rate of discount. In our study a value of 3 percent was used. Similarly, the present discounted value of average income is given by:

$$(12) \qquad \overline{PV} = \sum_{t=0}^{T} \frac{\bar{Y}_t}{(1+r)^t}$$

A standardized estimate of the present value of income differentials is given by $(PV' - \overline{PV})/\overline{PV}$.

THE EFFECTS OF VOCATIONAL TRAINING AND THE ROLE OF SIZE OF FIRM ON THE EMPLOYMENT EXPERIENCES OF NONCOLLEGE YOUTH

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THE EFFECTS OF VOCATIONAL TRAINING AND THE ROLE OF SIZE OF FIRM ON THE EMPLOYMENT EXPERIENCES OF NONCOLLEGE YOUTH

Section 1

Introduction

Public policymakers and social scientists are just beginning to piece together how the labor market for youth works. Much has been learned from analyses of large national data sources, case studies of particular local labor markets, and evaluations of government employment and training projects. Two issues of concern are the relative usefulness of alternative types of school curricula in preparing youth for existing jobs and the relative importance of different types of firms in providing employment opportunities for youth. Increasing attention is being focused on the role that small employers play in the operation of the youth labor market. It is, therefore, natural to ask whether a relationship exists between the employment experience young people have with small and large employers and the type of high school curriculum the young people chose--vocational, academic, business, or general.

Recent evidence suggests that smaller businesses are a major source of new jobs in the economy.[1] This alone would imply that small firms are likely to be important sources of job opportunities for youth. It has also been suggested, however, that certain classes of small firms may be especially important because the jobs these firms provide are particularly suited to young people at certain stages of their labor market experience. Certain types of small firms may, rather than providing specific skill training, provide useful general experience that serves as a "bridge" to better jobs that young workers will desire as they age and seek stable career employment.[2]

The attitudes of employers about the preparation and trainability of young labor market entrants[3] and the employers' abilities to train and promote[4] are likely to be key influences on the employment experiences of youth; these factors will certainly influence the relative usefulness of vocational preparation in high school. However, it is not clear, a priori, whether smaller employers are more likely or less likely to make use of students with vocational curriculum backgrounds. Further, the analyses of young people's labor market behavior that suggest a changing pattern of employment with age imply

that small as opposed to large employers may have an influence not only on the initial job experience of youth but on their later experiences as well.

These different possibilities can be stated as a set of hypotheses. This paper will analyze these hypotheses using a particularly appropriate source of data, which is described in Section 2.

Initial Employment

One hypothesis is that small firms provide general work experience and general work skills that youth find useful as a bridge to later employment with larger firms. Supporting this notion is research suggesting that young people experience several jobs, often unrelated, before settling into more stable employment. If this is so, then smaller employers providing this experience may prefer that youth have some skills developed through vocational education. This preference is probably small, however, because such initial job experience is unlikely to require or to develop many specific skills. This hypothesis would further suggest that larger firms may prefer to hire somewhat older employees (people who have already had their first few jobs) who have had some general experience and can be relied upon to stay with the firm long enough to justify training. The argument of this hypothesis is that certain small firms may be important in early job experience, but, given the skill requirements of those firms and the desire of larger firms to teach their own specific skills, vocational versus general or academic curriculum background is not likely to be a major factor.[5]

A counter-hypothesis is that small firms rely on vocational schools to train young people in industry-specific skills (as opposed to firm-specific) because the firms' size prevents them from being able to train workers themselves. Larger firms with longer job ladders and longer expected tenures of employment can afford to do internal training that smaller firms cannot. This hypothesis would imply that small employers would disproportionately seek and hire vocational graduates, as opposed to general or academic curriculum graduates.

The sequences just described differ substantially for young men and young women. Young women find jobs much more frequently in clerical occupations, and the distribution of these occupations across firms is quite different from the distribution of blue-collar and lower white-collar jobs that young, noncollege males typically find. In particular, many large firms employ large numbers of young women in clerical jobs that are short

term and not connected to other career jobs. The following analysis will distinguish men from women wherever possible.

Skill Acquisition and Wage Growth

Firms differ in their internal training and promotion patterns and possibilities. Small firms will of necessity have shorter job ladders. However, larger firms often have several tracks with differing advancement possibilities. We expect, on average, that workers who remain in small firms will experience lower wage growth than workers who remain in large firms. Movement from small firms to large firms also may affect wage growth. One hypothesis about the role of small employers, already mentioned, is that small firms provide early general experience that bridges the transition to more permanent employment with larger primary-sector firms. To the degree that this is so, we would expect persons who move from small to large firms to experience larger wage gains than those who remain in small firms.

To the degree that vocational high school preparation allows young people to more quickly attach themselves to job ladders, a vocational diploma will result in larger wage gains over the first several years of employment. If firms are more responsive to personal characteristics such as motivation and attitude than to high school curricula experience then, of course, the difference between vocational and nonvocational degrees will not be important in explaining differences in wage growth.

It is possible that high school curriculum experience and mobility within a firm interact. That is, vocational track students may be more likely to benefit in wage terms from the transition from small to large firms. This would be so if small firms complement skills acquired in a vocational curriculum and generate a more attractive potential worker for larger firms with more advancement possibilities. Although we did not specifically test for such an interaction in this study, it is a possibility that deserves later investigation.

Some caveats on the testing of the foregoing hypotheses are in order. First, the distinction between small and large firms is very blunt and likely to miss a host of firm characteristics that may be important. Within the categories of small and large there are likely to be wide and overlapping distributions of firms with regard to training possibilities, advancement possibilities, and personnel practices. These latter characteristics and perhaps others are likely to be most important in

explaining the experience of youth working in the firms. The small versus large distinction, it is hoped, will proxy these variables.

Second, the statistical associations analyzed in this paper cannot be interpreted without a, by now obligatory, warning of possible biases due to differences--among individuals which our data do not measure but which may be important. Young people who choose a vocational course of study may be different in unmeasured ways from those who do not. These unmeasured characteristics, if important to the determination of the dependent variables that we analyze, will influence the observed statistical relations in ways that cannot be known a priori. This problem has become the bete noire of statistical analyses with individual data.

Finally, the foregoing hypotheses have been stated quite generally. The analysis that follows examines several specific variables and relationships (1) to describe the early labor market experience of noncollege youth with alternative high school curricula, and (2) to test particular aspects of the hypotheses.

Section 2

Survey Design and Sample Characteristics

The data base to be used in this study has been generated from a followup survey of the 1969 graduating class from the Worcester, Massachusetts, public school system. Graduates from the city's four comprehensive high schools and two vocational trade schools were included in the followup. The survey, which was conducted in 1977, requested detailed information on all education and employment experiences of the young people since they had graduated from high school. The survey instrument also contained several questions pertaining to the personal and demographic characteristics of the respondents. Additional information, including high school courses taken and IQ scores (when available) was collected from high school records.

This data base is especially well suited to analyzing the different employment experiences of vocational and other graduates. First, it allows for a clear distinction to be made between graduates from the vocational curriculum and graduates from the general and academic curricula. All graduates from the city's two trade schools were assigned to the vocational curriculum. Analysis of the school records of graduates from the comprehensive high schools permitted ex-post assignments to

the general, academic (college-preparatory), and business (secretarial) curricula for these students.[6] The frequently used National Longitudinal Surveys are less precise on these curriculum assignments.

It should be emphasized that in this study the term vocational students refers exclusively to persons who received their training in the city's separate trade schools. Other studies frequently include persons with business training as part of the vocational curriculum. The impact of enrollment in the business track on employment outcomes may, therefore, also be considered as part of the overall assessment of the impact of vocational training.

A second major advantage of the Worcester survey is the detail of the information which was collected. This information includes, for each job, starting and leaving dates, starting and leaving wages, occupation, industry and location of employer, size of employer, job satisfaction, and reason for leaving the job. The industry and size-of-employer information was further verified using information contained in the Massachusetts Industrial Directory. Differences in industry and size of employer can therefore be compared across graduates from the different curricula, both for first jobs and for the jobs held 7 to 8 years later. The national data sets do not allow such detailed analysis.

The findings from this study are however, strictly applicable only to the experiences of Worcester, Massachusetts, graduates. A more comprehensive survey covering different geographic localities would be necessary to reach broad, national conclusions as to the role of the small employer in hiring vocationally trained youth. There is little reason, however, to expect that Worcester graduates are atypical of vocational graduates in other regions of the country.

Analysis in this study is limited to noncollege youth. The sample includes 257 young people from the different curricula (of a total of 515 respondents to the questionnaire). Table 1-A presents the curriculum distribution, by sex, of the noncollege sample. As seen in this table, the distribution of the noncollege sample is fairly even across curricula. Sample sizes within each curriculum, while relatively small, should nonetheless be large enough to conduct meaningful comparisons.

Unfortunately, this limited sample size does not permit a detailed examination of employment outcomes by field of vocational specialization. Fields of specialization are presented

in table 1-B, however, to provide a basic description of the types of training the vocational graduates received. Although more men were enrolled in machine and tool design than any other field of training, the sample is fairly evenly split among the 11 fields offered by this trade school. Fields of training offered by the Girls' Trade Vocational High School (as it is known in the area) are much more limited than those available in Boys' Trade and are in areas that lead to traditionally female occupations. A slight majority of the vocational women were enrolled in the cosmetology program (54 percent), with the remainder evenly distributed among the home economics, sewing, and cooking trades. Readers should keep these areas of training in mind as we evaluate the employment outcome of graduates from the vocational curriculum.

Section 3

Background Characteristics of the Sample

Before we compare the employment outcomes of students from the various curricula, it is necessary to analyze and test for differences in their personal and demographic characteristics. This becomes especially necessary because of the possibility of a "self-selection" bias in the curriculum enrollments. If the different curricula attract different types of students, variations in the observed outcomes might be due to these differences in type of student, rather than to differences in the type of high school training which they have received. It is impossible to measure all the characteristics that might influence curriculum choice, but variations by family income, family socioeconomic status, and IQ scores might be expected. Although race and minority status might also be expected to influence curriculum choice, this variable was not available for this sample. However, only 1.8 percent of the population in Worcester was black in 1970. Table 2 presents the mean values of the available background characteristics of the sample, by curriculum and sex.

As table 2 shows, family background characteristics of students from the various curricula revealed few differences. Among the men of the sample, the only statistically significant difference[7] was between the academic and vocational graduates, and then only in terms of their fathers' occupational status. This comparison indicates that men in the academic curriculum came from families of higher socioeconomic status than did men in the vocational curriculum. Although men from the vocational curriculum also scored lower on this status variable than did men from the general track curriculum, the difference between

Table 1-A

High School Curriculum Distribution of Noncollege Sample, by Sex

High School Track	Total		Men		Women	
	Number	Percent	Number	Percent	Number	Percent
Academic	90	35.0	48	36.6	42	33.3
General	57	22.2	36	27.5	21	16.7
Business	37	14.4	--	--	37	29.4
Vocational	73	28.4	47	35.9	26	20.6
Total	257	100.0	131	100.0	126	100.0

Table 1-B

Fields of Vocational Training, by Sex

Men

Vocational Specialization	Number	Percent
Machine & Tool Design	11	23.4
Sheet Metal	6	12.8
Printing	6	12.8
Electronics (electrical)	5	10.6
Auto Mechanics	4	8.5
Plumbing	4	8.5
Welding	4	8.5
Food Trades	3	6.4
Cabinet Making (carpentry)	2	4.3
Building Trades	1	2.1
Painting	1	2.1
	47	100.0

Women

Vocational Specialization	Number	Percent
Cosmetology (hairdressing)	14	53.8
Home Economics	5	19.2
Dressmaking (sewing)	4	15.4
Foods Trade	3	11.5
	26	99.9

Note: Columns may not sum to 100 percent because of rounding.

Table 2

Family Background Characteristics of Sample Population, by High School Curriculum, and Sex--Mean Values and Percentage Distributions

	Men				
	Academic	General	Business	Vocational	Total
Father's socio-economic status[b]	37.0[a]	35.3	---	29.4	34.1
Number	43	30	---	40	115
Father's education (years)	11.4	11.4	---	10.5	11.1
Number	47	34	---	35	118
Family income[c]					
Low	7.0	14.3	---	8.1	9.6
Middle	79.1	60.0	---	75.5	72.2
High	14.0	25.7	---	16.2	18.3
Total	100.1	100.0	---	99.8	100.1
Number	43	35	---	37	115

	Women				
	Academic	General	Business	Vocational	Total
Father's socio-economic status	37.0	35.6	29.3	35.0	34.4
Number	40	20	33	21	116
Father's education (years)	11.9	10.7	10.2	10.4	11.0
Number	39	19	28	24	112
Family income					
Low	5.4	---	16.0	25.0	11.3
Middle	70.3	66.7	64.0	50.0	63.9
High	24.3	33.3	20.0	25.0	24.7
Total	100.0	100.0	100.0	100.0	99.9
Number	37	15	25	20	97

a. Statistically different from the vocational curriculum at the 10 percent level.

b. Measured by the Duncan Index, ranging from 1 to 99, with 1 representing the lowest possible status.

c. Low income = 0-$5,999; Middle income = $6,000-$14,999; High income = $15,000+. This measure refers to total family income while the student was in high school (1966-69). Columns may not sum to 100 percent because of rounding.

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the two was not statistically significant. No significant differences between father's education or family income were found among the men from the different curricula. Also, there were no significant differences in any of the family background characteristics among the women from the sample.

Although IQ scores were also available for some members of the sample, the large number of missing values for this variable (41 percent of the men and 56 percent of the women) limits its analytical usefulness. Scores that are available, however, indicate that both men and women academic track graduates have significantly higher IQ scores than the graduates from the other curricula. Academic graduates averaged 112 on this measure, compared with an average score of 100 for the general curriculum and 102 for vocational track graduates.[8]

Section 4

Post-High-School Activities

Although the sample used in this study is limited to "noncollege" high school graduates, many of the young people obtained some form of postsecondary education or training prior to their full-time entrance into the labor market. Several members of this sample, for example, initially attended college or a postsecondary institution and then dropped out before completing the program or obtaining a degree. Others attended and completed training programs leading to a diploma or certificate. Persons who obtained an associate's degree in a trade or technical field were also included in the noncollege sample.[9] Several members of the sample also joined the military after graduation from high school, and thus may have received training useful to them in their later civilian jobs. The noncollege sample, therefore, includes many individuals with education and training beyond the high school level.

To indicate postsecondary training activities, tables 3 and 4 present information on the graduation activities and educational attainment of the sample. The graduation activities of table 3 refer to the major activities of the sample population in September 1969, 3 months after they graduated from high school. Major differences in activities among the sample are apparent when analyzed separately by high school curricula. Academic graduates were more likely to go directly to school immediately after high school graduation; general and vocational graduates were more likely to go to work or into the military. These differences apply to both the men and women of the noncollege sample, with the exception that no women joined the military.

Table 3

Graduation Activities of Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Major Activity	Academic	General	Business	Vocational	Total
School	58.6	22.2	---	11.1	31.5
Work	28.3	41.7	---	60.0	43.3
Military	8.7	27.8	---	24.2	19.7
Other	4.3	8.3	---	4.4	5.5
	99.9	100.0	---	99.7	100.0
Number	46	36	---	45	127

Women

Major Activity	Academic	General	Business	Vocational	Total
School	66.7	20.0	22.8	4.0	33.7
Work	33.3	65.0	74.3	92.0	62.3
Military	---	---	---	---	---
Other	---	15.0	2.9	4.0	4.1
	100.0	100.0	100.0	100.0	100.1
Number	42	20	35	25	122

Note: Activities as of September 1969, 3 months after high school graduation. Columns may not sum to 100 percent because of rounding.

Table 4

Postsecondary Educational Attainment of Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

	Academic	General	Business	Vocational	Total
Mean Years of Education[a]	13.33	12.94	---	12.32	---
Highest Degree Completed					
Associates	---	5.6	---	6.4	3.8
Diploma, Certificate	25.0	25.0	---	21.3	23.7
High School Only	75.0	69.4	---	72.3	72.5
	100.0	100.0	---	100.0	100.0
Number	48	36	---	47	131

Women

	Academic	General	Business	Vocational	Total
Mean Years of Education	12.88	12.52	12.38	12.25	
Highest Degree Completed					
Associates	4.8	9.5	5.4	---	4.8
Diploma, Certificate	23.8	23.8	13.5	15.4	19.0
High School Only	71.4	66.7	81.1	84.6	76.2
	100.0	100.0	100.0	100.0	100.0
Number	42	21	37	26	126

Note: Measures total educational attainment over the time period covered by the survey.

a. In addition, 43 percent of the men in this sample had served in the military.

Although the academic graduates may have initially been more likely to attend school after they graduated, table 3 indicates that several dropped out without completing their program.[10] In fact, a slightly greater percentage of men from the general and vocational curricula actually completed a postsecondary training program than did men from the academic curriculum. However, women from the academic and general tracks were more likely to have received a postsecondary diploma or certificate than their business and vocational counterparts. This summary of the educational attainment of the sample used in this study highlights two important points. First, although the majority of the sample completed their formal education with high school, a substantial proportion (25 percent) also completed some form of postsecondary training. Second, although noncollege academic graduates were initially more likely to attend a postsecondary institution, persons from the academic and vocational curricula differed very little in the percentages completing a postsecondary education or training program.

Section 5

Characteristics of First Job

The major research task of this paper is to test for differences in employment outcomes according to high school curriculum. This section compares youth from the different curricula on the characteristics of their first full-time job. The designation of "first job" was made after a careful inspection of each person's work and education history, and represents the first full-time, permanent job after completion of all full-time school and military activities. Sample members who remained in the military or who had held only part-time jobs during the 7 years covered by the survey are excluded from the employment comparisons. The sample available for analysis of first job thus contains approximately 114 men and 111 women.[11]

Size of Firm--First Job

One of the most important questions this paper addresses is whether graduates from the different curricula differ according to the size of the firms in which they find employment. Information on firm size was first collected from responses to the employment section of the Worcester questionnaire. This information was then verified using the Massachusetts Industrial Directory. Although the definition is somewhat arbitrary, small employers were defined as those hiring fewer than 50 employees; large employers were defined as those hiring 50 or more employees.[12]

As table 5 indicates, there were no significant differences in the size of firm for the first job held by members of the different curricula. The breakdown by sex shows the first jobs of the men to be equally divided among small and large firms, regardless of curriculum. Although male vocational curriculum graduates were slightly more likely to begin employment with larger firms than were the graduates from the general or academic programs (55 percent versus 49 percent and 51 percent, respectively), these differences were not statistically significant.

The women in this sample were on average more likely than the men to obtain their first jobs with large employers. As with the men, there was little variation in size of firm for women from the different curricula. While not statistically significant, women from the business curriculum were most likely to begin employment with large firms (73 percent); vocational curriculum women were more likely to begin with small firms (55 percent).

Occupation and Industry of First Job

The finding of no significant differences in firm size by curriculum does not necessarily imply that vocational graduates obtain similar jobs upon entry into the labor market. In fact, as shown in table 6, occupational and industrial distributions for these two groups are significantly different.[13]

The vast majority of men from the vocational curriculum (93 percent) were employed in blue-collar occupations on their first full-time jobs. In contrast, only 51 percent of the men from the academic and general curricula had initial jobs in blue-collar occupations. Male general curriculum graduates constituted the highest percentage of curriculum the three tracks employed in service occupations (15 percent), while male academic curriculum graduates had a greater relative distribution among white-collar occupations (42 percent).

Differences in industry for the first job among the men mirror the occupational differences just noted. Vocational curriculum men were significantly more likely to be employed in construction and manufacturing industries (66 percent) than were graduates from the academic (27 percent) or general curricula (49 percent). This heavy concentration in construction and manufacturing matches the blue-collar emphasis of the vocational curriculum. The relatively greater concentration of men from the nonvocational curricula in the nonmanufacturing sector is also likely to reflect their greater propensity to be employed in white-collar occupations.

Table 5

Size of Firm on First Job of Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Firm Size	Academic	General	Business	Vocational	Total
Small	48.8	51.5	---	44.7	48.2
Large	51.2	48.5	---	55.3	51.8
Total	100.0	100.0	---	100.0	100.0
Number	41	33	---	38	112

Women

Firm Size	Academic	General	Business	Vocational	Total
Small	31.6	35.3	27.3	54.5	35.5
Large	68.4	64.7	72.7	45.5	64.5
Total	100.0	100.0	100.0	100.0	100.0
Number	38	17	33	22	110

Note: Small employers were defined as those hiring fewer than 50 employees; large employers are those hiring 50 or more workers.

Table 6

Occupation and Industry of First Job of the Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Occupation	Academic	General	Business	Vocational	Total
White-collar	41.5	33.3	---	5.0	26.3
Blue-collar	51.2	51.5	---	92.5	65.8
Service	7.3	15.2	---	2.5	7.9
Total	100.0	100.0	---	100.0	100.0
Number	41	33	---	40	114
Industry					
Construction	4.9	9.1	---	15.8	9.8
Manufacturing	22.0	39.4	---	50.0	36.6
Nonmanufacturing	73.2	51.5	---	34.2	53.6
Total	100.1	100.0	---	100.0	100.0
Number	41	33	---	38	112

Note: Columns may not add to 100 percent because of rounding.

These findings therefore indicate that men from the different high school tracks obtained different types of jobs upon entry into the labor market. The finding of no differences in size of employer for these jobs implies that there are wide variations in the size of firms that hire young people, both across and between industries and occupations.

Significant differences by curriculum were also found for the women of this sample, although only by occupation. Although more than three-quarters of the women from the academic, general, and business curricula were employed in white-collar jobs upon labor market entry, only 26 percent of vocational curriculum women were in this category. Vocational curriculum women were most heavily concentrated in service occupations--an expected finding given the emphasis of their training. Of the four curriculum groups, vocational curriculum women also had the largest percentage of their number employed in blue-collar jobs (22 percent). Although their occupational distribution was found to vary, there were no significant differences in industry of employment among the women from the different curricula. Most women were employed in nonmanufacturing industries, regardless of their curriculum.

Wages and Socioeconomic Status of First Job

Efforts to evaluate the short-term impact of vocational training have centered primarily on a comparison of the initial wages received by graduates of the vocational and nonvocational curricula.[14] The findings from this sample confirm the results of previous research efforts, in that no significant differences were found in the starting wages of graduates of the vocational, academic, and general curricula on their first full-time job.

Table 7 presents the mean starting wages of first job for men and women from the different curricula. These wages are presented both in nominal terms and in constant 1967 dollars. Because of slight variations in the year they started their initial job (due to postsecondary training and military activities), the constant-dollar wage comparisons more accurately measured the impact of vocational training. It should be noted, however, that these comparisons do not control for other personal and human-capital factors that may also influence the wages that were received.

Table 7

Mean Starting Wages and Occupational Status of First Job Among Sample Population, by High School Curriculum and Sex

Men

	Academic	General	Business	Vocational	Total
Starting wages (per hour, nominal)	$3.10	$2.94	---	$3.22	$3.07
Starting wages (per hour, constant)[a]	$2.51	$2.45	---	$2.74	$2.55
Number	39	27	---	31	97
Mean status score[b]	34.8	31.4	---	30.4	31.9
Number	41	33	---	40	116

Women

	Academic	General	Business	Vocational	Total
Starting wages (per hour, nominal)	$2.20	$2.21	$2.31	$2.05	$2.21
Starting wages (per hour, constant)	$1.87	$2.01	$2.04	$1.75	$1.92
Number	33	14	26	19	92
Mean status score	43.5	43.2	47.1	23.4[c]	40.2
Number	38	17	33	23	112

a. For calculation of constant wages, 1967 is the base year (1967 = 100)

b. Duncan score is based on an index, with 1 representing jobs with the lowest possible status and 99 representing the highest status jobs.

c. Statistically different from the academic, general, and business curricula at the 1 percent level of significance.

Although the amounts are not statistically significant, men from the vocational curriculum did earn more on their first jobs than men from the academic and general curricula ($2.74 per hour versus $2.51 per hour and $2.45 per hour, respectively). In contrast, women from the vocational curriculum earned less than women from the other curricula, although these differences also were not significant.

As expected from past research findings, large statistically significant differences were found in the wages earned by the men and women of the sample. On average, noncollege women from all curricula earned $1.92 per hour on their first full-time jobs. The corresponding wage for noncollege men was $2.55 per hour, a $0.63 per hour, or 25 percent, differential. This difference between men's and women's wages was especially pronounced among the vocational curriculum graduates, with the men earning approximately 36 percent more than the women. The vocational training received by these women was therefore of little benefit to them in the labor market, at least in terms of relative wages.[15]

Entry wages were also compared by size of firm in order to judge whether large and small firms differed in the wages they offered to new labor force entrants. These comparisons showed no significant wage differences between firms of different sizes. In constant 1967 dollars, men averaged $2.47 per hour when employed by small firms, and $2.63 per hour when employed by large firms. The women of the sample averaged $1.82 per hour with small employers and $1.98 per hour with large employers. Although the larger firms did pay higher wages, the difference was not statistically significant for either the male or female sample.

In addition to wages, another frequently used measure of employment outcomes is the socioeconomic status of the occupation. Differences between wages and occupational status might appear for several reasons. For example, working conditions, hours, and benefits might represent compensating differences in employment and be included among status measures, but not wages. Also, initial wages might be held down if workers are receiving on-the-job training. Occupational status would then capture the longer term potential of these jobs. The standard Duncan Index was used in this study to measure the occupational status of the initial jobs of the sample. Values range from 1 to 99, with a higher score indicating greater socioeconomic status. Table 7 summarizes the mean status scores attached to the first job of the respondents, by curriculum and sex.

As was true with the wage comparisons, no significant differences in occupational status of first job were found among the men from the three curricula. This was not the case for the women in the sample, however. Among the women, vocational curriculum graduates obtained first jobs of significantly lower status than did women from the nonvocational curricula: Women from the business curriculum held jobs with higher relative status than did women from the other tracks, but the differences were not statistically significant. These comparisons thus indicate that women graduates of the vocational curriculum were at a clear disadvantage compared with graduates of the other curricula in terms of the employment characteristics of their entry jobs. Women from the business curriculum had the most positive outcomes.

Additional Characteristics of First Jobs

The initial jobs held by the members of the sample also were compared on the basis of the union status of the job, the way the job was located, the length of time on the job, and the reasons for leaving the job. Detailed breakdowns on these variables are contained in tables A and B in the appendix.

Union status comparisons by high school track indicate that men from the vocational curriculum were more likely than men from the academic and general curricula to be members of a union on their first jobs (43 percent compared with 27 percent and 6 percent, respectively). This higher percentage is probably due to the relatively greater concentration of men from vocational curriculum in blue-collar, manufacturing occupations. Vocational curriculum women, on the other hand, were much less likely than women from the other curricula to have been in a union on their first jobs (5 percent versus an average of 17 percent across all curricula).

There were no major differences among the men in the ways they located their first jobs, except that the vocational curriculum graduates were more likely to have benefited from school placement assistance. Twenty-four percent of the vocational curriculum men located their jobs with the help of their schools, compared with 3.4 percent of the academic curriculum graduates and 12 percent of the general curriculum graduates. A majority of men from all curricula obtained their first jobs either through direct application or through friends and relatives.

Women also were most likely to locate their jobs through direct application or through friends or relatives, although relatively fewer general track graduates used these methods. A relatively high percentage of both the vocational (24 percent) and general (27 percent) curriculum women located their jobs with the assistance of their schools.

Length of time on first job was also available for members of the noncollege sample. Comparisons by sex indicate, first, that the men in the sample tended to stay with their initial employer for a longer period of time than the female respondents did (2.8 years versus 2.6 years, respectively). Very few variations in job tenure were found when this variable was compared separately by high school curriculum and sex. No statistically significant differences were found in job tenure among the men from the different curricula, although the vocational curriculum men tended to remain on this job for a shorter period of time than did the academic or general track graduates (2.37 years compared to 2.98 and 3.01 years, respectively).

Significant differences in job tenure, however, did appear among the women of the sample, with business curriculum graduates experiencing greater job tenure than did women from both the general and vocational tracks. The relatively low wages and occupational status scores attached to the jobs that female vocational graduates held may help explain the relatively short job tenure these women experienced on their initial jobs. Business curriculum women might have stayed longer because of their relatively greater pay and status.

Finally, information was also gathered from respondents on their reasons for leaving this first job. A good percentage of both the men and women (16.2 percent and 7.8 percent, respectively) were still on their initial job at the time of the survey in 1977. Of those who had left, however, a majority of both men and women had left their jobs either because they were laid off or were dissatisfied. Men from the vocational curriculum were somewhat more likely to leave because of layoffs than for voluntary reasons (which is probably a reflection of their greater concentration in manufacturing industries). Also, a substantial percentage of women left their jobs for personal reasons (marriage, pregnancy, health) and dropped out of the labor force (an average of 38 percent across all curricula). The relatively large percentage (45 percent) of female vocational curriculum graduates who left their initial job because of dissatisfaction with its pay or working conditions supports the evidence presented earlier that these women are at a disadvantage in the labor market compared with graduates from the other high school curricula.

Section 6

Characteristics of Current Job

Analyses of the impact of vocational training on the initial work experiences of young people constitute a short-term evaluation of such training. Equally important, however, are the longer term impacts of vocational training on the careers of its recipients. To assess these longer term impacts, this section includes curriculum comparisons of the "current job" held by respondents to the Worcester survey. The designation "current job" corresponds to the job held by the respondents at the time of the survey in 1977, a maximum of 8 years after labor force entry. Previous research has indicated that it may take people 5 to 7 years of labor market exploration to settle into a career path.[16] The current jobs of these people should therefore provide a good indication of the long-term career orientation of the sample. All variable definitions used in this section are identical to those used to describe the characteristics of the sample population's first jobs.

It should be mentioned that changes in local economic conditions are likely to have influenced the labor market activities of the cohort over the time period covered by the survey. At the time they entered the labor force, members of this sample were entering a relatively tight labor market (the unemployment rate in Worcester was 4.9 percent in 1970). At the time of their current jobs, the local economy was just beginning to recover from the worst recession since World War II. In 1977, the local unemployment rate was 6.7 percent, down from 11.2 percent in 1975. Vocational curriculum graduates may have been especially hurt by these adverse economic conditions because of their relative concentration in manufacturing and construction industries.

Activities Eight Years After High School

As expected, the majority of men in this sample were employed at the time of the survey. Including those in the military, 86.3 percent of the men were actively involved in the labor market 8 years after high school. The remaining 14 percent were either unemployed, in school, or out of the labor force for health reasons. Table 8 presents this employment information broken down separately by high school curriculum. The 105 men with civilian employment experiences are included in the current job comparisons.

Table 8

Employment Rates 8 Years After High School for the Sample Population by Curriculum and Sex--Percentage Distributions

Men

Activity	Academic	General	Business	Vocational	Total
Not employed	12.5	16.7	---	12.8	13.7
Employed	83.3	77.8	---	78.7	80.2
Military	4.2	5.6	---	8.5	6.1
Total	100.0	100.1	---	100.0	100.0
Number	48	36	---	47	131

Women

Activity	Academic	General	Business	Vocational	Total
Not employed	57.1	57.1	48.6	61.5	55.6
Employed	42.9	38.1	51.3	38.5	43.6
Military	---	4.8	---	---	.8
Total	100.0	100.0	99.9	100.0	100.0
Number	42	21	37	26	126

Note: Columns may not sum to 100 percent because of rounding.

As shown in table 8, the women of this sample were much less likely to be working 8 years after high school than were the men. Only 44.4 percent of the women were employed (including one woman in the military), and only 33 percent held a full-time job. These relatively low labor force participation rates are primarily due to the age of the female cohort (approximately 26 to 27 years old). Most of the women out of the labor force were at home, caring for their families. The total sample size used for the current job comparisons of women from the different curricula is therefore limited to only 55 women.

Size of Firm for Current Job

Table 9 presents the current job distribution of the sample population between small and large firms, by curriculum and sex. First, the size distribution of the sample varied surprisingly little between the first and current jobs. Men were slightly more likely to be employed with large firms on their current jobs, with the exception of men from the academic curriculum, who registered a slight decrease in the percentage employed with large firms. With respect to size of firm for the current job, there were no significant differences among the men from the three high school curricula.

Except for women from the general curriculum, there also were no major changes in size of firm from first job to current job for the women. The majority of academic and business track women held current jobs with large employers; a majority of women from the vocational curriculum were employed in small firms. Although the general track women showed a large change in their distribution with respect to size of firm, the extremely small sample size of general track women holding a job 8 years after high school makes this finding highly questionable.

Occupation and Industry of Current Job

Comparisons of the occupational distribution of current jobs among the sample population reveal significant differences by curriculum for both men and women (see table 10). A majority of academic track men were employed in white-collar occupations, while a majority of both general curriculum and vocational track men held blue-collar jobs. These occupational distributions are somewhat different from the distributions at the time of labor force entry. From entry to current jobs, men from the academic curriculum moved away from blue-collar and service occupations and into white-collar jobs. There was very little occupational change among men from the general curriculum, with only a slight movement out of service occupations. Conversely, the percentage

Table 9

Size of Firm on Current Job of Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Firm Size	Academic	General	Business	Vocational	Total
Small	52.6	42.9	---	42.4	46.5
Large	47.4	57.1	---	57.6	53.5
Total	100.0	100.0	---	100.0	100.0
Number	38	28	---	33	99

Women

Firm Size	Academic	General	Business	Vocational	Total
Small	16.7	75.0	26.3	60.0	36.4
Large	83.3	25.0	73.7	40.0	63.6
Total	100.0	100.0	100.0	100.0	100.0
Number	18	8	19	10	55

Table 10

Occupation and Industry of Current Job of Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Occupation	Academic	General	Business	Vocational	Total
White-collar	53.8	35.7	---	16.7	36.9
Blue-collar	35.9	53.6	---	77.8	55.3
Service	10.3	10.7	---	5.6	8.7
Total	100.0	100.0	---	100.1	99.9
Number	39	28	---	36	103
Industry					
Construction	5.1	17.9	---	14.7	11.9
Manufacturing	33.3	39.3	---	52.9	41.6
Nonmanufacturing	61.5	42.9	---	32.4	46.6
Total	99.9	100.1	---	100.0	100.1
Number	39	28	---	34	101

Women

Occupation	Academic	General	Business	Vocational	Total
White-collar	70.6	62.5	89.5	30.0	68.5
Blue-collar	17.5	---	---	10.0	7.4
Service	11.8	37.5	10.5	60.0	24.1
Total	99.9	100.0	100.0	100.0	100.0
Number	17	8	19	10	54
Industry					
Construction	---	---	---	---	---
Manufacturing	5.6	---	15.8	10.0	9.1
Nonmanufacturing	94.4	100.0	84.2	90.0	90.9
Total	100.0	100.0	100.0	100.0	100.0
Number	18	8	19	10	55

Note: Columns may not sum to 100 percent because of rounding.

of men from the vocational curriculum holding blue-collar jobs decreased from 93 percent on their first jobs to 78 percent on their current jobs. Most of this movement was from blue-collar to white-collar occupations.

There were also very few changes in the occupational distribution of the women in the sample when their entry job was compared with their current job. The vast majority of women from the academic, general, and business curricula were still employed in white-collar occupations; vocational curriculum women remained heavily concentrated in service occupations.

For men of this sample, current-job differences in industrial distribution were similar to first-job differences: Men from the vocational curriculum remained heavily concentrated in the manufacturing sector; men from the academic curriculum were even more likely to be in the nonmanufacturing sector on their current job than they were on their first job. General curriculum men, however, experienced a shift away from the nonmanufacturing sector and into jobs in the construction industry. The major change for women from all curricula was an even greater propensity toward nonmanufacturing employment.

The findings of this comparison of current jobs among persons from different curricula once again illustrate that high school curriculum <u>does</u> influence employment outcomes. On both their first and current jobs, vocationally trained men and women were employed in occupations and industries that were different from those in which their counterparts from the nonvocational programs were employed. However, these different occupations and industries were <u>not</u> strongly associated with either large or small employers.

Wages and Status of Current Job

Table 11 presents the average wages of the noncollege sample population, by curriculum and sex, on the jobs these people held at the time of the Worcester survey. These wages are presented in both nominal and constant 1967 dollars.[17] As with the initial wage comparisons, the current-job wage comparisons have <u>not</u> been adjusted for human-capital and background differences.

As was true of the initial wage comparisons, there were <u>no</u> statistically significant differences in the current wages received by the men and women of this sample when compared across high school curricula. Although the figures were not statistically significant, men from the academic curriculum were

Table 11

Average Wages and Occupational Status of Current Jobs for Sample Population, by High School Curriculum and Sex

Men

	Academic	General	Business	Vocational	Total
Average wage (per hour, nominal)	$5.60	$5.14	---	$5.51	$5.41
Number	38	24	---	26	89
Average wage (per hour, constant)[a]	$3.08	$2.82	---	$3.01	$2.97
Number	38	24	---	26	89
Mean status score[b]	46.1	36.0	---	38.1	40.3
Number	39	28	---	36	104

Women

	Academic	General	Business	Vocational	Total
Average wage (per hour, nominal)	$4.67	$4.03	$3.77	$3.51	$4.07
Number	15	7	14	6	43
Average wage (per hour, constant)[a]	$2.56	$2.21	$2.07	$1.93	$2.23
Number	15	74	14	6	43
Mean status score[b]	44.7	37.3	51.5[c]	29.9	42.4
Number	18	8	19	10	55

a. Constant wages, 1967 = 100.

b. Derived from the Duncan Index of socioeconomic status, with 99 representing the highest possible score.

c. Statistically different from the general and vocational curriculum at the 10 percent level.

now earning slightly more than men from the vocational curriculum; men from the general curriculum continued to earn less than their counterparts from the academic and vocational tracks. Women from the vocational curriculum also were earning less than women from other curricula--a result similar to that found in the initial job wage comparisons. Also of interest is the finding that women from the business track were now earning less than both academic and general track women.

The wages of men from all curricula remained significantly higher than the wages received by women. As with their first jobs, the men averaged 25 percent greater wages on their current jobs than the women. Men with vocational training continued to earn a large wage premium (36 percent) compared with women with vocational training.

These wage comparisons of jobs held 8 years after high school confirm the findings of the initial wage comparisons. For this sample of noncollege men and women, vocational training failed to have a significant impact on either the short-term or the long-term wages of its recipients.

Current-job wage comparisons by size of firm also yield the same results as those found in the first job comparisons. Once again, although large employers paid slightly higher wages than did small employers ($3.06 per hour versus $2.86 per hour for the men and $2.29 per hour versus $2.08 per hour for the women), the differences between the wages of two sizes of firms were not statistically significant.

Table 11 also presents occupational status scores attached to the current jobs of the graduates from the different curricula. Among the men of the sample, academic graduates were now employed in jobs of significantly higher status than were the general and vocational curriculum graduates. This situation represents a change from the comparisons of initial job status, which found no significant differences among the three curricula. General and vocational track men remained very similar in terms of this socioeconomic status measure. Combining this result with the previous finding of no significant wage differences between men from the different curricula again points to the conclusion that vocational training (at least that received by men from the Worcester area in the late 1960's) did not have a positive impact on long-term employment outcomes.

In 1977, women from the vocational curriculum registered significantly lower occupational status scores than did women from other tracks. Women who graduated from the business curriculum held jobs of much higher status than did graduates of

the academic, general, or vocational tracks. Women who received their training in the separate vocational school therefore remained at a labor market disadvantage even 8 years after they have received their training. Women who received business training did benefit in the form of higher status jobs, although not in the form of wages.

Additional Characteristics of Current Jobs

Graduates from the different high school curricula were also compared on the basis of their union status, the way they located their current jobs, and their length of time on current jobs. This information is summarized in tables C and D of the appendix.

As with their first jobs, men from the vocational curriculum were more likely to be members of a union on their current job than were men from the academic and general curricula. The slight decrease in the percentage of unionized vocational graduates may very well be due to the slight increase in white-collar employment that vocational graduates also experienced from first job to current job. A surprisingly high percentage of women also were members of a union at the time of the followup survey (33 percent, excluding women from the general curriculum).

As for method of job search, direct application and help from friends or relatives remained the most popular methods of locating current jobs. A significant percentage of both men and women had been promoted to their current jobs from within the same company (about 20 percent of the men and 26 percent of the women).

The men of this sample had been employed in their current jobs for an average of 3.7 years; the women for 2.9 years. This information thus provides partial support for the view that young people settle into their occupational career path fairly soon after entering the labor market. At the age of 26 or 27, the men averaged more than 3 1/2 years in the same job. They had therefore started these jobs at about age 23, an age that has been frequently mentioned as the age many young people begin to settle down.[18]

Section 7

From First Job to Current Job

The preceding sections have presented overall comparisons of the employment outcomes of graduates from the four high school curricula. Changes in overall distributions do not capture the individual changes experienced by members of the sample. This section therefore compares the work experience and occupational changes of the sample population between the time they entered the labor market and the time of the survey.

Years of Work Experience--Total Sample

The sample population used in this study graduated from high school in June 1969; the followup survey captured their employment experiences up through 1977. Members of this sample could therefore have worked approximately 8 years if they had been continuously employed since high school graduation. Table 12 summarizes several work experience measures of the total non-college sample, including persons who were out of the labor force at the time of the survey. Each of these measures excludes time spent in the military.

The total experience measure was calculated by summing length of time on each job the respondents held. This measure thus includes any part-time and part-year jobs, in addition to full-time employment. There were no statistically significant differences across curricula on this measure, although the men from the vocational track did tend to have fewer accumulated years of work experience than did men from the other curricula. The greater propensity of men from the vocational track to enter the military may partially account for their fewer years of work experience. Women of the sample averaged fewer years of work experience than the men, an expected finding given their generally lower rates of labor force participation. Women from the business curriculum had more years of accumulated work experience than did women from the remaining curricula, but these differences were not statistically significant.

A more valid measure of labor market attachment and commitment may be the accumulated years of full-time work experience. On this measure, academic track men had significantly fewer years of experience than did general track men. The fewer years of full-time employment experienced by these academic men is probably due to their relatively higher rates of postsecondary schooling. Vocational track men also had lower rates of full-time experience than did general track men; this finding may be

Table 12

Accumulated Years of Work Experience of the Total Sample Population, by High School Curriculum and Sex

	Men			
	Academic	General	Business	Vocational
Average years of total experience	7.42	7.27	---	6.78
Number	47	36	---	42
Average years of full-time experience	4.91[b]	6.23	---	5.13[a]
Number	48	36	---	47

	Women			
	Academic	General	Business	Vocational
Average years of total experience	5.81	5.84	6.68	5.78
Number	42	21	36	26
Average years of full-time experience	3.66	3.81	5.39[a]	3.70
Number	42	21	37	26

a. Statistically different from the general curriculum at the 11 percent level.

b. Statistically different from the general curriculum at the 5 percent level.

partially influenced by the greater rates of military service among vocational graduates. However, this difference in years of full-time experience was significant at only the 11 percent level.

Among the women of the sample, business curriculum graduates averaged significantly more years of full-time experience than did women from all other curricula. There were no significant differences on this measure among women from the academic, general, or vocational tracks.

Years of Work Experience--Sample with Current Jobs

The foregoing work experience comparisons included all members of the sample, whether or not they were currently employed at the time of the followup survey. Limiting the experience comparisons to persons holding jobs at the time of the survey results in higher averages on these measures for all groups.

As table 13 shows, although there were no significant differences in total years of experience among the graduates from the different curricula who were currently employed, men from the academic and vocational tracks had significantly fewer accumulated years of full-time experience than did men from the general curriculum. This is a further discouraging finding of the impact of vocational training: Graduates from the vocational curriculum did not accumulate greater employment experience as a result of their training. Once again, however, these lower rates of employment may have been due to greater education, training, and military activities.

Except for women from the business curriculum, women demonstrated no differences by curriculum in the accumulated years of work experience. Currently employed business track women recorded the largest amount of work experience over the 8 years of the survey, and, in fact, they averaged more full-time experience than did the men. The very low sample size available for these comparisons of female work experience makes these findings questionable, however.

The Transition in Terms of Size of Firm

To facilitate understanding of the differences in the employment patterns of young people who have received different forms of high school training, this section begins with an analysis of the mobility of the graduates across and between firms of different sizes. By comparing the size of firm of first job to the size of the firm of current job, we can develop a clearer picture of the transition paths of noncollege youth.

Table 13

Accumulated Years of Work Experience of the Currently Employed Sample Population, by High School Curriculum and Sex

Men

	Academic	General	Business	Vocational
Average years of total experience	8.27	7.90	---	7.31
Number	39	38	---	34
Average years of full-time experience	5.65[b]	7.01	---	5.84[a]
Number	40	28	---	37

Women

	Academic	General	Business	Vocational
Average years of total experience	7.05	7.31	8.25	6.93
Number	18	8	19	10
Average years of full-time experience	4.84	4.18	7.56[c]	4.22
Number	18	8	19	10

a. Significantly different from the general curriculum at the 10 percent level.

b. Significantly different from the general curriculum at the 5 percent level.

c. Significantly different from the general curriculum at the 1 percent level.

Table 14 presents comparisons of firm size between first and current job, by high school curriculum and sex. The numbers in table 14 indicate first, that the majority of both men and women tended to remain with the same size of the firm with which they started. Of the men who started in small firms (the first two rows of table 14) 67 percent were also employed in small firms on their current jobs (the first row of table 14). The figure for women is 71 percent. Likewise, 74 percent of the men and 83 percent of the women who started in large firms remained with large employers on their current jobs. There was thus very little movement between firm size from first job to current.

Another finding revealed by this table is that there were no significant differences among workers by curriculum background in the size of firm transitions. For persons from all curricula, a majority of the sample remained with firms of similar size from first job to current job. Men from the vocational curriculum, however, tended to change size of firm more often than the other men did. Thirty-eight percent of the men from the vocational track changed size of firm (the second and fourth row of table 14). The corresponding percentages for persons from the academic and general tracks were 24 percent and 29 percent, respectively.

Larger differences by curriculum background appeared in the size of firm transition among the women of the sample, but the small sample size for this group limits the usefulness of this information. Most women stayed with large employers on both their first and current jobs.

Occupational Mobility from First Job to Current

The previous sections of this report compared overall occupational distributions of the sample population on both their first jobs and current jobs. Since these comparisons dealt only with average changes in occupation, they may be masking changes occurring on an individual basis. This section therefore compares the occupational mobility experienced by individual members of the sample between their first and current jobs (see table 15). The findings for the women of the sample are downplayed because of the small sample size available for this subgroup.

Men from the academic curriculum revealed a strong propensity toward white-collar employment. Most men who began in white-collar jobs remained in these occupations on their current jobs. A majority of the academic track men who began in blue-collar occupations also remained in blue-collar fields, but

Table 14

Size of Firm Transition, First Job to Current, Among Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Transition path-- First Job to Current	Academic	General	Business	Vocational	Total
Small firm to small firm	39.5	35.7	---	21.9	32.7
Small firm to large firm	10.5	21.4	---	18.8	16.3
Large firm to large firm	36.8	35.7	---	40.6	37.8
Large firm to small firm	13.2	7.1	---	18.8	13.3
Total	100.0	99.9	---	100.1	100.1
Number	38	28	---	32	98

Women

Transition path-- First Job to Current	Academic	General	Business	Vocational	Total
Small firm to small firm	5.9	50.0	10.5	50.0	20.0
Small firm to large firm	11.8	16.7	---	12.5	8.0
Large firm to large firm	76.5	16.7	73.7	25.0	60.0
Large firm to small firm	5.9	16.7	15.8	12.5	12.0
Total	100.1	100.1	100.0	100.0	100.0
Number	17	6	19	8	50

Note: Columns may not sum to 100 percent because of rounding.

Table 15

Occupational Mobility from First Job to Current Job for Sample Population, by High School Curriculum and Sex--Percentage Distributions

Men

Transition	Academic	General	Business	Vocational
White-collar to white-collar	33.3	25.0	---	5.7
White-collar to blue-collar	7.7	7.1	---	---
White-collar to service	2.6	---	---	---
Blue-collar to white-collar	17.9	42.9	---	11.4
Blue-collar to blue-collar	25.9	7.1	---	77.1
Blue-collar to service	5.1	7.1	---	2.9
Service to white-collar	2.6	3.6	---	---
Service to blue-collar	2.6	3.6	---	---
Service to service	2.6	3.6	---	2.9
Total	100.3	100.0	---	100.0
Number	39	28	---	35

Women

Transition	Academic	General	Business	Vocational
White-collar to white-collar	62.5	50.0	84.2	12.5
White-collar to blue-collar	12.5	---	---	12.5
White-collar to service	6.3	16.7	5.3	---
Blue-collar to white-collar	6.3	---	5.3	12.5
Blue-collar to blue-collar	6.3	---	---	---
Blue-collar to service	---	---	---	---
Service to white-collar	---	16.7	---	---
Service to blue-collar	---	---	---	---
Service to service	6.3	16.7	5.3	62.5
Total	100.2	100.1	100.1	100.0
Number	16	6	19	8

Note: Columns may not sum to 100 percent because of rounding.

more than a third also moved to white-collar employment (the entry in the fourth row of table 15 divided by the sum of the entries in fourth, fifth, and sixth rows). Very few academic track men either started in or moved to service occupations.

Men from the general curriculum were more likely to start their careers in blue-collar jobs than were men from the academic track. However, most of the general curriculum men moved from blue-collar to white-collar jobs by the time of the followup survey. Once again, there was very little movement into service occupations.

Vocational track men showed distinctly different patterns of mobility than did men from the other curricula. Vocational track men were heavily concentrated among blue-collar occupations, both on their first and current jobs. Only 12 percent of the vocational track men who experienced blue-collar employment on their initial jobs had moved to white-collar occupations by the time of the followup survey. This information thus confirms the earlier finding that vocational training does influence employment outcomes. The major problem, however, is that the different employment experiences of male vocational curriculum graduates do not result in greater labor market rewards (as measured by wages, occupational status, and total years of work experience). Noncollege academic and general curriculum men, while finding employment in different types of jobs, end up doing as well as or better than vocationally trained men in terms of wages and status.

Women from the academic, general, and business curricula tended to both start in and move to white-collar occupations over the course of their careers. Women from the vocational curriculum, however, were more likely to begin and remain in service occupations, a fact that may help to account for their relatively lower wages and occupational status.

Wage Changes from First Job to Current Job

The final curriculum comparison to be made in this paper concerns changes in hourly wages from first job to current job. These wage changes are presented for the sample population, by sex, in table 16. No significant differences in either nominal or constant wage growth were revealed among the men from the different high school curricula. This finding is expected, since there were also no significant differences in their wages on either their first jobs or their current jobs. In real terms (which are more accurate than nominal wages due to different starting dates of employment), academic curriculum men

Table 16

Change in Hourly Wages, First Job to Current Job for Sample Population, by High School Curriculum and Sex

	Men			
	Academic	General	Business	Vocational
Average change in nominal wages (dollars per hour)	$2.47	$2.28	---	$2.51
Average change in constant wages (dollars per hour)	$0.56	$0.38	---	$0.45
Number	37	22	---	24

	Women			
	Academic	General	Business	Vocational
Average change in nominal wages (dollars per hour)	$2.23[a]	$1.01	$1.33	$0.86
Average change in constant wages (dollars per hour)	$0.49[a]	$0.20	$0.13	$0.04
Number	13	4	13	4

a. Statistically different from the remaining curriculum at the 5 percent level.

Table 16

Change in Hourly Wages, First Job to Current Job for Sample Population, by High School Curriculum and Sex

	Men			
	Academic	General	Business	Vocational
Average change in nominal wages (dollars per hour)	$2.47	$2.28	---	$2.51
Average change in constant wages (dollars per hour)	$0.56	$0.38	---	$0.45
Number	37	22	---	24

	Women			
	Academic	General	Business	Vocational
Average change in nominal wages (dollars per hour)	$2.23[a]	$1.01	$1.33	$0.86
Average change in constant wages (dollars per hour)	$0.49[a]	$0.20	$0.13	$0.04
Number	13	4	13	4

a. Statistically different from the remaining curriculum at the 5 percent level.

gained $0.56 per hour from first job to current, general track men gained $0.38 per hour, and vocational men gained $0.45 per hour. These wage gains are relatively low in large part because of high inflation rates over the time period covered by the survey.

Because of these high inflation rates, women from all curricula except the academic actually experienced a decrease on their real wages over the course of their early careers. Although academic track women showed significantly greater wage growth than did graduates from the remaining curricula, the small sample size for this variable once again prohibits a definitive statement as the mobility characteristics of women from the different curricula.

Section 8

Regression Analysis

This section reports the results of descriptive regressions that relate initial wages, current wages, and wage changes over the sample period to a set of personal characteristics, high school curricula, and variables that indicate transitions between size classes of firms. The latter variables allow us to examine the hypothesis that movement from small to large firms results in differential wage gains.

To anticipate, the regression results confirm those from the bivariate analyses previously reported. Within this sample, a vocational diploma did not result in any significant initial wage advantage or differential wage growth. The results concerning the effect of movement between small and large firms provides only the most tentative evidence that large firms offer better wage opportunities.

Wages

The first regression reported in table 17 has the initial wage on first job as the dependent variable. The categorical variables indicating curriculum background (measured against the general track as a reference category) show no significant differences from one another.[19] Also, a first job with a large employer offers no higher wages than a first job with a small employer. The only variables that do appear as significant in this equation are (1) a variable indicating whether the respondent is male (and this has a relatively large and significant effect), and (2) a variable indicating that the respondent's family had high income. This latter variable has a negative coefficient indicating perhaps that noncollege youth from

Table 17

Regression Results Relating Starting Wage on First Job of Sample Population's Personal Characteristics, High School Curriculum Background, and Size of Firm

Independent Variable	Regression Coefficient	t-ratio
Sex--male	.92	6.41[b]
Family income--high	-.54	2.22[a]
Family income--low	-.03	.20
Academic curriculum	.16	.93
Business curriculum	.23	.93
Vocational curriculum	.18	.96
First job--large employer	.11	.85
Constant	2.06	

$\bar{R}^2$ = .213
N = 168

Note: The omitted variables used for reference in this regression included women, persons from middle-income families, persons from the general curriculum, and persons whose first jobs were with small employers.

a. Statistically significant at the 5 percent level.

b. Statistically significant at the 1 percent level.

relatively wealthy families might be systematically lower achievers. When a variable measuring the Duncan occupational prestige scale of the father's job was used instead of the family income variables, the same inverse relation was produced, but it was not significant.

In a separate regression with the same dependent variable, a set of categorical variables was included to indicate whether a person had completed any postsecondary schooling. These variables were described earlier in tables 3 and 4. The coefficients on these variables were quite small and not distinguishable from zero.

The second regression has as the dependent variable the current or most recently observed wage for each respondent that had a current job. The sample of people employed at the time of the survey may have been filtered of those who have less ability to translate their background characteristics into wage gains, so the results may contain some biases due to systematic sample attrition.

The results are reported in table 18. Men earn more than women as expected. An academic high school curriculum background, in comparison with the general curriculum background, has a fairly large and significant effect on a person's wages 7 years after graduation, even though the academic background was not associated with higher initial wages. The amount of work experience accumulated in the 7-year period also has a predictably positive, and significant, effect on wages. Persons whose current job is with a large firm appear to have higher wages than do those employed by small firms, but the effect is significant only at the 10 percent level.

The categorical variables indicating completion of postsecondary schooling (mentioned earlier) were also tried in a regression with this dependent variable. Neither variable produced a significant coefficient, although the variable indicating an associate's degree was relatively large and would pass a significance test at approximately the 15 percent level.[20]

Changes in Wages

The third regression has as the dependent variable the wage change over the sample period (table 19). This regression was also run only on the sample who reported a current wage. This regression has the same independent variables as the previous equation, but in addition has a set of variables that indicate the transition (or lack of transition) an individual has made

Table 18

Regression Results Relating Wage on Current Job to Sample Population's Personal Characteristics, High School Curriculum, Years of Work Experience, and Size of Firm

Independent Variable	Regression Coefficient	t-ratio
Sex--male	1.22	3.52[c]
Family income--high	0.28	0.53
Family income--low	-0.18	0.50
Academic curriculum	0.88	2.58[c]
Business curriculum	-0.05	0.08
Vocational curriculum	0.27	0.70
Years of full-time work experience	0.12	2.02[b]
Current job--large employer	0.46	1.63[a]
Constant	2.90	

$\bar{R}^2$ = .193
N = 117

Note: The omitted variables used for reference in this regression included women, persons from middle income families, persons from the general curriculum, and persons whose first jobs were with small employers.

a. Statistically significant at the 10 percent level.

b. Statistically significant at the 5 percent level.

c. Statistically significant at the 1 percent level.

Table 19

Regression Results Relating Wage Gains from First Job to Current to Sample Population's Personal Characteristics, High School Curriculum, Postsecondary Training, Years of Work Experience, and Size of Firm Transition

Independent Variable	Regression Coefficient	t-ratio
Sex--male	.82	1.94[a]
Academic curriculum	.63	1.62[a]
Business curriculum	-.41	.63
Vocational curriculum	.11	.24
Postsecondary diploma or certificate	.41	1.07
Postsecondary associate degree	1.09	1.13
Years of full-time work experience	.22	3.34[b]
Transition--small to large experience	.69	1.37
Transition--large to large experience	.70	1.78[a]
Transition--large to small experience	.51	.97
Constant	-.62	

$\bar{R}^2$ = .120
N = 118

Note: The omitted variables used for reference in this regression included women, persons from the general curriculum, persons with no postsecondary training, and persons who started and remained with smaller employers.

a. Statistically significant at the 10 percent level.

b. Statistically significant at the 1 percent level.

between size classes of firms from first to current job. There are four possibilities: Small initially to small currently; small initially to large currently; large initially to small currently; and large initially to large currently. Small to small is the reference category against which the coefficients on the other categories are measured. The results in this regression for the variables other than the transition variables are similar to the results for the previous regression. The academic curriculum background is associated with larger wage gains than the general curriculum background (significant at the 10 percent level), while there were no significant differences in the wage gains experienced by vocational and general track graduates.

Of special interest is the additional finding that people who have moved to large firms from small ones, or have been in large firms both initially and currently, also appear to have gained higher wages. The estimated effects of the latter two variables are similar in size; the coefficient on the large- to large variable is significant at the 10 percent level, while the coefficient on small-to-large is significant only at the 20 percent level. Thus, there does appear to be some tentative support for the hypothesis that larger firms provide more opportunities for wage growth.

Section 9

Conclusion

The basic research task of this study was to test for differences in the labor market experiences of noncollege high school graduates of vocational and other curricula. Special emphasis was placed on the role of size of firms with which the graduates worked. In particular, this study investigated whether small employers were relatively more likely to employ vocational track graduates, and whether size of firm had an influence on the wages the youth from the different high school curricula received.

One major finding from this study is that the size of firm plays a relatively minor role in differentiating the experiences of graduates from the different high school curricula. Although there is some evidence that employment with large employers generates a slight wage advantage, there was no evidence that vocational and other graduates differed in the size of firm with which they found employment.

A second finding from this study is that differences in high school preparation have a minimal influence on the wages received by noncollege youth over the course of their early careers. Vocational graduates were not found to earn wages that differed substantially from the wages earned by graduates of the other curricula. The findings indicate, however, that academic curriculum graduates may gain an advantage over general curriculum graduates after several years in the labor force.

A final important finding from this study is that high school vocational training does appear to influence the types of jobs obtained by youth in this curriculum. Male graduates from the vocational curriculum found employment in blue-collar occupations, while male graduates from the academic and general curricula were more likely to be employed in white-collar occupations. The major curriculum difference among the women of the sample was the relatively greater propensity of vocationally trained women to be employed in service occupations. Women from the academic, general, and business curricula were heavily concentrated in white-collar jobs. This finding then raises the question of occupational preferences. Although vocational training may not benefit individuals in terms of wages, if may serve as an important method of preparation for jobs that certain groups of young people want.

Notes

1. See David Birch, "The Job Creation Process" (Cambridge: Massachusetts Institute of Technology, photocopy, 1978).

2. See Paul Osterman, Getting Started: The Youth Labor Market (Cambridge: Massachusetts Institute of Technology Press, 1978).

3. See ibid.

4. See Patricia Flynn Pannell, "Employer Response to Skill Shortages: Implications for Small Business," Bentley College, photocopy, 1981.

5. This appears to be the modal sequence in a sample of youth interviewed by Osterman, Getting Started, pp. 15-29. He also cites two other studies that found similar evidence, Richard Lester, Hiring Practices and Labor Competition (Princeton, N.J.: Industrial Relations Section, Princeton University, 1954); and Theodore Malm, "Recruiting Patterns and the Functioning of Labor Markets," Industrial and Labor Relations Review, July 1954.

6. Respondents to the questionnaire were also asked to state their high school curriculum. Over 92 percent of the sample reported the same curriculum to which they had been assigned, ex post.

7. Throughout this report, tests of statistical significance involved use of the Chi-square statistic (to test for differences in proportions) and the "t" statistic (to test for differences in means). Because of the relatively small sample sizes, the 10 percent level of significance was used as the maximum acceptable significance level. All tables indicate whether a significant relationship was found at the 1 percent, 5 percent, or 10 percent level.

8. An additional measure of "ability," rank in class, was available only for graduates from the comprehensive high schools. (The trade schools did not calculate rank in class for its graduates.) This variable was therefore excluded from the background comparisons. No other grade information was available for any of the sample.

9. Persons who received an associate's degree in a field offered by a 4-year institution (including liberal arts majors) were placed in the college sample. The college/noncollege grouping of the associate's degree holders was made after a careful inspection of the individual questionnaires of these persons. If the intent of the postsecondary education appeared to be preparation for an eventual bachelor's degree, the person was placed in the college category.

10. Since this sample is restricted to noncollege graduates, persons from the academic track who remained in college and obtained a degree have been excluded from both table 3 and and table 4.

11. The sample size differs for the various employment characteristics because of missing values for some variables.

12. Classifying employers hiring 50 to 100 workers in the small, rather than large, category did not substantially alter the findings presented in this paper. Even fewer curriculum differences were found among the men on their first job; vocational track women were still more likely to be employed by small employers than were other women. No data are available for comparison to the overall size distribution of firms in the Worcester area.

13. Because the sample used in this study is relatively small, especially when broken down by curriculum and sex, standard occupation and industry classifications were condensed into a smaller number of categories. These broader categories were derived from the standard Census and S.I.C. classifications as follows:

White-collar	= Professional, managerial, sales, and clerical occupations
Blue-collar	= Craft, operative, transport, and labor occupations
Service	= Service and private household occupations
Construction	= Construction industry
Manufacturing	= Durable and nondurable manufacturing industries

Nonmanufacturing = Transportation and communication; wholesale and retail trade; finance, insurance, and real estate; service; and government.

14. For a review of previous studies of the impact of vocational training, see Donna E. Olszewski, "Career Paths and Vocational Education," in P. Poeringer and B. Vermeulen eds., Jobs and Training in the 1980's (Boston: Martinus Nijhoff, 1981).

15. It should be noted, however, that many women may desire vocational training for reasons other than employment and earnings; these "avocational" reasons might yield significant benefits to these women in areas other than those included in economic and labor market studies.

16. Osterman, Getting Started.

17. Because this information was gathered at one point in time, these nominal wages represent a more accurate basis for comparisons on the basis of curriculum background than they did when compared for first jobs.

18. Osterman, Getting Started.

19. The variable denoting the person's sex and the variable indicating business curriculum are clearly correlated. No men reported having been in the business curriculum. However, not all (only about one-third) of the women reported having been in a business curriculum, and therefore the correlation is certainly not perfect.

20. Two points should be made about these variables: First, they should be properly included in a regression along with all the variables reported in table 21; this was not done in the first round of analysis and will be in the next. Second, the number of people reporting an associate's degree is very small (since this is a noncollege sample), the relatively large coefficient may be due to one or two extreme values; this also will be investigated further.

APPENDIX A

ADDITIONAL CHARACTERISTICS OF FIRST JOB, FOR MEN IN THE SAMPLE POPULATION BY HIGH SCHOOL CURRICULUM--PERCENTAGE DISTRIBUTIONS

Union Status	Academic	General	Business	Vocational	Total
Union member	26.8	6.3	---	43.2	26.4
Total responding	41	32	---	37	110
Job Search Method					
Direct application	34.5	36.0	---	31.0	33.8
Friends/relatives	44.8	32.0	---	27.5	34.9
Formal agency	10.3	4.0	---	10.3	8.4
School placement	3.4	12.0	---	24.1	13.3
Other	6.8	16.0	---	6.8	9.6
Total	98.8	100.0	---	99.7	100.0
Number	29	25	---	29	83
Reason for Leaving					
Current job	19.4	16.7	---	12.1	16.2
Promoted, transferred	16.7	6.7	---	3.0	9.1
Laid off, involuntary	22.3	20.0	---	39.4	27.2
Dissatisfied	33.4	50.0	---	39.4	39.4
School, military	---	---	---	6.0	2.0
Left labor force	8.4	6.6	---	3.0	6.0
Total	100.2	100.0	---	99.8	99.9
Number	36	30	---	33	99
Job Tenure (years)	2.98	3.01	---	2.37	2.80
Number	41	33	---	37	113

Note: Columns may not sum to 100 percent because of rounding.

APPENDIX B

ADDITIONAL CHARACTERISTICS OF FIRST JOB, FOR WOMEN IN THE SAMPLE POPULATION, BY HIGH SCHOOL CURRICULUM--PERCENTAGE DISTRIBUTIONS

Union Status	Academic	General	Business	Vocational	Total
Union member	13.2	25.0	25.0	4.8	16.8
Total responding	38	16	32	21	107
Job Search Method					
Direct application	26.9	18.2	58.3	47.0	39.7
Friends/relatives	46.1	9.1	25.0	29.4	30.8
Formal agency	3.8	18.2	4.2	---	5.1
School placement	15.4	27.3	4.2	23.5	15.4
Other	7.7	27.3	8.3	---	9.0
Total	99.9	100.1	100.0	99.9	100.0
Number	26	11	24	17	78
Reason for Leaving					
Current job	11.4	18.8	19.4	5.0	13.7
Promoted, transferred	14.3	6.3	6.5	---	7.8
Laid off, involuntary	5.8	---	---	15.0	7.8
Dissatisfied	17.2	25.1	35.5	45.0	29.4
School, military	2.9	6.3	---	5.0	2.9
Left labor force	48.6	43.9	29.0	30.0	38.3
Total	100.2	100.4	100.1	100.0	99.9
Number	35	16	31	20	102
Job Tenure (years)	2.18	2.49	3.73[a]	1.54	2.62
Number	38	17	33	21	110

Note: Columns may not sum to 100 percent because of rounding.

a. Statistically different from the general (7 percent level) and vocational curriculum (1 percent level).

APPENDIX C

UNION STATUS, JOB SEARCH METHOD, AND JOB TENURE OF CURRENT JOB FOR MEN IN THE SAMPLE POPULATION, BY HIGH SCHOOL CURRICULUM--PERCENTAGE DISTRIBUTIONS

	Academic	General	Business	Vocational	Total
Union Member	15.4	18.5	---	34.4	22.4
Total responding	39	28	---	36	103
Job Search Method					
Direct application	37.6	40.9	---	29.6	35.8
Friends/relatives	21.9	31.8	---	14.8	22.2
Formal agency	12.5	9.0	---	7.4	9.8
School placement	3.1	---	---	3.7	2.5
Promotion	18.8	13.6	---	25.9	19.8
Other	6.3	14.5	---	18.5	9.9
Total	100.2	99.8		99.9	100.0
Number	32	22	---	27	81
Job Tenure (years)	2.85	3.38	---	2.50	2.90
Number	40	28	---	37	106

Note: Columns may not sum to 100 percent because of rounding.

APPENDIX D

UNION STATUS, JOB SEARCH METHOD, AND JOB TENURE OF CURRENT JOB FOR WOMEN IN THE SAMPLE POPULATION, BY HIGH SCHOOL CURRICULUM--PERCENTAGE DISTRIBUTIONS

	Academic	General	Business	Vocational	Total
Union Member	33.3	0.0	36.8	33.3	29.6
Total responding	18	8	19	9	54
Job Search Method					
Direct application	30.8	16.7	40.0	37.5	33.3
Friends/relatives	38.5	33.3	26.7	37.5	33.4
Formal agency	---	---	6.7	---	2.4
School placement	---	16.7	---	12.5	4.8
Promotion	30.8	33.3	26.7	12.5	26.2
Other	---	---	---	---	---
Total	100.1	100.0	100.1	100.0	100.1
Number	13	6	15	8	42
Job Tenure (years)	3.63	3.83	3.93	2.77	3.47
Number	18	8	19	10	57

Note: Columns may not sum to 100 percent because of rounding.

ASSESSING THE EFFECTIVENESS OF VOCATIONAL EDUCATION AND CETA PROGRAMS THROUGH THE USE OF ROUTINELY AVAILABLE ADMINISTRATIVE DATA

by

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ASSESSING THE EFFECTIVENESS OF VOCATIONAL EDUCATION AND CETA PROGRAMS THROUGH THE USE OF ROUTINELY AVAILABLE ADMINISTRATIVE DATA

Introduction

The purpose of this paper is to illustrate the use of routinely available administrative data[1] to examine the following:

- Employment and earnings records for persons who have participated in secondary-level vocational education programs;
- Subsequent participation in CETA programs by these former participants in secondary-level vocational education activities; and,
- The labor market outcomes that are associated with specific features of previous vocational education, of employment and training participation, or of both.

The authors conclude that this procedure, which requires no direct follow-up contact with former program participants, is a promising way to address many of the critical questions of program effectiveness, questions that are pertinent to the following:

- Congressional consideration of reauthorization of the Vocational Education Act and the Comprehensive Employment and Training Act;
- State allocation of vocational education monies among institutions and among specific programs within those schools; and,
- Effective program management at the individual school and prime-sponsor levels.

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[1]This paper refines, and applies in a different context, an analytical approach that is described in David W. Stevens, "Performance Measurement in the CETA System," in CETA: An Analysis of the Issues, Special Report No. 23 (Washington, D.C.: National Commission for Manpower Policy, May 1978), pp. 217-41.

It is not the authors' intention to suggest that the approach they plan to discuss offers a simple, universally applicable method for program assessment that should supersede all other evaluation procedures.

Section 1 of this paper offers a brief overview of the administrative data sources that are routinely available for analytical purposes. This overview includes a detailed statement of the specific data reduction tasks that were conducted for this paper.

Section 2 presents tables to illustrate the sequence of events that can be traced through this procedure. Although this section barely scratches the surface of the full analytical potential of this method, it clearly indicates the understanding of program relationships and effectiveness that can be acquired through this approach.[2]

Section 3 offers specific recommendations for congressional and administrative actions to assure appropriate uses of the procedures documented here.

Section 1

Analysis File Creation

The sources of administrative data that make up the analysis file are these:

- The Missouri Department of Elementary and Secondary Education Vocational Education information system,
- The Missouri Division of Employment Security Unemployment Insurance Wage and Contribution reporting system, and
- The CETA information system of six prime sponsors in the State.

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[2] No tests of the statistical significance, and therefore inferential usefulness of the specific data presented, are offered. This purposeful omission is intended to limit the extent to which the particular data relationships shown can be misused. The reader is urged to focus on what important management questions can be addressed using this technique, not what advocacy position can be promoted with a particular comparison taken out of context.

These agencies routinely collect information about vocational education participants as part of their administrative reporting systems. This section describes the data contained in these information systems and how it can be combined to create an analysis file that subsequently can be used to assess the performance of vocational education.

Vocational Education Information System

In 1973 the Missouri Department of Elementary and Secondary Education developed an automated system for keeping track of enrollments in federally reimbursed vocational programs in the State. The system, known as the Missouri Occupational Training Information System (MOTIS), was designed to provide at the state level a complete record on each student enrolled in the program. Eventually, Missouri's version of the Vocational Education Data System (VEDS), which was authorized in the 1976 Vocational Education Amendments, replaced MOTIS. Since we chose to study persons enrolled in vocational education during the 1975-76 and 1976-77 school years, we depended exclusively on the MOTIS data base for information. We would, however, have used the VEDS-generated data had the study focused on a more recent time period.

For the school years 1975-76 and 1976-77, the MOTIS system contained 446,608 records on participants in vocational education. These records make up the primary vocational education file; this file is reduced further to explore the specific research questions posed in the study. Table 1 lists the major categories of data on each record. A record contains information that can be used to identify the client, determine the program services received, and assign a completion status to the enrollee. These categories of information, as well as others listed, make up the analysis file.

CETA Management Information System

The major source of data on CETA participants is a computerized management information system (MIS) operated by the Missouri Division of Employment Security (MDES). In Missouri, six of the nine prime sponsors contract with MDES for operation of their respective information systems. MDES serves the same function as a data processing service bureau by capturing and processing the data, and by producing routine reports that help the prime sponsors manage their programs.

Table 1

Vocational Education File:
Major Categories of Data

Category	Data Elements
Student identifier	Name, Social Security number
Demographic characteristics	Sex, age, race, education
School data	County, district number
Program information	Office of Education program code, program level
Condition	Educationally or socioeconomically disadvantaged, handicapped, correctional institute inmate or parolee
Program completion status	Program completion, program dropout, obtained marketable skill
Followup	Training-related placement, continuing education, armed forces, employed, unemployed

Three types of information are collected on each CETA participant: (1) when a participant first enters a CETA program, "intake" or enrollment information, including participant characteristics, previous labor market experience, and other eligibility criteria is collected; (2) while a participant is in the program, program services information is collected; and (3) when a participant leaves a program, termination information is collected. Thus, for each participant the CETA MIS system contains a record of enrollment information, program activity data, and termination information.

For the period October 1977 through May 1980, 185,000 individual records were maintained on the MIS system for the six prime sponsors covered in the study. From this total we have identified former vocational education students, and selected a CETA comparison group. More details of these data reduction procedures are presented in later sections.

The maximum length of a person's record is 921 characters. Rather than attempt to describe each data item in a record, we have categorized the record into groupings of data items that represent those itmes that are of major interest in performance measurement. These groupings, labeled data aggregates, are displayed in table 2.

Unemployment Insurance File

The Unemployment Insurance (UI) program, administered by the Missouri Division of Employment Security, captures earnings information on 97 percent of the work force in the State. Each quarter, employers in the State must submit a wage and contribution report specifying the wages paid to all employees. Included in the quarterly report are the employer's identification number, the employee's Social Security number, and an industry identification code. These data are used to determine unemployment insurance eligibility. For example, to be eligible for benefits, an employee must have earnings above a certain threshold level and be employed for a specified length of time during a base period. This record of earnings is maintained on each covered employee for a period of five quarters. As illustrated later, this source of data allows us to secure earnings data on all former vocational education and CETA participants covered by the UI program.

Table 2

CETA MIS Data Aggregates

Data Aggregate	Data Item(s)
Client characteristics	Sex, race, age, education, handicapped, offender, farmworker, family size, income
Client identification	Social Security number, name, address, telephone
Employment experience	Current status, unemployed, hourly pay, previous job, length of previous job, title of last job, reason left job, date last job ended
Transfer program participation	AFDC, food stamps, welfare, special status, unemployment insurance, benefits, targeted jobs tax credit
Program identification	Prime-sponsor identifier, local office, region, program type
Program activity	Activity code, date of activity, enrollment date, transition services, date of last enrollment
Termination/followup data	Termination code, date terminated, followup status, hourly wage, date of followup

Administrative Sources Data Base

Collectively, the three sources of administrative data offer the files depicted in table 3. The data categories that are of interest are labeled in each of the boxes. Briefly, the vocational education file contains program service, enrollment data, and completion information of 446,608 vocational education enrollees during the 1975-76 and 1976-77 school years. The CETA file provides client characteristics, program services, and labor market experience data on 185,000 CETA enrollees from October 1977 to May 1980. As indicated, the UI earnings file contains over 2 million records for 97 percent of the workers in the State for the five calendar quarters beginning October 1, 1979 and ending December 31, 1980.

From this data base, we created an analysis file to answer the research objectives of the study. This next subsection describes the procedures for reducing the data base to create an analysis file that can be used to answer the research questions posed.

Data Base Reduction Procedures

Reduction of Vocational Education File[3]

The initial file contained data on 446,608 vocational education enrollees during the 1975-76 and 1976-77 school years. We divided this file into two data sets (Student Accounting Component (SAC)) 175 and SAC 176, to represent all enrollments in the State for each of the two school years. The 1975-76 file contains 207,693 records, and the 1976-77 file contains 238,915 records. Next, we identified and removed those persons enrolled in postsecondary and adult programs. Then we eliminated all enrollees who did not have Social Security numbers. The resulting data sets are presented in the first box in flow charts 1 and 2.

The next steps were to include only those persons who met the following criteria:

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[3]Postsecondary education is left out for expository purposes only. There is no practical reason why enrollment in higher education programs could not be included in the analysis file.

Table 3

Administrative Sources Data Base

Vocational Education File	CETA File	UI Quarterly Wage Contribution File
Number of records: 446,608	Number of records: 446,608	Number of records: 2 million
Length of record: 174 bytes	Length of record: 921 bytes	Length of record: 76 bytes
Time period: 1975-76 and 1976-77 school years quarters	Time period: October 1977 to May 1980	Time period: 5 most recent calendar quarters
Coverage: All Vocational Education enrollments in State of Missouri	Coverage: All clients served by 6 of 9 prime sponsors in Missouri	Coverage: 97% of workers in State of Missouri
Data Categories:	Data Categories:	Data Categories:
o Student identifier o Demographic data o School data o Program data o Disadvantaged data o Program completion o Followup	o Program data o Demographic data o Participant data o Program activity o Labor market experience o Termination o Followup	o Social Security number o Employer ID number o Industry ID code o Earnings by quarter

1. Enrolled in one of the following vocational programs: agriculture, distributive education, health, occupational home economics, business and office, technical, or trade and industry.

2. Enrolled in school districts located in the six CETA prime-sponsor jurisdictions.

3. A high school senior in the designated year.

These steps are depicted in flow charts 1 and 2. Seniors in the 1976-77 data set were compared with persons who also were enrolled in 1975-76 to determine which persons had been enrolled for at least 2 years. An indicator of this variable was added to the former data set.

Comparison With CETA Management Information System

The reduced vocational education data sets were compared with the CETA MIS data set to establish matches (step 5 in flow charts 1 and 2). Separate data sets were created for matched and unmatched groups (step 6 in flow charts 1 and 2). Two matched groups were created: One included all persons enrolled in CETA up to May 15, 1980; the other included only persons who had terminated all CETA activities prior to October 1, 1979.

Generation of Social Security Number Tape

A tape containing Social Security numbers was generated for the purpose of collecting covered earnings data for CETA and vocational education participants. Three groups were identified: CETA/vocational education matches, CETA only, and vocational education only (1975-76 and 1976-77 graduates). (See steps 7 and 8, flow charts 1 and 2.)

1. CETA/vocational education matches:

   All vocational education high school seniors who had completed CETA activities prior to October 1, 1979, were included.

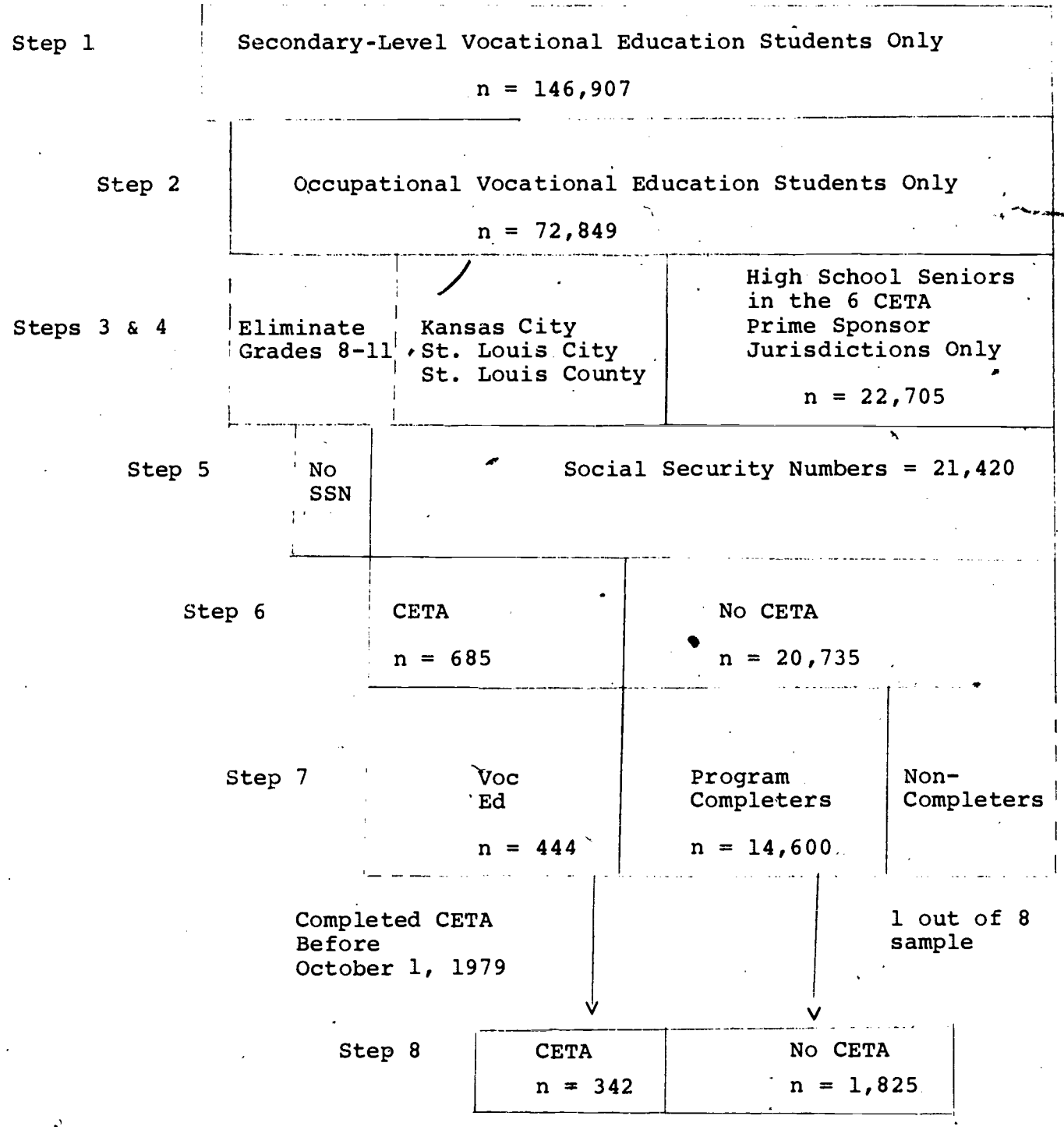
2. CETA only:

   All CETA participants born between September 1956 and November 1958 who had completed all CETA activities prior to October 1, 1979, were selected. (These dates correspond to the birthdates of 90 percent of vocational education students who were high school seniors in 1975-76 and 1976-77.)

Flow Chart 1

SAC 175

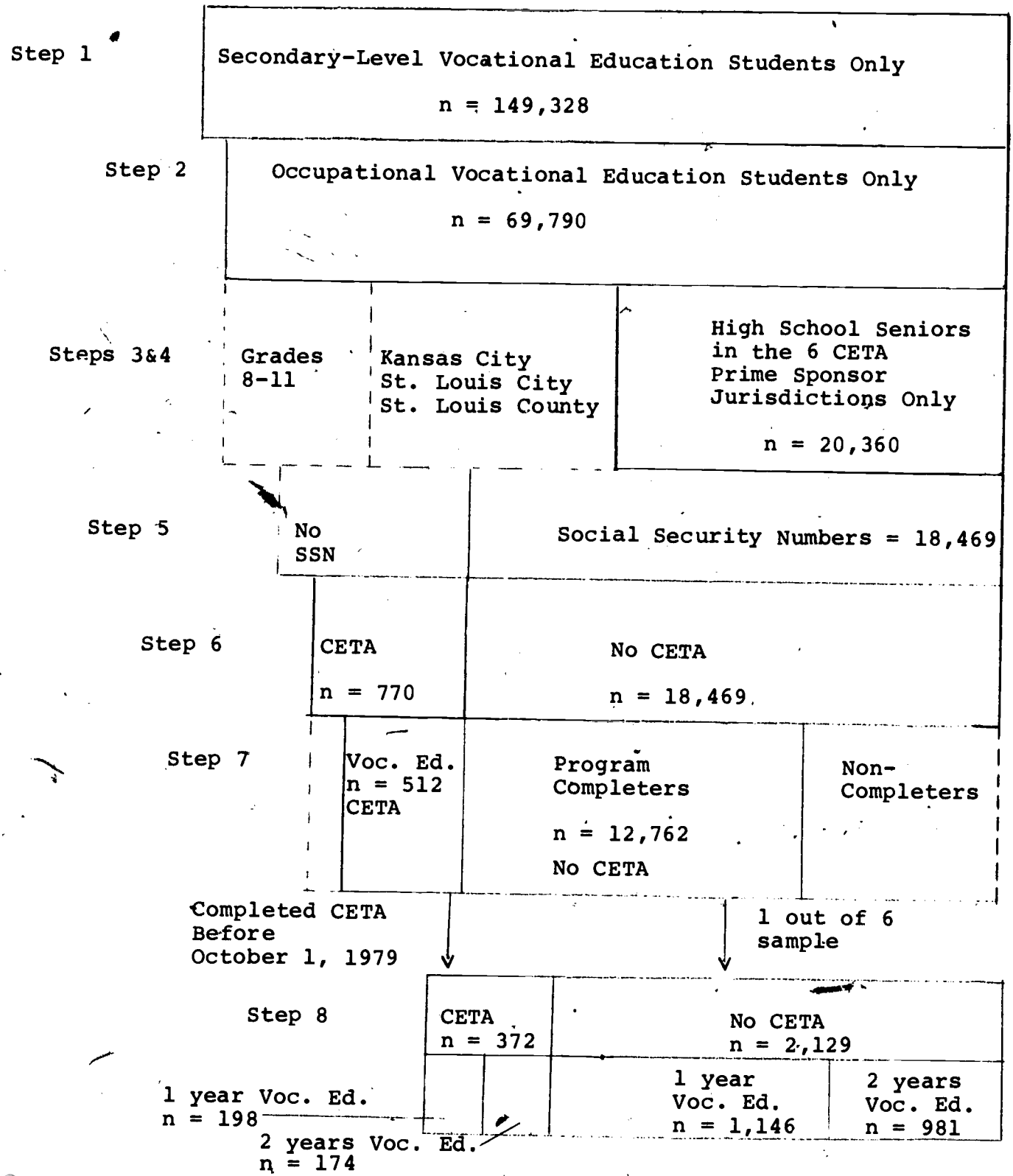
1975-76 Vocational Education Data Set



Flow Chart 2

SAC 176

1976-77 Vocational Education Data Set



3. Vocational education only:

Selection was limited to a systematic random sample of persons whose record indicates a final status of "completed training program and graduated." One out of every eight persons was chosen from the SAC 175 data set; and one out of every six for the SAC 176 data set.

Analysis File

We created the analysis file by linking the earnings records contained in the wage and contribution file with the records of persons in the CETA-only data set, the vocational-education-only data set, and the CETA/vocational education matched data set. This file was then used to answer the research questions presented in Section 2.

Section 2

Illustrative Applications

The tables in this section are presented as examples of the way in which former participants in vocational education programs can be traced through subsequent events to discover information such as the following:

- Whether they place additional demands upon the Nation's employment and training system;
- Whether they engage in employment for pay, and, if so, what the characteristics of this employment experience are; and,
- Whether regular patterns of relative advantage are exhibited for those who follow specific paths through the system.

The story that is told here begins with persons who graduated in 1977 from secondary-level vocational education programs within the jurisdictions of one of six prime sponsors in Missouri which contract with the Missouri Division of Employment Security to maintain their management information systems. These graduates are then traced through subsequent enrollment in a CETA program, if this event occurred, and employment in a job covered by Missouri's unemployment insurance statutes, if this occurred.

The tables focus on personal characteristics of the former participants and the vocational education program areas from which they emerged. Other dimensions of the data could be exhibited just as easily; for example, we could make comparisons within a given program type among individual institutions, or refine the unit of observation for CETA program participation to the level of activity, or even to the project or site.

Table 4 displays selected characteristics of the persons who completed the 1976-77 vocational education program, arrayed by whether they had enrolled in 1 or 2 years of secondary-level training, whether they had subsequently enrolled in a CETA program (somewhere in the six prime-sponsor jurisdictions), and, if so, whether they had participated in a title II-B activity. The reversal of sex proportions between the 1- and 2-year enrollment categories is readily apparent; the reasons for this pattern are not so obvious. Similarly, the limited ethnic mix and dominance of persons who were not disadvantaged are clear features of the data, but interpretation of these patterns requires additional information. (That information would be readily available to anyone using this analytical approach for management support purposes.)

Table 5 illustrates how the procedure we describe in this paper can be used to examine the traditional question, how do vocational education program areas vary in their success in preparing participants for stable and rewarding employment? Alone, the data in table 5 raise more questions than they answer, but this problem exemplifies a theme of this paper: The analytical approach illustrated here permits analysts to examine simultaneously many aspects of the education and employment and training systems and their effectiveness in promoting client employability.

Readers may want information about the mix of CETA program involvement beyond title II-B distinction shown in tables 4 and 5. Table 6 displays one additional the dimension of this issue. What is of obvious interest but is not shown is the specific activities (e.g., on-the-job training, classroom training, or adult work-experience) in which these clients participated within the title II-B category.

This statement exemplifies the importance of paying careful attention to the proper choice of unit of observation: What level and type of management decision is the analyst intending to address with a given selection of presentation format? The tables here whet readers' appetites for a disaggregation within title II-B to enable them to directly examine the use vocational

Table 4

Characteristics of 1976-77 Graduates, by Number of Years of Vocational Education Participation and Subsequent Enrollment in CETA

Characteristics	1 Year Match						2 Years Match					
	No CETA		All CETA		II-B CETA		No CETA		All CETA		II-B CETA	
	N	%	N	%	N	%	N	%	N	%	N	%
Sex												
Male	452	(39)	76	(38)	40	(35)	705	(72)	117	(67)	51	(61)
Female	694	(61)	122	(62)	74	(65)	276	(28)	57	(33)	33	(39)
Race												
White	1,110	(97)	180	(91)	106	(93)	954	(97)	164	(94)	81	(96)
Nonwhite	37	(3)	18	(9)	8	(7)	25	(3)	10	(6)	3	(4)
Disadvantaged												
Not disadvantaged	1,104	(96)	184	(93)	109	(96)	949	(97)	159	(91)	80	(95)
Academically	19	(2)	6	(3)	2	(2)	10	(1)	6	(3)	2	(2)
Economically	24	(2)	7	(4)	3	(3)	21	(2)	9	(5)	2	(2)

Table 5

1976-77 Graduates, by Number of Years of Vocational Education Participation, Program, and Subsequent Enrollment in CETA

Vocational Education Program	No CETA		1 Year Match All CETA		1 Year Match II-B CETA		No CETA		2 Years Match All CETA		2 Years Match II-B CETA	
	N	%	N	%	N	%	N	%	N	%	N	%
Agriculture	119	(10)	12	(6)	6	(5)	263	(27)	36	(21)	18	(21)
Distributive Education	164	(14)	25	(13)	17	(15)	161	(16)	21	(12)	15	(18)
Health	100	(9)	21	(11)	12	(11)	16	(2)	7	(4)	5	(6)
Occupational Home Economics	21	(2)	7	(4)	3	(3)	9	(1)	2	(1)	2	(2)
Business and Office	495	(43)	80	(40)	46	(40)	151	(15)	35	(20)	13	(16)
Technical	10	(1)	0	(0)	0	(0)	6	(1)	0	(0)	0	(0)
Trade and Industry	239	(21)	53	(27)	30	(26)	375	(38)	73	(42)	31	(37)
Total	1,148		198		114		981		174		84	

Table 6

CETA Program Type for 1976-77 Vocational Education Graduates, By Number of Years of Enrollment

CETA Program	Years of Vocational Education Enrollment	
	1 year	2 years
	N	N
YETP	11	4
YCCIP	0	1
Youth Special Grants	1	0
II-B	110	78
II-D	8	13
IV	7	8
Special Grants	4	5
VI	51	58
SYEP	6	5
HIRE II	0	1
STIP	0	1
Total	198	174

education program graduates make of subsequent classroom training under CETA auspices. This disaggregation can be easily accommodated within the approach that is described in this paper.

Let us now examine the pattern of appearance of these 1976 graduates in "covered"[4] employment in Missouri from October 1979 to September 1980. Table 7 exhibits a startling uniformity of appearance in "covered" employment, with the exception of classifications in which small cell sizes pose such serious problems that no inference can be drawn about the extent and stability of difference.

Readers are warned not to interpret any percentage figure presented in table 7 as an accurate measure of the proportion of 1976 graduates with given characteristics who were working 40 (October 1979) to 52 (September 1980) months after completion of their secondary level vocational education programs. This inference would be improper for these reasons:

- Graduates who have left the State of Missouri and are working in "covered" employment in another State would not appear in our data set.[5]

- Persons who are self-employed and therefore not required to report quarterly earnings, or persons who are working in noncovered jobs, would not appear.

Having stated these cautions, it is appropriate to note that 97 percent of employed persons are included in the covered earnings file.

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[4]Employment with an employer who is required by law to report on a quarterly basis all earnings accrued by each employee, in compliance with Federal and State unemployment insurance statutes, anywhere in the State of Missouri. See the previous section for a discussion of this data source and its limitations.

[5]It is theoretically possible to submit a list of Social Security numbers of "missing" cases to other State departments of employment security for routine administrative inquiry of their covered earnings files. The practical aspects of such cooperative arrangements are not dealt with further in this paper.

Table 7

Percentage of 1976 Graduates with Earnings Between October 1979 and September 1980[a] By Characteristics, Number of Years of Vocational Education Participation, And Subsequent Enrollment in CETA

	1 Year							2 Years					
		Match				CETA Only			Match				
		All CETA		II-B CETA				No CETA		All CETA		II-B CETA	
Characteristics	n/N[b]	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%
Sex														
Male	315/452	(70)	59/76	(78)	32/40	(80)	525/755	(70)	495/705	(70)	91/117	(78)	41/51	(80)
Female	497/694	(72)	97/122	(80)	58/74	(78)	487/654	(74)	196/276	(71)	47/57	(82)	28/33	(85)
Race														
White	787/1,110	(71)	145/180	(81)	85/106	(80)	888/1,208	(74)	672/954	(70)	129/164	(79)	66/81	(81)
Nonwhite	26/37	(70)	11/18	(61)	5/8	(62)	124/201	(62)	18/25	(72)	9/10	(90)	3/3	(100)
Disadvantaged														
Not Disadvantaged	784/1,104	(71)	144/184	(78)	86/109	(79)			671/949	(71)	126/159	(79)	66/80	(82)
Educationally Disadvantaged	13/19	(68)	4/6	(67)	1/2	(50)			8/10	(80)	4/6	(67)	1/2	(50)
Economically Disadvantaged	16/24	(67)	7/7	(100)	3/3	(100)			12/21	(57)	8/9	(89)	2/2	(100)

a. Includes only those participants who had some earnings during the period October 1979 to September 1980.

b. n includes only those participants with some earnings. N includes the total number of participants in each cell.

Table 8 complements the previous exhibits by showing 1979-80 covered employment status in Missouri classified by the seven types of secondary-level vocational education programs. Managers might want to use this format to detect low rates of appearance in covered employment, among other things. Such differences cannot by themselves be interpreted as a signal of training program deficiency, but they would normally trigger further inquiry to determine why the differentials occur.[6]

It is possible to determine the geographic distribution of covered employees by using the geographic location part of employer identification numbers. This would permit any given jurisdictional level to trace the dispersion of its program leavers within the State. (Again, out-of-State mobility cannot be identified.) Knowledge of this sort can contribute to decisions about the appropriate jurisdictional level for secondary-level vocational education funding. This information is also useful for deciding to what extent training opportunities should be tied to local occupational employment patterns.

Tables 7 and 8 allow us to examine whether 1976 graduates worked in covered employment in Missouri at any time during the period from October 1979 to September 1980. By itself, this information provides little insight about the relative well-being the graduates achieved through productive labor market activity. Tables 9 to 12 help in this regard.

Tables 9 and 10 exhibit the mean number of calendar quarters during which no covered earnings were reported for persons who appeared in the covered earnings file at some time during the period from October 1979 to September 1980. Full examination of this employment stability question would take us far afield from the basic focus of the paper. The point is this: Even some of the 1976 graduates who worked in "covered" employment in Missouri during part of 1979-80 also experienced substantial periods without earnings.

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[6]Among the possibilities are outmigration from Missouri, which might be the result of dominant "push" factors (cannot find satisfactory employment in Missouri) or "pull" factors (well-trained people are recruited by out-of-State employers), self-employment, and a lower labor force participation rate. The program management implications of these causal forces obviously differ.

Table 8

Percentage of 1976 Graduates with Earnings Between October 1979 and September 1980[a], by Vocational Education Program, Number of Years of Participation, and Subsequent Enrollment in CETA

Vocational Education Program	1 Year Match						2 Years Match					
	No CETA		All CETA		II-B CETA		No CETA		All CETA		II-B CETA	
	n/N[b]	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%
Agriculture	67/119	(56)	7/12	(58)	4/6	(67)	168/263	(64)	26/36	(72)	14/18	(78)
Distributive Education	121/164	(74)	19/25	(76)	13/17	(76)	127/161	(79)	16/21	(76)	11/15	(73)
Health	67/100	(67)	15/21	(71)	10/12	(83)	12/16	(75)	6/7	(86)	5/5	(100)
Occupational Home Economics	16/21	(76)	6/7	(86)	2/3	(67)	5/9	(56)	2/2	(100)	2/2	(100)
Business and Office	363/495	(73)	68/80	(85)	37/46	(80)	105/151	(70)	31/35	(89)	12/13	(92)
Technical	7/10	(70)	---		0	---	4/6	(67)	0	---	0	---
Trade and Industry	173/239	(72)	41/53	(77)	24/30	(80)	270/375	(72)	57/73	(78)	25/31	(81)
Total	814/1,148	(71)	156/198	(79)	90/114	(79)	691/981	(70)	138/174	(79)	69/84	(82)

a. Includes only those participants who had some earnings during the period October 1979 to September 1980.

b. n includes only those participants with some earnings. N includes the total number of participants in each cell.

Table 10

Average Number of Zero Earnings Quarters Between October 1979 and September 1980[a] by Vocational Education Program, Number of Years of Participation, and Subsequent Enrollment in CETA

Vocational Education Program	1 Year Match						2 Years Match					
	No CETA		All CETA		II-B CETA		No CETA		All CETA		II-B CETA	
	N	X	N	X	N	X	N	X	N	X	N	X
Agriculture	67	.81	7	.86	4	1.25	168	.68	26	1.08	14	1.36
Distributive Education	121	.50	19	1.16	13	1.38	127	.51	16	.69	11	.82
Health	67	.57	15	.73	10	.80	12	1.00	6	.50	5	.60
Occupational Home Economics	16	.69	66	.33	2	.0	.5	1.20	2	1.00	.2	1.00
Business and Office	363	.59	68	.91	37	.97	105	.45	31	.97	12	.83
Technical	7	.43	---	---	0	---	4	.50	0	---	0	---
Trade and Industry	173	.60	41	.76	24	.71	270	.49	57	.74	25	.52
Total	814	.59	156	.86	90	.93	691	.55	138	.84	69	.81

a. Includes only those participants who had some earnings during the period from October 1979 to September 1980.

Table 11

Average Earnings Between October 1979 and September 1980[a] By Characteristics, Number of Years Of Vocational Education Participation, and Subsequent Enrollment in CETA

Characteristics	1 Year Match								2 Years Match					
	No CETA		All CETA		II-B CETA		CETA ONLY		No CETA		All CETA		II-B CETA	
	N	X$	N	X$	N	X$	N	X$	N	X$	N	X$	N	X$
Sex														
Male	315	$8,514	59	$6,894	32	$6,509	525	$5,295	495	$9,190	91	$6,502	41	$6,865
Female	497	6,277	97	4,884	58	4,996	487	4,337	196	6,240	47	4,715	28	4,533
Race														
White	787	7,174	145	5,718	85	5,620	888	4,943	672	8,385	129	5,976	66	5,966
Nonwhite	26	6,518	11	4,670	5	4,078	124	4,052	18	7,296	9	4,714	3	4,871
Disadvantaged														
Not Disadvantaged	784	7,205	144	5,753	86	5,657			671	8,428	126	5,917	66	5,699
Academically	13	6,280	4	6,119	1	6,576			8	6,019	4	4,881	1	5,222
Economically	16	5,762	7	2,618	3	1,657			12	5,709	8	6,030	2	13,527

a. Includes only those participants who had some earnings during the period from October 1979 to September 1980.

Table 12

Average Earnings Between October 1979 and September 1980[a], by Vocational Education Program, Number of Years of Participation, and Subsequent Enrollment in CETA

Vocational Education Program	1 Year Match						2 Years Match					
	No CETA		All CETA		II-B CETA		No CETA		All CETA		II-B CETA	
	N	X$	N	X$	N	X$	N	X$	N	X$	N	X$
Agriculture	67	$7,709	7	$9,601	4	$7,395	168	$8,137	26	$5,492	14	$5,095
Distributive Education	121	7,334	19	4,051	13	4,412	127	7,564	16	5,458	11	5,205
Health	67	7,077	15	6,657	10	7,354	12	3,728	6	6,991	5	5,351
Occupational Home Economics	16	6,583	6	7,111	2	7,001	5	5,342	2	3,630	2	3,624
Business and Office	363	6,317	68	4,879	37	4,938	105	6,817	31	4,725	12	4,677
Technical	7	7,626	0	--	0	--	4	10,105	0	--	0	--
Trade and Industry	173	8,637	41	6,390	24	5,870	270	9,692	57	6,798	25	7,587
Total	814	$7,155	156	$5,644	90	$5,534	691	$8,353	138	$5,894	69	$5,918

a. Includes only those participants who had some earnings during the period from October 1979 to September 1980.

The data files and analytical approach described in this paper permit analysts to examine these interruptions of employment to determine whether particular personal, institutional, or program characteristics are associated with recurring patterns of employment instability. Of course, the period examined would normally begin with the calendar quarter when the person left the program and would extend over as many quarters thereafter as the analyst thought appropriate for management decision(s) to be supported. For example, annual updates of the employment and earnings experiences (and subsequent enrollment in employment and training activities)[7] of a given cohort of program leavers would be instructive for some administrative purposes.

Having explored whether the 1976 graduates subsequently participated in a CETA program, whether they were employed in Missouri, and what degree of continuity that employment exhibited, it is logical to examine the comparative "covered" earnings that were reported for the four quarters from October 1, 1979, to September 30, 1980. This is done in tables 11 and 12.

The mean annual earnings figures displayed cover only those 1976 graduates for whom covered earnings were reported at any time during the relevant four-quarter period. No projection of single-quarter earnings to annual rates, or related extrapolation, was performed.

The potential usefulness of these earnings data to management should be readily apparent:

- What effect does CETA program participation have on the earnings of persons who had already completed a secondary-level vocational education program?
- How have women and nonwhites who participated in these programs fared in achieving equality of earnings?
- Are there important differences in the average earnings of persons who complete particular secondary-level vocational education program types?

Warning flags could be hoisted with every comparison a reader might want to draw from tables 11 or 12. No tests of significant differences are reported. No measures of dispersion

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[7]Postsecondary education is left out for expository purposes only. There is no practical reason why enrollment in higher education programs could not be included in the analysis file.

around the reported averages are shown. Comparisons across columns (within any row) raise problems of selection bias. The point is, although inferences cannot be drawn directly from the figures reported, appropriate statistical procedures are readily available that would permit this important final step to be taken.

The purpose of this section has been to illustrate how the merged analysis file can be used to trace persons who enroll in secondary-level vocational education programs through subsequent participation in employment and training activities. The particular tabular sequence chosen for display here highlights the chronological coverage of the analysis file. For many management support purposes, different units of observation would be selected. For example:

- Only program graduates were included in the analysis reported here. The data file includes persons who left before they completed the program or who completed the appropriate training course sequence but did not graduate.

- Although secondary-level vocational education program participation has been examined here, theoretically there is no reason to restrict the analysis to this level.

- Only CETA program participation that was completed within 40 months of high school graduation was covered here, but there is no practical reason why the time horizon on such tracking cannot be extended as far into the future as is necessary.

- Only vocational education and CETA program participation have been included in the analysis file created for this paper, but related data sources could be added to broaden and deepen the analytical potential of the approach.[8]

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[8]Through the auspices of the Office of the Assistant Secretary for Policy, Evaluation, and Research in the U.S. Department of Labor, Human Resource Data Systems, Inc., has developed a software package that merges CETA MIS data, covered earnings records, unemployment insurance claims information, items from the Job Service's automated reporting system, and parts of the administrative data maintained for State welfare department purposes.

- No attention has been given to employer-specific information that is available in the administrative records relied upon, but employee movement among employers can be traced routinely, including geographic and industry detail.

Readers should now have a reasonable understanding of the uses of the analysis file described in the preceding sections. Section 3 addresses specific action that Congress and administrative agencies can take to capitalize on the availability of this management support technique.

Section 3

Recommendations for Action

During 1982, Congress must consider reauthorization of both the Vocational Education Act and the Comprehensive Employment and Training Act. Individual Members of Congress who must rely on minimal amounts of reliable information about the historical and projected effectiveness of these programs will have difficulty judging among the various advocacy positions. The analytical approach described and illustrated in these pages offers a partial solution to this problem.

Only 37 States maintain quarterly reporting by employers of covered earnings in compliance with State unemployment insurance statutes, so Congress has limited ability to mandate accountability procedures using these records. To the extent that Congress considers patterns of postprogram training and employment and earnings to be relevant, albeit insufficient, measures of program effectiveness, the use of information on these patterns, whenever available, can be encouraged. This "encouragement" could take many forms, such as these, which are listed in order from weakest to strongest:

1. Reference in the reauthorized Act;

2. Provision of federally funded technical assistance (of the NOICC/SOICC type) to promote understanding and adoption at the State and local levels;

3. Earmarking of incentive dollars to those programs that adopt specified evaluation practices; or,

4. Earmarking that requires evidence of administrative use of the data collected and analyzed.

Before we can decide the level of congressional attention that we believe to be appropriate, we must resolve the problem of form versus substance. Do we understand the links among education, training, and employment well enough to know when to reward "administrative use" of evaluation data? If not, the process of data collection and analysis becomes a largely self-contained management activity, insulated from resource allocation decisions.

Congress' ability to affect State and local management practices is, of course, restricted by the limited share of total vocational education funding that can be traced to Federal origins.[9]

Short of congressional involvement, State and local management practices can obviously be structured through the administrative regulation process. To date, these directives have been limited to procedural compliance requirements that do not extend to using specific data sources. The Reagan Administration's stated intention to remove regulatory bonds from the exercise of management discretion suggests that this route to behavior modification would encounter serious roadblocks.

Why have routinely available administrative data rarely been drawn upon to promote program effectiveness?[10] Plausible answers to this question have been offered.[11] To date, little importance has been given by the Congress or the U.S. Department of Education to labor market outcomes as a measure of vocational education program effectiveness. This is inconsistent with the stated purpose of Federal funding, namely, to promote productive

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[9]See Jim W. Atteberry and David W. Stevens, A Vocational Educator's Guide to the CETA System, Critical Issues Series No. 3, Washington, D.C.: American Vocational Association, 1980.

[10]Cf. "Unemployment Insurance Data: A Study of Their Utility for Follow-up of CETA Participants in Balance of State North Carolina," MDC, Inc., November 1980.

[11]See David W. Stevens, Employment Projections for Planning Vocational-Technical Education Curricula: Mission Impossible?, University of Missouri-Columbia, January 1976, pp. 31-39; and idem, "CETA Performance Measurement: Why, How, and For Whom?" U.S. Department of Labor, ASPER, February 1980.

employment. It is also inconsistent with continued investment in sophisticated fine-tuning of occupational information systems for program planning and student counseling purposes. Few vocational education program administrators appear to be aware how futile this fine-tuning is without equal attention being devoted to determining whether program mix matters in the ultimate labor market success of students.

The evaluation approach described in this paper offers a promising way to correct this imbalance and thereby improve program management practices.

ELASTICITY OF SUBSTITUTION ACROSS OCCUPATIONS, OCCUPATIONAL CODING, AND ACCOUNTABILITY IN VOCATION EDUCATION

by

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ELASTICITY OF SUBSTITUTION ACROSS OCCUPATIONS, OCCUPATIONAL CODING, AND ACCOUNTABILITY IN VOCATIONAL EDUCATION

The purpose of this paper is to examine the extent to which the promotion and use of occupational employment projections in planning classroom skill-training programs is consistent with what is known about occupational mobility processes.

Aspects of this topic have been dealt with in the professional literature for years (e.g., Kelley, Chirikos, and Firm, 1975; Stevens, 1976; Lecht, 1978; Sommers, 1979; and Goldstein, 1981). So why is another paper on the issue pertinent at this time? Because consideration of the reauthorization of the Vocational Education Act (VEA) and the Comprehensive Employment and Training Act (CETA) will require explicit decisions about whether to--

- -- Modify the activities of the National Occupational Information Coordinating Committee (NOICC) and its State affiliates (SOICC's);
- -- Recommend administrative use of a specific procedure for analyzing occupational "supply" and "demand" information;
- -- Mandate adoption of a particular occupational classification system; and,
- -- Continue to focus on training-related placement performance as an indicator of program effectiveness.

This paper combines a critical assessment of the theoretical foundations upon which occupational employment projections have been made with a reexamination of the accountability processes that have been relied upon to date in occupational training. Section 1 presents the conceptual basis for different projection techniques and explores the extent to which conclusions can be stated with assurance about the relative merits of the respective approaches for the purpose at hand.[1] Section 2 briefly

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[1]We have attempted to strike a proper balance between theoretical completeness and comprehensibility in this presentation. Readers who seek full conceptual justification should consult the references cited to gain a satisfactory level of understanding.

examines the occupational classification systems that have been used to organize information to date, focusing on their consistency with the conceptual requirements stated earlier. Section 3 offers specific recommendations for actions that might be taken by participants in the VEA and CETA reauthorization processes.

Section 1

Employment Projections in Theory and Practice[2]

Employment projections have become an accepted tool of labor market analysis in recent years. They have been particularly helpful in government and educational planning programs, with a scope ranging from cities to entire countries. We are specifically interested in how detailed occupational employment projections can help planners make decisions about vocational offerings. Employment projections may be used to analyze the supply-demand equilibriums that are expected over time as a result of previous patterns. The projections may be used by decision makers who want to alter expected outcomes to produce more desirable labor market consequences. For example, if a particular occupation is expected to experience a surplus of workers, given the extrapolation of recent supply and demand conditions, it would be desirable to deemphasize training programs designed to provide workers with skills for that occupation. In other words, planners would modify the supply curve in order to soften expected "bad" labor market outcomes such as surpluses and shortages.

Two basic types of employment projection methodologies have been developed, the "price-theoretic" model and the "manpower requirements" or "fixed-coefficient" model. The price-theoretic model, which is the less developed of the two, actually subsumes two complementary approaches. The price-theoretic model technically combines demand and supply components to describe a full model of changes in demand, in supply, and in wages that act to clear the relevant markets. In fact, the methodology most frequently used under the price-theoretic heading is the human capital or rate-of-return analysis. The focus is on the supply side, with price and wage data being used to calculate a rate of

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[2]Since the basic concepts used in this section have become a matter of widespread general knowledge, available in many sources, individual citations will not be used in most cases. The reader is referred to the bibliography for background reading.

return for preparing for a particular occupation. The various rates of return calculated among alternative occupations or investments are then compared to yield indications of potential market problems. A particularly high rate of return for an occupation should generate increased training of workers for that occupation until increased supply drives down the expected wage and rate of return. A low rate of return should indicate that a decline in training and preparation for that occupation would be appropriate. Industry structure is not generally considered under the rate-of-return analysis.

The second price-theoretic approach concentrates on the relevant elasticities of substitution between workers of different occupations. This is more of a demand-side focus, as it considers the physical substitution of one type of worker for another in response to changes in the relative wage ratios. In other words, if the wage level of one type of worker increases, employers will seek to substitute workers from other more or less closely related occupations, or other factors of production, for the workers with the higher wage. This will tend to equilibrate wages in similar occupations. This mechanism involves no training of new workers, but, rather, the "trading" of old workers across occupations to deal with varying wages or rates of return.

Although it is common to speak of factor substitution across occupations, this is a considerable simplification from the theoretical model. Factor substitution relates to an employer's profit-maximizing or cost-minimizing behavior in the choice of the proper mix of production inputs. An accurate characterization would necessarily deal with factor substitution between occupations within an industry, since there must be an underlying production function to generate factor substitution. Analysts attempting to deal with factor substitution generally make assumptions that permit them to consider supply and demand for an occupation across industries. We attempt to analyze such studies, although readers should keep in mind the qualification of the industry specific nature of factor substitution just mentioned. The procedure is so complex that efforts to simplify by considering occupations across rather than within industries can, perhaps, be justified on practical grounds, although it is difficult to justify on theoretical grounds.

The second type of methodology is the "manpower requirements" or "fixed-coefficient" model. It assumes fixed skill coefficients of the Leontief type for the composition of industry employment. The composition of projected industrial output can thus be directly converted into projected needs for occupational

employment. The projected needs can be compared to existing and expected supplies by extrapolation of the growth pattern of occupation or skill groups. Discrepancies indicate market problems where supply-side adjustments should be made. Incidentally, it is important to note that very different manpower requirement scenarios can yield correct predictions.

Methodology of Employment Projections

Three basic factors affect actual employment patterns: demand, supply, and technological changes.

Demand changes, in both the relative and absolute sense, tend to generate the most important occupational employment changes. Generally speaking, we start by projecting industry demand totals, in terms of output and hence employment. This is usually done by a simple extrapolation of a growth or time-trend model based on past industry growth, which, of course, really reflects an interaction of demand and supply. Industry projections, then, are implicitly based on an assumption of continuation of past trends in the interaction of demand and supply.

Supply consists of two components: the supply of new, trained workers which can be generated to meet the expected requirements if past trends continue, and the existing supply or pool of skilled workers which can switch to related occupations as relative wages change. We are concerned with new supply because this is the component we can affect by increasing or decreasing support of training programs to point new workers in the direction of greatest need. We are also concerned with old supply because shifts may move existing workers to fill empty slots, so new workers will not be needed for the expected target slots.

Technological change refers to unanticipated and largely unpredictable changes in production processes that--

- -- Change relative demand for final output as a result of changing costs and prices of output,
- -- Create new output goods,
- -- Change the optimal occupational mix for a production process, or
- -- Create new occupations.

The technological change that is in any sense predictable will be captured in past trends in demand and supply, while unpredictable change cannot be analyzed by any existing employment projection techniques.

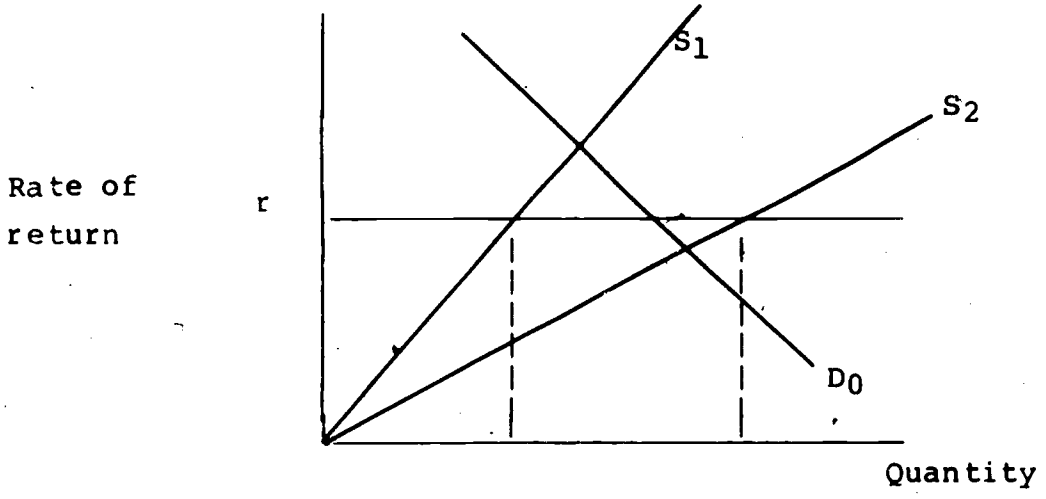
The main employment projection techniques which have been used so far are the manpower requirements model and the rate-of-return, or human capital, model. Elasticity of substitution can best be viewed as a supplementary technique to be spliced onto one of the two basic models. Analysis involving elasticity of substitution has been little used in employment projections. Briefly, it is difficult and costly to calculate elasticities of substitution it is often impractical to use them. The value of using elasticity of substitution techniques must be explicitly weighed against the cost.

The first methodology to be considered will be the price-theoretic, rate-of-return, or human capital, analysis. A rate of return is usually calculated for investments in education and skill. Data are obtained for cross-section (point in time) income profiles of persons with various characteristics. Rates of return for particular investments are calculated assuming that historical wage differentials will accurately predict future wage patterns.

The rate of return for a particular investment is compared with an average rate of return to determine if surpluses or shortages are likely to occur. There are several problems with this type of analysis, as Freeman has pointed out (1976). First, if the supply of labor is upward sloping, it is possible for a single rate of return to reflect anything from a surplus to a shortage. In figure 1, the supply curve S_1 reflects a shortage, while S_2 reflects a surplus.

Figure 1

Supply and Demand for a Particular Occupation



Therefore, the rate of return alone is consistent with a number of supply-demand situations; additional information is required if a determination is to be made concerning market implications of a rate of return. According to Freeman (1976), the typical solution is to assume that supply is infinitely elastic at a known rate. In this case, however, there can be no long-term variation in wage ratios and therefore no factor substitution, which would imply that a fixed-input coefficient model without consideration of factor substitution would be appropriate.

A second problem deals with the source of wage data. Assuming that relative wage differentials elicit dynamic market responses, wages will constantly change as supply responds to perceived current wage differentials. Lags in market responses and overshooting by corrective supply-response mechanisms may lead to a dramatic change in relative wages in 5 or 6 years; hence cross-section wages at a particular time may give misleading evidence concerning long-term trends.

The third major problem is that, assuming we have infinite elastic supply and a correct projected rate of return, a comparison of the rate of return with an equilibrium rate of return still does not yield the estimated size of the shortage or surplus. As Freeman demonstrated (1976), the answer depends on the elasticity of demand. Suppose we have a rate of return greater than the equilibrium rate, which may perhaps be measured as the rate of return on business capital. Clearly we have a shortage, but how much? The shortage will be small if demand is inelastic, but large if demand is very elastic.

The weakest point of this model may well be the use of cross-section wages to calculate rates of return. Wages are by definition the equilibrating mechanism of markets; they shift to equalize rates of return. It seems unwise to use an equilibrating mechanism as an assumed stable relationship able to predict future rates of return.

The manpower requirements model assumes fixed skill coefficients within industries and applies Leontief assumptions to the demand for labor skills. First, projections of industry output and hence employment are projected based on past trends. Second, assuming fixed skill coefficients, industry-occupation matrices are applied to generate projected employment by occupation. This process, yields a numerical estimate of the projected "need" for occupational employment that can be compared to expected supplies of workers based on extrapolated growth of

skill groups to identify market problems. Once again, market problems can be defined as shortages or surpluses that we can modify by appropriately altering supply.

Two points need to be stressed about the manpower requirements model:

1. The manpower requirements model generates numerical estimates of shortage or surplus, rather than indications that a shortage or surplus is likely to exist. In contrast, rate-of-return analysis may indicate that a surplus or shortage is likely to exist, but it offers little information concerning the magnitude of the discrepancy. The manpower requirements model does offer a projection of the number of workers needed, which enables planners to derive a numerical estimate of shortage or surplus by bringing in the supply-side planning.

2. The manpower requirements method uses quantity data at a highly disaggregated level to develop estimates. We need one observation of quantity data on occupational/industrial structure to generate the skill coefficients for the model. This procedure enables us to achieve a very high level of disaggregation, which is extremely useful for planning purposes. Rate-of-return analysis requires estimation from wage data that are taken from individuals. We therefore need many observations from many persons to get an idea of the true wage, since individual wages vary greatly. Also, a rate-of-return model usually analyzes occupations across industries and ignores considerations within an industry.

The major criticism of the requirements model is that it assumes that the skill input ratios remain fixed over time; thus this model ignores the possibility of factor substitution. If relative wages change in response to shifts in demand, clearly employers could shift workers among closely related occupations to minimize costs of production. This "old supply" response takes advantage of a pool of trained workers who would need little or no training to shift to closely related occupations in response to employer hiring preferences generated as a result of wage differentials.

Factor substitution grows out of a price-theoretic model. It can be viewed as a link or addendum to either the rate-of-return analysis or the manpower requirements analysis.

Looking first at the rate-of-return approach, we see that wage differentials lead to analysis of a rate of return for a particular occupation or for the training embodied in that

occupation. We would then want to consider the magnitude of employers' "old supply" responses to the wage differentials, which would modify the expected plans regarding "new supply" responses. We also might consider supply shifts by workers who perceive wage differentials. Unfortunately, we have no estimate of the magnitude of total shortage or surplus, so it does little good to consider factor substitution or shifts in the supply of human capital as an alternative or supplement to new supply changes.

Factor substitution would apply directly as the "missing link" to the manpower requirements model, as the fixed-skill-coefficient assumption is the major theoretical weakness of the model. Factor substitution would explicitly modify projected "needs" by providing the potential for "old supply" employment adjustment to wage differentials, which would change the observed skill coefficients. Therefore, if factor substitution is to be used, it appears that it should be used in conjunction with the manpower requirements model.

Two issues are at stake at this point. We must consider first the weaknesses of the factor substitution approach and then the costs and benefits to be attained by adding factor substitution to manpower requirements.

Before examining factor substitution, we must agree on a single elasticity of substitution concept. If we use a production function with more than two inputs, the various elasticities of substitution will no longer be equivalent. An Allen-Uzawa elasticity of substitution measures the percentage change in factor quantities with response to a percentage change in factor prices, holding other factor prices fixed.

$$\sigma_{ij} = \left(\frac{\%\Delta L_1/L_2}{\%\Delta W_1/W_2} \right) \qquad \text{other factor prices constant,}$$

W_i = price of i^{th} factor

L_i = quantity of i^{th} factor.

The direct elasticity of substitution is calculated holding other input quantities fixed, while the shadow elasticity of substitution holds total costs fixed. Finally, Hicks refers to an elasticity of complementarity that measures the percentage change in wages in response to a percentage change in factor quantities, holding other factor quantities constant.

We should also note at this point that our previous caveat concerning factor substitution applies to this methodology. Theoretically, factor substitution is relevant within an industry, since directly estimating substitution parameters across inputs depends on the implicit assumption of an underlying production function. Existing attempts to deal with factor substitution generally consider substitution between occupations across all industries. At the very least this implies that there is very little difference in factor substitution relationships across industries. The simplifying assumptions necessary to calculate factor substitution parameters across industries are not insignificant and should be empirically examined.

First we must decide on the direction of causality: Do factor prices respond to changes in factor quantities, or do factor quantities respond to changes in factor prices? In terms of estimation, a translog production function will yield Hicks elasticities of complementarity, while a translog cost function will yield Allen-Uzawa elasticities of substitution. Assuming that we agree on Allen-Uzawa elasticities of substitution, we are left with the limitations that availability of good data place on the model. To estimate a translog cost function we need good estimates of every input quantity and rental price. There is an underlying assumption of a constant production function, so; if we are trying to estimate factor substitution parameters in a direct approach, we can use data over time or over States, but not over industries.

In practice, data limitations mean that most underlying production functions are developed using no more than three inputs, such as capital, skilled labor, and unskilled labor. Binswanger estimated elasticities of substitution for these factors: land, labor, machinery, fertilizer, and other inputs. However, it is clear that stringent restrictions on the number of factors that can be dealt with will develop as a result of the data requirements. The level of disaggregated detail of occupational projection achieved by the manpower requirements model cannot even be approached by traditional techniques for estimating elasticities of substitution.

Finally, the factor substitution approach is relevant or useful only under circumstances that involve changing relative wages by occupation. Empirically, wage rates seem to vary very little over time (Freeman, 1976). The explanation may be: (1) there is a very elastic demand curve, (2) supply and demand move together in interconnected and offsetting shifts with regard to

wages, or, (3) there is a very elastic supply curve (or institutional wage rigidity). Freeman argues that the third possibility is the most likely, although there is some evidence for the second solution. The first is unlikely.

A very elastic supply curve--the third scenario--indicates that wages will not change much if at all, so the manpower requirements model works with precision. If the second scenario holds, wages may change, for example, because of a shift in demand, but they will be drawn back to the initial level by offsetting changes in responsive supply curves.

Freeman's evidence indicates that for the 1950's and the 1960's industrial employment varied more than income did. For both periods, shifts in demand curves were at least twice as important as changes in relative wages in explaining the percentage changes in labor.

Basically, we are looking at the strengths and weaknesses of the manpower requirements methodology and considering the merits of including factor substitution. The questions to be considered are these:

1. Is it important to consider factor substitution?

2. What would factor substitution cost?

3. What benefits would it give us?

With respect to the first question, consider that the percentage change in labor can be described by the theoretical model.[3]

$$\dot{L} = \dot{X} - n\dot{W}$$

where $\dot{L} = \Delta L/L$ = % change in labor

$\dot{X} = \Delta X/X$ = % change in industry employment

$\dot{W} = \Delta W/W$ = % change in wages

n = elasticity of demand for industry.

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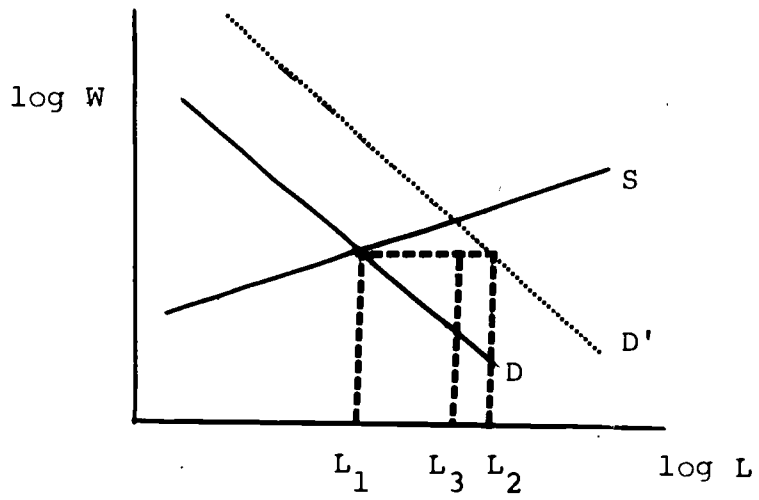
[3]In keeping with the analytical approach used by Freeman (1976) we will consider the abstract approach using supply and demand for an occupation, as the weighted sum of industry components.

The evidence indicates that the variance attributed to demand changes is much higher than the variance attributed to wage changes, and that over time wage changes are relatively small, because of elastic supply curves or offsetting shifts in supply and demand. In this sense, then, the wage term, $-n\dot{W}$, is much less important than the $\dot{X}$ term. Also, employment projections are more reliable than wage projections in general are.

As for the cost of adding factor substitution to the model, the purity of the correct theoretical approach, which implies factor substitution, is obtained at a cost of some loss of detail in economic planning. The manpower planning model can be applied, according to Freeman, to a set of 142 industries and then converted to up to 222 occupational projections. To bring in factor substitution at this level of detail would require computation of 222 occupational pairings, assuming we ignore factor substitution within industries and concentrate on substitution between occupations. This would involve estimating 24,531 elasticities of substitution, which is clearly absurd. Studies of elasticity of substitution rarely deal with more than a few factors, since the complexities of estimating and obtaining suitable data quickly become staggering. Therefore, factor substitution adds: (1) the direct and nonnegligible costs of estimating factor elasticities of substitution, and (2) the massive indirect cost due to loss of occupational detail by cutting down the model to match the detail available through factor substitution.

Finally, there is the question of gain from the use of factor substitution. Consider the equation of $\dot{L} = \dot{X} - n\dot{W}$ again. Changes in labor equal demand shifts minus the elasticity of demand times the wage shift corresponding to the demand shift. Graphically we have an initial demand curve, D, and a supply curve, S.



Suppose, for example, that D shifts outward to D'. Then $L_2 - L_1$ represents the increase in labor demand due to the demand shift as described by the manpower requirements model. $L_3 - L_2$ represents $-n\dot{W}$ or the factor substitution effect.

Freeman has expanded this model to include the supply side explicitly. Suppose we have a new equation for the supply side:

$$\dot{L}^S = \dot{S} + \dot{E}\dot{W}$$

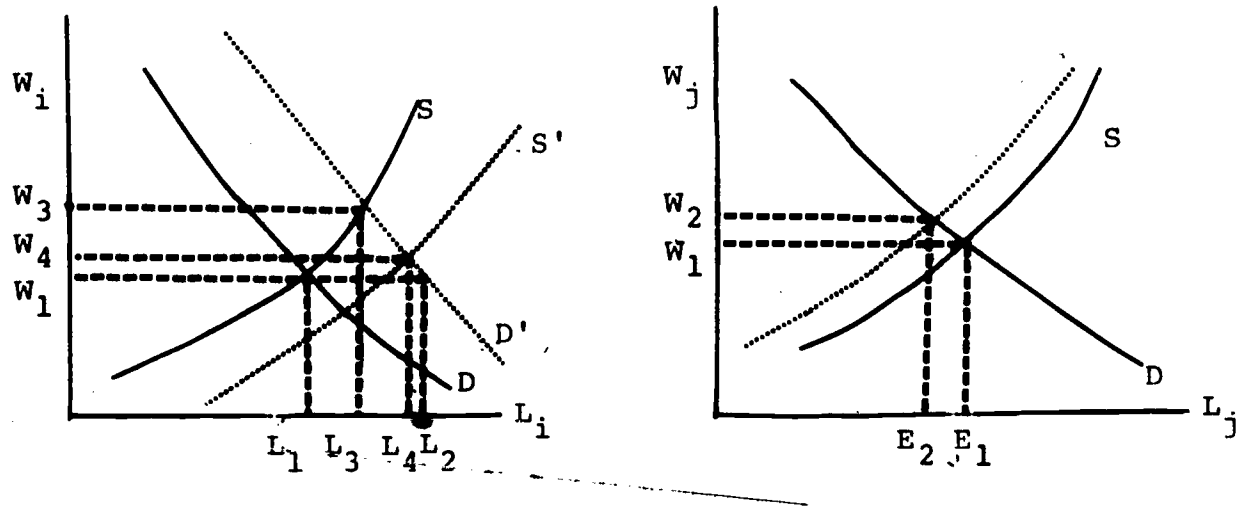
where $\dot{L}^S$ = change in number supplied
$\dot{S}$ = shift in supply schedule
$\dot{E}$ = elasticity of supply

Combining the demand and supply equations using the identity or equilibrium relationship of $\dot{L}^S = \dot{L}^D$, we can drive the reduced form equations:

$$\dot{L} = (E\dot{D} + n\dot{S})/(E + n)$$
$$\dot{W} = (\dot{D} - \dot{S})/(E + n).$$

The previous figure illustrates the case where $\dot{S} = 0$, or there are no supply shifts. In this case, $\dot{L} = E\dot{D}/(E + n)$. Demand shifts alone will offer perfect prediction in two cases: when demand is inelastic ($n = 0$) and $\dot{L} = \dot{D}$, and when supply is perfectly elastic ($E = \infty$) so that $\dot{L} = \dot{D}$ as E approaches infinity. In these cases manpower requirements will yield extremely precise answers. Our illustration is of the case when the elasticity of supply is very elastic, so the rising wage level chokes off only a small amount of employment when demand shifts occur. The small wage increase and correspondingly small correction of labor employed fit the evidence of low wage changes over time, and the indication that wage changes contribute much less to employment changes than demand shifts contribute.

In the second case, we may want to consider letting supply shifts occur. Consider occupations i and j. Concentrating on occupation i, the demand shifts outward. The manpower requirements model predicts an increase in employment of $L_2 - L_1$, while the sharply upward-sloping curve cuts employment back by $L_3 - L_2$. However, wages have risen from W_1 to W_3. It seems reasonable that supply may shift outward as workers who are easily able to substitute their skills into occupation i skills move over to obtain higher wages. We may refer to this as an "old supply" human capital response of supply shift.



Suppose these workers come from occupation j. Supply shifts from S to S', which sends the wage down to W_4 and labor to L_4. So labor increases by $L_4 - L_3$. The supply shift may come partly because of workers' moving over from occupation j or because of a backward supply shift for occupation j. Alternatively, supply may increase as new entrants to the labor force move into occupation i because of its high wage profile (a "new supply" component of the supply shift). Obviously, once we begin considering the supply side and factor substitution, dynamic modeling is necessary for full technical accuracy. Implications for wages and employment in occupation j also need to be considered.

For program planning purposes, however, we are interested in the long-term equilibriums that can be projected, not in the dynamic short-term adjustments that take place as changes occur. In the long run, we have evidence that, compared with demand shifts, wages do not vary much.[4] While elastic supply and

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[4]Elastic supply implies that, because of small wage effects, factor substitution is small. Offsetting demand and supply shifts imply that, while factor substitution may be important, human-capital considerations, which the supply curves, will tend to offset factor substitution effects.

off-setting demand and supply have different implications, for purposes of planning, the outcomes have similar meaning. Wages are not very important as a source of changing long-term employment, and the manpower requirements methodology will exhibit considerable accuracy.

Finally, consider the nature of factor substitution. The assumption is that there is a production function which is constant, so that we may estimate across time or states but not across industries. The inputs give us the prices for the associated cost function.

In the case of occupational projections, we are constantly concerned with the flow of "old supply," in the sense that a "need" in occupation i will be filled by occupation j, so that no training of new workers need take place. When we consider the substitution of occupation j for i, we must realize that both occupations may be used in a number of different industries. In the traditional sense, we think of a substitution between two factors within an industry. Thus, even using a translog cost function for estimation, we are implicitly assuming a constant production function in the background for an industry.

Are we now assuming a "production" function for the economy estimate an elasticity of substitution for occupations i and j? Or, are we actually concerned with the elasticity of substitution between occupation i and j within a particular industry? The traditional definition of factor substitution would argue for a within-industry consideration, but it can be clearly recognized that occupations may be the same in terms of skills but belong to different industries, making cross-industry substitutions possible in terms of employer hiring preferences (and also in terms of worker-generated, human-capital supply shifts to capture higher wages). Can we derive a definition for a cross-industry elasticity of substitution that (1) is estimable and (2) does not imply an underlying constant production function?

We are clearly facing a monstrous task. We must define the occupations that make up the different types of labor inputs to each industry, and then consider within-industry pairings and cross-industry pairings when appropriate. Letting σ_{ij} denote the elasticity of substitution between factors (occupations) i and j, it is clear that σ_{ij} for industry A does not necessarily equal σ_{ij} for industry B or σ_{ij} between A and B. Also, $\sigma_{ij}(AB)$ will not necessarily equal $\sigma_{ij}(AC)$.

Perhaps the best use of factor substitution comes within an industry, where the translog cost function can be used to estimate elasticities. The elasticities can be examined to determine which occupations, or labor factors of production, can be aggregated to form a single index or factor. If i and j are nearly indistinguishable in combination with other inputs, then they are really a single occupation. This experiment alone requires considerable effort but it may help define which occupations (at what level of detail) we need to study.

Section 2

Occupational Classification Systems

A basic conclusion of the preceding section is that distinctions between the "old supply" of occupational skills, which refers to persons who are potentially recruitable into vacancies without special training, and "new supply," which refers to persons who would require training prior to job entry, are important when elasticities of substitution (adaptability) among occupations are high and pervasive. But, it was noted, the practical costs of estimating these individual adaptability measures, their uniformity across firms, and their stability through time would be enormous--so much so that it is unreasonable to consider undertaking the task.

Where does this leave us? Section 1 expressed qualified endorsement for the assumption of fixed occupational composition within a particular production process, that is, the fixed-coefficients or manpower requirements approach. What remains, then, is to explore the following questions:

1. How adequately do existing occupational classification systems represent the conceptual terms labor input and production process?

2. To the extent that deficiencies are found in these classification schemes, are they correctable, and, if so, at what cost?

3. What can then be said about current accountability practices in assessing the effectiveness of vocational education and employment and training programs?

The basis for and content of occupational classification systems have not gone unnoticed (Cain, Hansen, and Wiesbrod, 1967; Scoville, 1972; U.S. Department of Labor, 1975; Roskam and Podgursky, 1975; Stevens and Taylor, 1980; NOICC, 1981).

However, the recent investments in making occupational information available for administrative use by relatively uninformed persons begs a careful reexamination of the topic.

Most readers will be familiar with the Dictionary of Occupational Titles, Occupational Employment Statistics, Census Occupational Classification, and Standard Industrial Classification systems. Less familiar, perhaps, is the Standard Occupational Classification format, and related "supply-side" sources, including the U.S. Office of Education Instructional Program coding system, and the Higher Education General Information Survey. (See the appendix to this paper for brief descriptions of these systems.)

An occupation comprises a number of jobs, each of which consists of a particular set of tasks or skills. A crucial practical question is, Does any one--or more--of the classification systems offer sufficient within-category similarity (or between-category difference) to be useful for educational program and curriculum planning?

The issue of skill transferability has been studied extensively. (Sommers, 1979; Pratzner, 1978; and Faddis, 1980.) The basic conclusion is that skill matters in transferability, but the specific extent to which it and other factors affect the opportunity is poorly understood. Furthermore, economists disagree about skill embodiment, over which an individual exercises independent control, versus a team concept of productivity, in which the circumstances surrounding the application of an individual's skills have an important influence on the consequences of that activity. The complexity of the matter can be highlighted in this way:

- "Skill" matters, but routine identification of its relative importance in a given production setting has proved elusive.
- There is no consensus that "skill" can be conveyed outside the workplace without reference to the idiosyncrasies of the particular setting in which the tasks learned will be performed.

How do the occupational classification systems rate in sorting out these variations? (Goldstein, 1981.) The Census occupational classification structure brings together workers belonging to the same socioeconomic class, with little regard to the jobs they pursue. No job descriptions are provided for

the Census classification structure. (The Standard Occupational Classification structure will be adopted in the 1980 Census publications.)

The Dictionary of Occupational Titles has evolved through occupational anaylsis conducted through a network of field centers. The strongest parts of this classification structure are to be found in the manufacturing sector. Since the DOT was developed for use by local office staff persons in State employment security agencies, the DOT's occupational structure does not necessarily correspond to a given employer's personnel designations.

When the occupational employment survey portion of the Occupational Employment Statistics program was undertaken, neither the Census nor DOT classifications were judged adequate, so a hybrid structure was created, with industrial specialization and a provision allowing individual employers to add their own occupational categories.

The Standard Occupational Classification system was developed for the same reason as the Standard Industrial Classification system: to assure uniformity of reporting practices among government agencies.

The National Occupational Information Coordinating Committee (NOICC) volume Vocational Preparation and Occupations offers "cross-walks" among the DOT, SOC, OES, and Census occupational codes. An extraordinary amount of professional effort by knowledgeable analysts has gone into this effort, but how are we to determine how adequate the result is with regard to the "labor input" and "production process" concepts?

Is accuracy of projection an appropriate criterion to use in evaluating adequacy of occupational classification? (Goldstein, 1981; Hudson-Wilson and Wheeler, n.d.) Obviously not, since the least sensitive classification structure will permit the greatest averaging of errors to occur, in which case "accuracy" at the level of observed data results from offsetting inaccuracy within the category. In other words, the criterion of homogeneity within categories is not met. The reader can deduce the implications of this internal error factor for skill-training program planning.

No occupational classification system has been designed to maximize skill comparability within categories. There is little direct evidence of the importance of prior skill acquisition as a determinant of entry-level employment opportunity. Moreover,

no direct evidence of the improvement of management decision-making attributable to occupational "supply" and "demand" information is available (U.S. Department of Labor, 1979 and 1980). Remember, decisions can change the result without necessarily improving it. What occurs can only be compared with a hypothetical question, what would have happened in the absence of the altered decision? It is debatable, in the absence of congressional action during the CETA and VEA reauthorization process, whether the use of occupational information in skill-training program planning will improve.

What specific recommendations for action therefore emerge from the conclusions reached in this paper?

1. The "requirements" approach to performing occupational employment projections receives a qualified endorsement--qualified, in part, because of the cost of refinements given our limited understanding of the processes of occupational mobility and skill transferability (Goldstein, 1981; Hudson-Wilson and Wheeler, n.d.).

2. It is unlikely that the existing occupational classification systems will be altered in significant ways to accommodate an expressed desire for greater skill specificity within categories (if such was thought to be warranted). In fact, the Bureau of Labor Statistics, recent deemphasis of Federal support for the employment projection program, in conjunction with increasing Federal reliance on the Standard Occupational Classification format, will create new challenges for State and local planning activities.

3. It is simply impossible to assess the degree to which the NOICC's occupational classification "cross-walk," which must certainly be the best practical example of such a procedure, violates the criterion of within-category skill comparability.

Five years ago, one of the authors of this paper wrote:

> Just as ruminating animals bring up a cud from the first stomach to be chewd again, what is really sought in vocational-technical education planning is a cud; a "second chewing" of information which is currently stored in planning documents, to nourish the administration of educational processes. (Stevens, 1976.)

Today, we have no more direct information than we had then about the consequences of the improvement in management

decisionmaking that has occurred because of "better" occupational data. The form, as distinguished from the substance, of the planning process has clearly become more sophisticated. But, does it matter? By what criteria should expenditures on vocational education be judged? One important criterion that has been used is "training related" placement rates. Virtually every student of the issue recognizes the weaknesses of this measure:

- The procedures used to collect the status information are frequently seriously deficient.
- The definition of "training relatedness" is difficult to specify and apply uniformly.
- In fact, the definition of training itself is tricky as one of the authors and his colleagues have shown in another paper prepared for this volume. (Atteberry, Bender, Stevens, and Tacker, 1981.)
- And what does an estimate of training-related placement mean when you have it?

Placement is a status, captured at a single point in time. It offers virtually no direct information about the current or expected future well-being of the person whose status is reported. Yes, but, some analysts argue that classroom training institutions cannot be held accountable for the external forces that increasingly affect a worker's destiny after initial job entry. Other analysts respond, if this is the case, why does "training relatedness" matter at all? The best answer of which we are aware is this: because it is intuitively appealing to tout a high training-related placement rate as an indicator of program effectiveness. A theme of this paper is that this may well be an illusory and mistaken appeal.

How, then, do we propose to replace or complement this measure of performance?

Section 3

Recommendations

Most advocates of Federal funding of vocational education programs assert that preparation for productive involvement in the Nation's work force is the major goal of this Federal spending. To date, little effort has been expended to determine how successful the vocational education system has been in achieving this objective.

The authors make the following recommendations:

1. Congress should complement its support of the NOICC/ SOICC system, which focuses on use of occupational information for counseling and planning, with dedicated resources to improve our understanding of the circumstances in which skills can be acquired prior to job entry. (Sommers, 1979, pp. 45-47; Goldstein, 1981, pp. 39-41);

2. Serious consideration should be given by those who establish educational accountabilty rules to at least discouraging the use of training-related placement data as an accountability criterion (see Atteberry, Bender, Stevens, and Tacker, 1981);

3. The Office of Adult and Vocational Education within the U.S. Department of Education should offer direct management assistance to States and localities regarding the basis upon which their use of Federal dollars will be held accountable;

4. Congress should make as clear a statement of purpose in allocating Federal funds to vocational education as Congress made in the Comprehensive Employment and Training Act.

Action on these four fronts would considerably clarify what the goals of Federal funds devoted to vocational education are, and the extent to which these goals are met.

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APPENDIX

Brief descriptions of the structure of the following occupational classification systems:

- o Dictionary of Occupational Titles (DOT)
- o Occupational Employment Statistics (OES) Survey Classification System
- o Census Occupational Classification System
- o Standard Industrial Classification (SIC)
- o Standard Occupational Claffification (SOC)
- o United States Office of Education (USOE) Instructional Program Codes (Handbook VI)
- o Higher Education General Information Survey (HEGIS)

Dictionary of Occupational Titles (DOT)

The Dictionary of Occupational Titles was developed for the Employment Service system to provide standardized occupational information for job placement and counseling, and occupational and career guidance. The fourth edition, including almost 20,000 occupations, organizes jobs into "occupations" on the basis of similarities between jobs and their relationship to the structure and content of the occupations.

Each occupation is given a nine-digit code that reflects the type and level of work performed. The first three digits indicate grouping occupations on the basis of some combination of work field, purpose, material, product, service, subject matter, generic terms, and industry. Each of the first three digits allows the occupations to be aggregated at successively finer levels of detail, from nine broad categories into 82 two-digit divisions, which, in turn, are divided into 559 separate three-digit groups.

The fourth, fifth, and sixth digits indicate relationships between the specific occupation and data, people, and things. The relationships are expressed as a hierarchy, from simple to complex. Each successive level includes the simpler functions and excludes the complex.

The final three digits indicate the alphabetical order of occupations within the six-digit code groups and act as a unique identifier for each occupation.

Occupational Employment Statistics (OES) Survey Classification System

The OES classification system uses a combination of titles and descriptions of occupations from the Dictionary of Occupational Titles and Census occupational categories and titles. The structure has been designed for flexibility in adding and deleting occupations as industries' structures change.

The survey code consists of five-digit codes for each occupation, with a variety of major categories to allow for aggregation and summarization of data within each category. Four of the five digits are always numerical; the third digit often is a letter, to allow for a larger number of occupations to be included without exceeding the five-digit standard.

The matrix code consists of eight digits, five of which correspond to the survey code. The remaining three provide for subtotals, summaries, and aggregation. The subtotals correspond to the 1970 Census major occupational groups.

Census Occupational Classification System

The 1970 Census used 441 occupational categories, each of which was assigned a three-digit code. These categories were arranged in 12 major occupation groups. Because of the limited number of these occupation groups, each encompasses a wide range of skill levels. No definitions are provided for the occupational titles and there is little comparability between the Census and other classification systems. The 1980 Census will use the Standard Occupational Classification system, which should alleviate some of these problems.

Standard Industrial Classification (SIC)

The Standard Industrial Classification was designed for classifying establishments by the primary activity in which they are engaged: The activity is determined by the principal product or group of products produced or distributed, or by services rendered. The SIC is intended to cover the entire range of economic activities from agriculture to public administration. The SIC was developed to provide uniformity and comparability between data collected by various governmental agencies and private organizations.

The structure of the classification allows for data to be presented from two- to four-digit code detail. Two-digit codes represent the broadest categories of classification, with the classification becoming successively more detailed with the three- and four-digit code levels. Because the data can be aggregated back to the four-digit level or to even broader categories, individual agencies can create additional subdivisions beyond the four-digit level for their own purposes, while retaining comparability with other series. The SIC classifies establishments rather than legal entities or enterprises. A Standard Enterprise Classification related to the SIC has been developed for use in classifying enterprises.

Standard Occupational Classification (SOC)

Developed in 1977 to provide a standard for occupational classfication and to promote comparability in occupational statistics, the Standard Occupational Classification (SOC) Manual serves as a mechanism for cross-referencing and aggregating occupational data collected by different programs. This classification system covers all occupations in which work is performed for pay or profit, including unpaid family members working for a family-operated enterprise.

The manual is based on a four-tier classification system: division, major group, minor group, and unit group. Each level consists of smaller and more closely related groupings of homogeneous occupations, with residual categories established for occupations that do not warrant separate identification or do not fit into any specific group. The titles and codes from the Dictionary of Occupational Titles that are relevant to the occupations included are provided with each grouping. Selected Census codes are also included.

U.S. Office of Education (USOE)
Instructional Program Codes (Handbook VI)

The USOE code was designed for use by local and State education agencies in identifying, classifying, and describing information about subject matter and curricula. When the current revision of the code is completed, it will include all education programs and will replace the HEGIS code.

The taxonomy now encompasses 20 subject-matter areas, plus one area for cocurricular activities, and one area for general elementary and secondary education. Seven of the subject-matter areas were designated for vocational-technical education. Although the other subject areas are identified by 10-digit

codes, the vocational-technical education areas have generally been limited to 6 digits; in a few cases 8 digits are used to allow for greater detail.

The USOE code ranges from broad subject-matter areas to specific programs. The first two digits of the code indicate broad subject-matter area, such as "office occupations," and each two-digit group following represents greater specificity. Individual training programs may be included in more than one broad subject-matter area, making tabulation of the data more difficult. A description is provided for each instructional program but each is a composite of subject matter rather than a well-defined course.

Higher Education General Information Survey (HEGIS)

The HEGIS classification system attempts to represent the ways that the majority of higher education institutions organize and record their data, as well as the categories for which data is needed. HEGIS data are compiled from surveys on earned degrees and formal awards; enrollment by division, major, and field of training for faculty; as well as other information relevant to higher education institutions.

HEGIS is divided into two sections, the first of which reflects training for conventional academic programs. The second division refers to technological and occupational training related to associate degrees and other awards below the baccalaureate level. The two sections are divided into disciplines; disciplines are further divided into specialties, including a special category for "general" disciplines. Each discipline has a classification code consisting of four digits; the first two refer to the discipline division, and the latter two refer to the specialty area.

Some problems have occurred with this classification system because coding is subject to each administrator's interpretation. In some cases, programs or individuals do not fit precisely into one code and require the use of several codes for identification.

VOCATIONAL EDUCATION FOR COAL MINING OCCUPATIONS: THE WEST VIRGINIA EXPERIENCE

by

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VOCATIONAL EDUCATION FOR COAL MINING OCCUPATIONS: THE WEST VIRGINIA EXPERIENCE

Chapter 1

Introduction

The Vocational Education Act of 1963 and successive amendments to this act have placed a high priority on increasing the responsiveness of vocational education programs to changing occupational requirements and labor market conditions. Thus, the 1976 amendments (P.L. 94-480) included provisions designed to improve the data base for vocational education planning through establishment of national-State occupational information coordinating committees. These amendments also assigned specific responsibility to the National Commission for Employment Policy and the National Advisory Council on Vocational Education to identify "the vocational education and employment and training needs of the nation and assess the extent to which vocational education, employment training, vocational rehabilitation and other programs represent a consistent, integrated and coordinated approach to meeting these needs."[1]

This report is designed to contribute to this assessment. In contrast to other, much more comprehensive studies being concurrently conducted for the Commission and for the National Institute of Education, this paper focuses on the experience of vocational education in relation to a particular industry, bituminous coal mining, in a particular State, West Virginia. We hope this case study approach will increase knowledge of how economic and institutional factors affect vocational education, and the uses--and limitations--of labor market data in the planning process. Several considerations influenced our choice of coal mining for this study:

1. Although coal mining is one of our Nation's older occupations, it is also one of our "newest" occupations, from the standpoint of vocational education. As is described in the following chapter, a market for formal occupational training of prospective coal miners was created during the past decade by a unique combination of developments, including the recent mining safety and health legislation and the resurgence of employment in this previously depressed industry.

2. A number of recent studies had provided evidence of an apparent lack of coordination in the response of the vocational education system to this new demand for occupational training. One such study, conducted in 1979, concluded that "the entire system lacks effective communication and coordination among and within the various training providers" and cited a number of illustrations of apparent gross overproduction of trainees, in relation to the industry's hiring requirements.[2]

3. Despite the recent growth in national coal output, some of the old, established coal mining regions, notably those in West Virginia, have experienced significant employment cutbacks and increases in unemployment in the past 2 years (1978-80). This recent experience thus provides an opportunity to examine the responsiveness of the system under conditions of both expanding and contracting labor market demand.

4. A final, practical consideration in the selection of this case study was the availability of a considerable body of recent research on both labor demand and supply in the coal industry, and on the scope of current industry training programs. In particular, the availability of new data based on a nationwide 1979 survey of coal industry training programs, which the author of this paper directed, provided an unusual opportunity to obtain some insights on the roles of private industry and the public sector (including vocational education) in meeting the new needs for coal miner training. Our analysis was further limited to West Virginia because this State ranks first in coal mining employment and because it boasts a highly developed public vocational education system, which has pioneered in the provision of vocational education programs to prospective coal miners.

This report has several closely related objectives: to review the recent development of various categories of public and private coal mining training programs in the State (chapter 2); to analyze the extent to which these programs have been responsive to changing labor market conditions, as reflected in enrollment and placement trends (chapter 3); and to make recommendations for improvement in the vocational education planning process, based on this experience (chapter 4).

Despite our focus on West Virginia experience, chapter 2 also includes an industrywide perspective on recent employment and training developments in the industry. These trends are discussed much more extensively in two recent studies by the author: The Labor Outlook for the Bituminous Coal Mining Industry, with John Ostbo, and Occupational and Training Requirements for Expanded Coal Production. (The latter report, prepared for the Department of Energy, is scheduled for publication later this year.)

The specific West Virginia materials cited in this report were developed in the course of several recent visits to the State and through communications with key public officials and with coal industry training officials who participated in the planning process in various capacities. We are particularly indebted to Superintendent Clarence Burdette, Director of the West Virginia Bureau of Vocational, Technical, and Adult Education, and to Harold Sullivan, Assistant Director for Planning and Information Systems, and to many of their associates, who generously provided extensive unpublished data and other background materials for this study.

Notes

1. P.L. 94-483, section 164(b)(4)(A).

2. John Short and Associates, A Study to Determine the Manpower and Training Needs of the Coal Mining Industry. Prepared for U.S. Department of Interior, Bureau of Mines, December 1979, pp. 69 and 72.

Chapter 2

The Emergence of Coal Miner Training Programs

Formal vocational education for miners is a very recent development in the bituminous coal mining industry. Until the late 1960's, all basic skills needed for operating mining equipment and handling related mining tasks were acquired through informal, on-the-job training. Newly hired, inexperienced miners were usually paired with more experienced miners--often fathers or close relatives--in a "buddy system," in which they served as helpers while becoming familiar with mining procedures or equipment. Based on available records, the first secondary school vocational course in coal mining in West Virginia was offered in 1968; the first postsecondary programs leading to certificates or associate degrees in mining technology began in the following year.

Inservice training programs, provided directly by coal mining companies, are of equally recent origin. A few of the largest coal mine operators, such as Bethlehem Steel, pioneered in the development of companywide safety training programs in the early 1960's, but it was not until the late 1960's or early 1970's that even these companies began to expand their training activities to include training in occupational and supervisory skills.

From these rudimentary beginnings, the first half of the 1970's witnessed the emergence and rapid growth in school-based and company training courses for coal mining occupations. A survey of West Virginia miner training courses, conducted in 1975, found that "instructional programs for the coal industry have proliferated in response to need. State agencies, federal agencies, the industry, the United Mine Workers of America, educational and vocational institutions, manufacturers, and others have all contributed programs and materials to fill the training void."[1]

This development can be traced to the combined effect of several forces upon the industry; these include significant increases in employment and recruitment needs, technological trends, and, most important, the promulgation of mandatory health and safety training requirements under Federal and State legislation and in collective bargaining contracts.

This chapter reviews these major influences and provides a general description of the categories of training programs that have emerged to meet these needs, with specific reference to the West Virginia coal mining industry.

National Employment Trends

Since the end of World War II, the bituminous coal mining industry has experienced a cycle of severe contraction and subsequent recovery which has profoundly affected its requirements for new manpower as well as the size and composition of its work force (see table 1).

The 1950's witnessed a severe erosion of coal industry markets as a result of large-scale conversions of major energy-using industries from coal to oil and natural gas--fuels that were cleaner and easier to process, store, and transport. Annual coal output dropped by nearly one-fifth, from 516 million tons in 1950 to 416 million in 1960. Moreover, in an effort to maintain a competitive cost edge in its remaining markets (notably, the electric utilities), the industry--with the active support of the United Mine Workers of America (UMWA)--engaged in extensive mechanization that doubled productivity in that decade. The combined result was a drastic reduction in coal mining employment, from 368,000 in 1950 to 169,000 in 1960. By the latter year, coal mining was one of the Nation's most severely depressed industries; the overall unemployment rate for coal miners was 14 percent and Appalachia and other major coal mining areas suffered severe economic distress.

The 1960's were a transition period for the industry. Rapid growth in total national energy demand and the continued reliance of the electric utility industry upon coal as its primary fuel resulted in a substantial recovery in coal output, which expanded at an annual rate of 3.4 percent during this decade. This decade also witnessed further growth in coal mining productivity as a result of the virtual elimination of hand-loading of coal, the large-scale introduction of continuous mining machinery, and a significant increase in the share of total output accounted for by the less-labor-intensive surface, or strip, mining sector of the industry. These productivity gains were concentrated in the first half of the 1960's; as a result, between 1960 and 1965 coal mining employment was further reduced by some 37,000 jobs. When productivity growth slowed markedly between 1965 and 1969, employment stabilized at an average level of about 130,000 for this 5-year period.

Table 1

Production, Productivity, and Employment in Bituminous Coal and Lignite Mining, United States, 1950-80

Year	Production (Million net tons)	Productivity (Net tons per person per day)	Employment (thousands)
1950	516.3	6.8	367.9
1955	464.6	9.8	218.7
1960	415.5	12.8	168.5
1965	512.1	17.5	131.8
1966	533.9	18.5	129.6
1967	552.6	19.2	132.0
1968	545.2	19.4	126.4
1969	560.5	19.9	129.6
1970	602.9	18.8	139.6
1971	552.2	18.0	140.4
1972	595.4	17.7	157.1
1973	591.7	17.6	158.0
1974	603.4	17.6	176.0
1975	648.4	14.7	209.3
1976	678.7	14.5	221.4
1977	691.3	14.8	221.9
1978	665.1[a]	14.7[a]	205.4[a]
1979	776.3	13.5	259.1
1980[b]	830.0		258.5
	Average Annual Percentage Change		
1950-60	-2.2	6.6	-7.5
1960-69	3.4	5.0	-2.9
1969-74	1.5	-2.0	6.3
1974-80**	5.5	-5.1	6.6

SOURCES: Production and productivity data from U.S. Bureau of Mines, Minerals Yearbook, and Energy Information Administration, Energy Data Reports, selected issues. Employment based on Bureau of Labor Statistics for total employees in Employment and Earnings, 1909-78, and selected monthly issues.

a. Data for 1978 significantly affected by UMWA contract strike, from December 1977 through March 1978.

b. Preliminary data. Data on productivity for the 1974-79 period.

The 1970's, in turn, were marked by a dramatic reversal in the coal industry labor market. The number of coal mining jobs doubled, from about 130,000 in 1969 to 259,000 in 1980, with particularly sharp growth in the years immediately following the 1973-74 Arab oil embargo. This employment growth was, however, only partially attributable to increased coal demand. In fact, national coal output remained fairly stable, at about 600 million tons each year between 1970 and 1974, and experienced its most rapid growth only in the closing years of the decade. A major contributing factor to employment growth in this decade was, rather, the sharp downturn in coal mining productivity, which declined by one-third, from an average of 19.9 tons per worker per day in 1969 to 13.5 tons in 1979.

This productivity decline was particularly striking because the coal industry--previously in the vanguard of national productivity growth--now had the dubious distinction of having experienced the most severe productivity decline of any major United States goods-producing industry. Moreover, as shown in table 2, the post-1969 productivity reductions were shared by both the deep and surface mining sectors of the industry, although the reduction was much more severe in the former. These declines have been attributed to a combination of factors during this period:

- o Regulatory factors -- the additional labor requirements associated with compliance with the Coal Mine Health and Safety Act of 1969, recent Federal and State reclamation laws, and union contractual requirements related to mine health and safety;

- o Labor supply factors -- an influx of large numbers of younger, inexperienced, and less disciplined miners, concurrent with increased retirements of experienced miners;

- o Labor relations factors -- extensive labor unrest in the coal fields, reflected in a sharp increase in wildcat strikes in the mid-1970's and in increased worker absenteeism;

- o Market factors -- the effects of the sharp post-1973 increase in coal prices, which permitted the entry or continued operation of many marginal, higher-cost mining operations.

Table 2

U.S. Bituminous Coal Output and Productivity, by Type of Mining, Selected Years, 1960-79

	Output (Million net tons)				Productivity (net tons per person per day)		
Year	Total	Deep	Surface	%Surface	Total	Deep	Surface
1960	415.5	284.9	130.6	31.4	12.8	10.6	23.2
1965	512.1	332.7	179.4	35.0	17.5	14.0	32.8
1969	602.9	338.8	264.1	43.8	19.9	15.6	36.1
1975	648.4	292.8	355.6	54.8	14.7	9.5	26.7
1979	770.0	302.2	467.8	60.8	13.5	7.9	24.8

SOURCES: U.S. Bureau of Mines and Department of Energy.

These negative factors more than offset the positive influence upon the overall industry productivity averages of (1) further technological advances and (2) a continued shift in distribution of output from deep mining (primarily based in Appalachia) to the much more capital-intensive surface mining sector, particularly in the rapidly expanding coal-producing areas of Wyoming and Montana.

There were indications in the closing years of the decade, however, that the productivity declines were slowing and that productivity would again begin to rise. Among the favorable factors noted in our analysis, conducted in 1979, were (1) a pronounced improvement in the industry's labor relations climate, following setclement of the 1977-78 national contract strike; (2) an expected improvement in the experience level of the mine work force; and (3) further projected technological progress. These factors, in combination with an assumed stabilization of regulatory constraints, were expected to cause a gradual increase in coal mining productivity in the 1980's.

Some confirmation for this assessment is now available, based on recent data for 1980. As table 1 showed, the U.S. bituminous coal industry increased its output by 54 million tons, or 7 percent, between 1979 and 1980, with virtually no change in the size of its work force. Although official Department of Energy statistics on industrywide coal mining productivity are not yet available for 1980, an analysis by staff of the Bituminous Coal Operators' Association (BCOA), based on data compiled by the UMWA Health and Retirement Funds for companies covered by the UMWA National Agreement, indicates that productivity, measured in tons per production worker-hour, rose by about 8 percent between 1979 and 1980. The BCOA attributes this improvement to several factors, including the reduction in wildcat strikes, technological advances, and closing of marginal mines because of depressed business conditions in some sectors of the industry. The statement cautions, however, that "because these recent productivity improvements are so new and may reflect only temporary events, it is still too early to determine whether the improvement will continue."[2]

The West Virginia Coal Industry

The State of West Virginia has long been one of the Nation's leading producers of bituminous coal. As recently as 1965, it accounted for 29 percent of total U.S. output. In common with other Appalachian coal mining States, its share of total output has declined steadily since then to less than 15 percent in 1980. Nevertheless, West Virginia still ranks first in coal employment, among the major coal-producing States. Moreover, coal continues to be a mainstay of the West Virginia economy, providing employment to more workers in the State than any other goods-producing industry and--because of the industry's high wage rates--accounting for an even greater share of total payrolls.[3] The dependence of many West Virginia areas upon coal mining is also illustrated by the fact that, in 1970, this industry provided employment to 20 percent or more of the male labor force in 10 West Virginia counties, generally located in the southern part of the State.[4]

The West Virginia coal mining industry has certain distinctive features highly relevant to any assessment of its recent labor market trends. Based on their geological characteristics, the State's coal mine areas consist of two major coalfields, a northern coalfield which primarily produces "steam" coal for utility and industrial markets, and a southern coalfield which includes major low-volatile coal deposits that are much lower in gas and sulfur content and high in carbons. This coal, although costly to mine, is ideally suited for use as metallurgical coal.

As shown in table 3, West Virginia coal is produced mainly in underground mines, which accounted for 81 percent of its total output in 1979--and nearly 90 percent of its total coal mining employment. The industry is also highly unionized, with about 93 percent of its work force employed in UMWA mines, as compared with 74 percent nationally.[5] The relative importance of metallurgical coal is indicated by the fact that 47 percent of the State's total output went to domestic coke plants or was exported, mainly for metallurgical use. Finally, the average price of West Virginia coal in 1979 was about 57 percent above the national average, reflecting both its higher average quality and higher production costs.

Table 3

Key Characteristics of West Virginia and U.S. Bituminous Coal Mining Industry

	West Virginia	United States
Total output, 1979 (Million net tons)	112.4	770.0
Output by type of mining, 1979 (percentage distribution)		
Deep	81.2%	39.2%
Surface	18.8	60.8
TOTAL	100.0	100.0
Major users, 1977-79 (percentage distribution)		
Electric utilities	46.1%	71.0%
Coke plants	19.9	10.9
Other domestic	6.9	13.3
Export	27.1	4.8
TOTAL	100.0	100.0
Average coal prices, 1979	$36.90	$23.50

SOURCE: Coal Facts '80, West Virginia Coal Asscciation, 1980.

These characteristics help to explain some of the trends in output and employment in the industry during the past decade. As shown in table 4, West Virginia coal output declined following 1970 and, despite a partial recovery following the 1978 coal strike, was still about 22 million tons, or 15 percent, lower in 1980 than in 1970. Most of this slump, in the face of the recent nationwide upsurge in coal demand, has been attributed to weakness in both the domestic and export markets for metallurgical coal and to increased competition from other coal-producing States. In addition, interruptions in output, resulting from both extensive wildcat strikes in the mid-1970's and from the 1977-78 contract strike, had a particularly severe impact upon the West Virginia industry, because of its high degree of unionization.

Nevertheless, until the late 1970's, West Virginia shared in the expansion of coal industry employment. Annual employment of coal mine personnel rose from 45,000 in 1970 to 63,000 in the final 9 months of 1978, according to reports of the West Virginia Department of Mines. These increases were entirely attributable to the sharp drop in labor productivity, which fell by about 40 percent over this period. However, the next 2 years saw a sharp reversal in the coal industry job market. Coal mining employment declined by about 4,000 as a result of the significant recovery in productivity, which, at about 11 tons per worker-shift in 1979 and 1980, almost equaled the 1974 level.

Confirmation for this recent trend is also provided by detailed data on total worker-hours in UMWA mines in the State. Based on reports submitted to the UMWA Health and Retirement Funds, total worker-hours in union mines in West Virginia fell from a total of 61.3 million in the period April-December 1978 (following termination of the national coal strike) to 56.3 million in the same months of 1980, a decline of more than 8 percent, while output in these mines increased by 13 percent over the same period. As a result, productivity, as measured by tons per worker-hour, rose by more than 23 percent during this period.

This relatively sharp rebound of coal mining productivity in West Virginia probably resulted from internal redistribution of output and employment within the State, as well as from other factors noted in our discussion of recent industrywide trends. An examination of employment trends between 1977 and 1979 indicates that coal industry employment cutbacks during this period were concentrated in those southern counties specializing in production of low-volatile metallurgical coal

Table 4

Production, Productivity, and Employment Trends in the West Virginia Bituminous Coal Mining Industry, 1950-80

Year	Production (Million net tons)	Productivity (Output per worker per day)	Employment (thousands)
1950	145.6	6.4	119.6
1955	137.1	9.4	64.3
1960	120.1	12.1	48.7
1965	149.2	15.9	44.9
1970	143.3	14.0	45.3
1971	118.3	13.2	48.9
1972	122.9	12.3	48.2
1973	115.2	11.8	47.8
1974	101.7	10.8	50.1
1975	109.5	9.2	57.3
1976	108.8	8.6	59.8
1977	95.4	8.2	61.8
1978	84.7	8.5	63.0
1979	112.4	11.1	58.6
1980	121.0	10.9	56.3

SOURCES: Production--U.S. Bureau of Mines and Energy Information Administration (EIA).

Productivity--Data through 1978 from U.S. Bureau of Mines and EIA. Data for 1979 and 1980 from West Virginia Department of Mines.

Employment--Annual Reports, West Virginia Department of Mines. Employment averages exclude months affected by strikes.

(see table 5). Since unit labor requirements are much higher for metallurgical than for steam coal, the reduced share of the former mines in the State's total coal output and employment, in turn, contributed to the increase in the State's overall productivity average, from 8.2 tons per worker per day in 1977 to 11.1 tons in 1979.

Personnel Turnover Trends

The broad swings in coal mining employment in the past 3 decades and the accompanying changes in the age structure of the industry's work force have had important implications for the industry's recruitment and training requirements, both nationally and in West Virginia. During the period of sharp employment cutbacks, which continued until the mid-1960's hiring of new miners was negligible. Thus, in 1960, when layoffs were at an average monthly rate of 2.7 per 100 employees, based on industrywide Bureau of Labor Statistics (BLS) data, the rate of new hires was only 0.5 per month (see table 6). Moreover, with 14 percent of all experienced coal miners reported as unemployed in 1960, most new hires probably consisted of workers with prior mining experience. The result was a virtual halt to entry of new, younger men into the industry and a progressive aging of the industry's work force.

Hiring of new coal miners began to pick up in the second half of the 1960's. With the stabilization of coal employment, many coal companies reentered the labor market to hire replacements for normal personnel turnover. Moreover, the reserves of unemployed coal miners had gradually become depleted as a result of large-scale migration of many younger men from depressed Appalachian coal mining areas and retirements of many older ex-miners; by 1970 the unemployment rate for coal miners was only 2.4 percent.

Between 1970 and 1976, the combined effects of employment growth and of relatively high, voluntary separation rates from the industry resulted in a relatively large annual requirement for new entrants into coal mining jobs. Thus, based on analysis of a 10-percent sample of Social Security records of coal miners, we estimated that nearly 100,000 workers entered coal mining employment nationally between 1971 and 1974, exclusive of short-term or casual employees. In the State of West Virginia, accessions of new entrants averaged 4,300 per year in 1971 and 1972, and about 7,500 per year in 1973 and 1974.

Table 5

Employment in the West Virginia Bituminous Coal Mining Industry, By District, 1977, 1979

District	1977	1979	Change No.	Change %
Southern--Low-volatile (metallurgical)	26,000	23,463	-2,537	-10.0
Southern--High-volatile (steam and metallurgical)	17,259	17,076	-183	-1.1
Northern--High-volatile (steam)	18,556	18,026	-530	-2.9
TOTAL	61,815	58,565	-3,250	-5.3

SOURCE: Employment data by county from West Virginia Department of Mines, Annual Reports for 1977 and 1979. Grouping by district based on following classification of counties, appearing in Coal Facts '80, West Virginia Coal Association:

Southern--low-volatile:	McDowell, Wyoming, Raleigh, Fayette, Mercer, Nicholas, Greenbrier, Summers, Monroe
Southern--high-volatile:	Wayne, Mingo, Logan, Boone, Kanawha, Lincoln, Cabell, Putnam, Mason
Northern--high-volatile:	Brooke, Ohio, Marshall, Monongalia, Marion, Harrison, Lewis, Braxton, Webster, Preston, Taylor, Barbour, Upshur, Randolph, Tucker, Grant, Mineral

Table 6

Labor Turnover Rates in the Bituminous Coal Mining Industry: Selected Years, 1960-80

Year	Accessions (New Hires)	Separations		
		Total	Layoffs	Quits, Retirements, and Other Causes
	(Monthly averages per 100 employees)			
1960	0.5	3.4	2.7	0.7
1965	0.9	1.7	0.7	1.0
1970	1.7	1.5	0.2	1.3
1971	1.5	1.7	0.2	1.5
1972	1.4	1.8	0.5	1.3
1973	1.3	1.6	0.3	1.3
1974	1.7	1.4	0.1	1.3
1975	1.9	1.4	0.2	1.2
1976	1.5	1.7	0.3	1.4
1977	1.3	1.6	0.2	1.4
1978	1.3	1.6	0.4	1.2
1979	1.0	2.1	1.0	1.1
1980	0.7	2.2	1.2	1.0

SOURCE: U.S. Bureau of Labor Statistics.

In the past 2 to 3 years, however, available data indicate a pronounced weakening in the coal mining labor market. Nationally the hiring rate for "new" workers fell from a monthly average of 1.3 per 100 in 1978, to only 0.7 in 1980 -- the lowest rate since the early 1960's, while layoffs rose from 0.4 to 1.2 per 100 over the same period. The unemployment rate for coal miners, which had fluctuated within a narrow range of 2-4 percent during most of the 1970's, in turn mounted to 8.6 percent in 1980, as compared to a rate of 6.8 percent for all experienced workers in the same year (table 7).

In West Virginia, unemployment among coal miners more than doubled, from an average of 2,900, or 4.5 percent, in 1977 to 6,000 in 1980, according to estimates of the State's Department of Employment Security. At the same time, based on a survey conducted by The Conference Board in 1979, we estimate that the number of new, inexperienced entrants into coal mining jobs had probably fallen from an annual average of 7,500, earlier in the decade, to only about 2,000 in the 12 months ending in June 1979.

Thus, after nearly a decade of rapid employment growth and nearly full employment, the coal industry--despite steadily rising production and glowing long-term forecasts--was confronted with an all too familiar pattern of serious unemployment and restricting hiring, at least in established older centers of the industry, such as the coal mining areas of West Virginia.

Occupational Requirements

The post-World War II decades have witnessed a series of major changes in coal mining technology, which have significantly affected the industry's occupational structure and its requirements for trained personnel. In underground mining, machine cutting of coal had already largely replaced the miner's pickaxe by the 1920's: only 5.1 percent of total deep coal output was still cut by hand in 1951, and this dwindled to insignificant dimensions by the end of the 1960's. "Conventional mining," as it emerged in the early postwar years, has consisted of a series of separate mechanical operations designed to undercut the coal seams, to separate the coal through machine drilling or blasting, to load the coal, and to move the coal to the mine face by conveyor belts and shuttle cars. This method of underground coal mining accounted for more than 90 percent of total coal output in the first half of

Table 7

Unemployment Rates for Coal Mine Workers and for All Experienced Workers, 1960, 1970-80

Year	Percentage Unemployed	
	Coal Mine Workers	All Experienced Workers
1960	14.0	5.0
1970	2.4	4.5
1971	3.9	5.7
1972	4.0	5.3
1973	3.0	4.5
1974	2.4	5.3
1975	2.1	8.2
1976	4.2	7.3
1977	3.4	6.6
1978	4.5	5.6
1979	6.7	5.4
1980	8.6	6.8

SOURCES: 1960--Decennial Census of Population.

1970-80--U.S. Bureau of Labor Statistics, based on unpublished tabulations from the Current Population Survey.

the 1950's. It has since been increasingly displaced, however, by more sophisticated "continuous" mining equipment, which cuts and loads coal in one operation. The percentage of deep coal mined by continuous mining machines jumped from less than 2 percent in 1951 to 50 percent in 1969, and to 64 percent by 1978.[6]

As in other major industries undergoing mechanization, these technological changes were accompanied by a substantial upgrading in the skill requirements of its work force. Table 8 shows the broad shifts in occupational distribution since 1960, based on census data for 1960 and 1970 and on data compiled by the Equal Employment Opportunity Commission (EEOC) for 1970 and 1978. This period witnessed progressive increases in the proportion of white-collar workers, supervisory personnel, and the skilled blue-collar workers and corresponding reductions in the less-skilled operative and laborer occupations.

From the standpoint of vocational education, one of the most significant trends has been growth in the requirement for skilled mechanics and other maintenance workers. In underground mining, the two largest specialties are classified as "mine machinery mechanics" and "electricians." Because of the increased introduction of machinery using complex electrical circuitry, the employees responsible for repairing this machinery are often classified as electricians rather than mine machinery mechanics, and both require the same electrician certification under State mining laws. The extent to which technological advances tend to increase the need for mine machinery mechanics and electricians is indicated by the fact that, whereas this specialty accounts for only 4.9 percent of total employment in underground mines using conventional methods, the proportion in this specialty is twice as high, 9.8 percent, in mines using continuous mining methods.[7]

In West Virginia, where some detailed occupational data on coal mining occupations are available from earlier surveys, the shift from conventional to continuous mining systems has, in turn, increased the percentage of mine machinery mechanics and electricians of total employees from 6.7 percent in 1960 to 8.7 percent in 1978.[8]

The growth in the requirement for skilled personnel, illustrated by the above comparisons, has been accompanied by an increase in qualitative job demands, resulting from the growing complexity of mining equipment and the need to comply with a wide range of safety and environmental standards. In the early 1970's these difficulties were compounded by the

Table 8

Occupational Distributions of Coal Mining Employees, 1960, 1970, 1978, Based on Decennial Census and EEOC Data

Occupational groups	Percentage Distribution			
	Decennial census[a]		EEOC	
	1960	1970	1970	1978
Salaried occupations	12.6	16.1	17.0	21.6
Professional & technical	1.7	2.2	2.9	4.3
Engineers	(0.8)	(1.0)		
All other	(0.9)	(1.2)		
Managers and officials	1.6	2.0	10.1[a]	12.3[a]
Foremen	5.8	7.5		
Clerical, including sales	3.5	4.4	4.0	5.0
Production worker occupations	87.3	83.8	83.0	78.5
Mechanics/craft workers, mechanics, and repairmen	14.7	23.4	28.6	26.8
All other	(5.0)	(7.4)		
	(9.7)	(16.0)		
Operative and laborers (including service workers)	72.6	60.4	54.4	51.7
TOTAL	100.0	100.0	100.0	100.0

SOURCES: Decennial census data from decennial Censuses of Population, selected volumes. Data include anthracite as well as bituminous coal and lignite mining. EEOC data from unpublished tabulations provided by Equal Employment Opportunity Commission, based on reports from bituminous coal and lignite mining companies with 100 or more employees.

a. This category is believed to include salaried (nonworking) supervisors as well as higher-level managerial personnel.

limited supply of older, experienced personnel in these occupations with sufficient competence to provide adequate on-the-job training to workers newly assigned to these tasks. Hence, even before the imposition of the new requirements for safety training, a few of the larger, more sophisticated coal mining corporations had already initiated more systematic, formal training for their skilled maintenance occupations.

The major impetus for systematic, industrywide training of coal miners came, however, from enactment of Federal and State mine safety laws and from union pressures to reduce some of the health and safety hazards of this inherently dangerous occupation, as described in the following section.

Health and Safety Training Standards

Following earlier, limited efforts under Federal and State laws to provide basic protections for miners from the numerous hazards of their occupation, the Federal Coal Mine Health and Safety Act, enacted in late 1969, provided for the first time a statutory framework for establishment of more comprehensive, nationwide health and safety standards and for enforcement of these standards through a separate regulatory agency--originally the Mining Enforcement and Safety Administration (MESA) in the Department of Interior, now the Mining Safety and Health Administration (MSHA) of the Department of Labor. One major departure in the 1969 act was establishment of the principle that coal mine operators were responsible for training of their employees in the health- and safety-related aspects of their jobs. Although the act mandated training of all "certified" and "qualified" persons in coal mining, its initial application was to certain key specialists, such as mine or section foremen, fire bosses, mine electricians, or hoisting engineers--occupations for which certification papers had long been required under State mining laws.

Additional impetus for establishment of industrywide minimum and safety training standards was provided by the collective bargaining agreement negotiated by the UMWA with the Bituminous Coal Operators' Association in 1974. This agreement established the following specific training requirements:

1. Initial orientation programs in specified safety subjects of at least 4 days (or 32 hours) for all new, inexperienced workers at underground or surface mines; of at least 1 day (8 hours) for new, experienced miners;

2. Annual retraining programs of at least 8 hours for all mine workers;

3. Safety training for all employees assigned to new jobs, to include a "thorough job briefing relative to the hazards of the job"; and

4. A requirement for training programs (of unspecified duration) for employees in maintenance jobs, to include training in mechanical, welding, and electrical skills through such methods as "progressive job tasks, on-the-job training, and classroom training."

This agreement paved the way for enactment of specific training requirements for all coal miners in the 1977 Amendments to the Federal Mine Health and Safety Act. These amendments and subsequent regulations promulgated in October 1978 established requirements for orientation training, annual refresher training, task and hazards training (see table 9). These closely paralleled those in the UMWA contract, except for requiring 40 hours, rather than 32 hours, of orientation training for new, inexperienced miners in underground mines.

Meanwhile, several States enacted their own miner training laws which, in some instances, exceeded the minimum standards of both the UMWA contract and the Federal law. Requirements for some mandatory safety training of miners--including 10-hour courses in general mining practices and in first aid--had been in effect in West Virginia since 1967. These courses were to be provided to miners during their first 6 months of employment, either by staff of the State's Department of Mines or by company personnel who had been qualified as "cooperative" instructors by the department. In 1974 a much more comprehensive training requirement was enacted; it provided for mandatory "apprentice" training courses for all applicants for mining jobs, prior to entry into mining occupations. The course requirements, specified in great detail in subsequent regulations, provide for 80 hours of instruction for prospective underground miners, and 40 hours for surface miner (see table 10).

Although overall responsibility for the program was vested in the Department of Mines, the State's public vocational education system was assigned primary responsibility for providing the training under the supervision of the Bureau of Vocational, Technical, and Adult Education, in the Department of Education. In addition, a number of coal companies received permission to conduct their own 80-hour training courses, using State-approved instructors. Vocational schools began training of underground

Table 9

Training of Coal Miners Required by the Federal Mine Safety and Health Act of 1977

Mandatory Course Components/Training Time	Inexperienced Miners		Experienced Miners						All Miners	
	Orientation		Orientation/ New Hires		New Task		Annual Refresher		Hazard	
	Deep	Surface	Deep	Surface	Deep	Surface	Deep	Surface	Deep	Surface
Minimum time required (hours)	40	24	8	8	a	a	8	8	a	a
Introduction to work environment	X	X	X	X						
Statutory rights/ responsibilities	X	X	X	X						
Transportation/commu-nication	X	X	X	X			X	X		
Mine map/escape education/ barricading	X	X	X	X			X	X	X	X
Self rescuer/respiratory devices	X	X					X	X	X	X
Health	X	X					X	X		
Clean-up/rock dusting	X									
Roof control/ventilation	X		X				X			
First aid	X	X					X	X		
Electrical hazards	X	X					X	X		
Mine gases	X						X			
Task health/safety	X	X			X	X				
Hazard recognition/ avoidance	X	X	X	X					X	X

Table 9 (continued)

Training of Coal Miners Required by the Federal Mine Safety and Health Act of 1977

Mandatory Course Components/Training Time	Inexperienced Miners		Experienced Miners						All Miners	
	Orientation		Orientation/ New Hires		New Task		Annual Refresher		Hazard	
	Deep	Surface	Deep	Surface	Deep	Surface	Deep	Surface	Deep	Surface
Ground control/high walls/ water hazards/spoil banks/ illumination		X		X				X		
Explosives		X					X	X		
Mandatory health/safety standards			X	X			X	X	X	X
Supervised practice/ nonproduction					X	X				
Supervised practice/ production					X	X				
New or modified machines/ equipment					X	X				
Prevention of accidents							X	X		

SOURCE: Adapted from Final Rules under Part 48, Health and Safety Training and Retraining of Miners, Federal Register, Friday, October 13, 1978, Part IV.

a. No specified minimum course hours for these categories.

Table 10

Course Contents For Underground Coal Miner Orientation Training, West Virginia

Subject	Hours[a]
General Orientation to Mining	4
Introduction to General Mine Safety (including use of self-rescuer)	4
Underground Mine Tour	6
First Aid	12
General Safety	6
General Mine Safety	7
Mine Gases and Their Detection	4 1/2
Recognition and Avoidance of Electrical Hazards	4
Fire Prevention and Control	3
Ventilation and Mine Mapping	5 1/2
Roof and Rib Control	6
Haulage and Equipment Safety	7
State and Federal Laws and Regulations	2
Miner and Operator Rights and Responsibilities	3
Health and Sanitation	2
Summary and Debriefing	4

SOURCE: West Virginia Administrative Regulations, Department of Mines. Rules and Regulations Governing the Safety Training Program for Prospective Underground Coal Miners in West Virginia, 1976.

a. Time distribution for topics is a "suggested one" that can vary, so long as the training objectives are achieved.

miners under this program in March 1976, and, beginning in May 1976, the State's coal companies were required to limit their hiring of new employees to persons who had been certified as trained apprentice miners upon completion of these courses.

These courses have also been approved by the Office of Mining Safety and Health of the Labor Department as satisfying the requirements under the Federal law. However, companies covered by the UMWA contract are required to supplement this training by at least 32 hours of inservice orientation training for new, inexperienced miners. Thus, the total length of required initial health and safety training for new, union, underground miners in West Virginia is now 112 hours or approximately 3 weeks.

In addition to these miner orientation, or apprenticeship, training requirements, the requirements for certification of certain key mining occupations, under State laws, also have important training implications. In West Virginia, the following occupations are subject to certification: mine foreman, assistant mine foreman, fire boss, shot firer, and electrician. Employees authorized to work in these occupations must satisfy certain minimum experience requirements, ranging from 2 years for shot firers or assistant mine foremen in surface mines, to 5 years for an underground mine foreman. These employees also must pass examinations on the subject matter of their specialty. The regulations permit some substitution of education for working experience, for example, a reduction from 3 to 2 years for surface mine foremen with degrees in mining engineering. These certification requirements, in turn, have created a market for "refresher" courses to help mining personnel prepare for the more theoretical aspects of the certification examinations in their respective specialties. Under a revised regulation issued in November 1979, a 12-month apprenticeship training program, including a minimum of 40 hours of classroom training (as well as a total of 3 years of electrical experience), is now required for certification as mine electrician.[9]

The Coal Mining Training Infrastructure

Enactment of mandatory training requirements for coal miners, coinciding as it did with the need to recruit and train a large number of new workers with no prior mining experience, created a need to develop, almost overnight, a training infrastructure for the industry. As noted at the beginning of this chapter, the industry had entered the 1970's with only a rudimentary capability for training of its personnel in either the safety or the technical aspects of their jobs. There were a few notable exceptions among the coal mine companies, including

some of the major corporations operating captive mines, whose pioneering efforts to establish comprehensive safety programs had in fact served as models for the design of federally mandated standards. However, recent surveys have confirmed that all but a small fraction of company training programs were initiated after enactment of the Federal Mine Health and Safety Act of 1969.[10]

Introduction of new and more sophisticated equipment did, of course, entail some specialized training, at least on an ad hoc basis. This was often provided by the manufacturers of mining equipment as a service to accompany installation of the equipment. Some of the major mining machinery manufacturers also had developed more comprehensive maintenance training programs and aids, and they marketed this training to coal mining companies. With these exceptions, though, the prevailing practice was to rely on informal, on-the-job training methods even for the more technical mechanical skills.

The extent of involvement of the vocational education system in coal miner training prior to 1970 was even more limited than that of private industry. Thus, at the secondary-school level, the first regular coal miner instructional program recorded was one started in Monongalia County in 1968.[11]

The public sector involvement in coal mining training prior to 1970 was largely limited to the activities of State mining agencies, which, with very small staff, were responsible for providing safety training services that ranged from general training of miners in first aid and other safety subjects, to training for miners preparing for State qualification or certification examinations, and training of mine rescue teams throughout the State. The limited scope of these activities is suggested by the fact that even by 1974 the West Virginia State Department of Mines had a staff of only eight full-time instructors to service the needs of an industry then employing about 45,000 miners.

From these beginnings, training programs and training institutions proliferated rapidly to meet the coal mining industry's needs to comply with the new safety training standards and to improve the skills and productivity of its expanding work force. A collateral objective, particularly for the vocational education system, was to help young people, including those from disadvantaged backgrounds, to qualify and to compete more effectively for the jobs opening up in this high-wage industry. The major types of training providers which had developed by the late 1970's and the scope of their activities, with specific reference to the State of West Virginia, are summarized in the next paragraphs.

Coal Company Programs

Comprehensive data on the current scope of coal industry training activities are available from a survey conducted by The Conference Board for the Department of Energy in 1979. Responses were obtained, nationwide, from 91 large and medium-sized companies which accounted for about one-half the industry's total employment. Of those providing specific information about their internal training organization, about three-fourths reported that they had a separate unit or staff responsible for training, either at company headquarters or at the regional or district levels. More than half of these companies reported that their units had been in existence for 10 years or longer. Although smaller companies (those with annual outputs of less than 300,000 tons) were not included in the survey, the pattern of responses by size indicated that very few, if any, of these excluded firms, which account for about one-fifth of total output, are likely to have any formal organization for training. As one observer has noted, in very small mine operations "the training director, safety engineer, foreman, mine manager, superintendent, and owner could be the same individual."[12]

Among companies with full-time training staffs, the number of trainers per 1,000 employees was found to vary inversely with company size: from 2.3 per 1,000 in firms with 5,000 or more employees, to 8.1 per 1,000 in companies with fewer than 500 employees. These ratios suggest that organization of internal company training programs with full-time instructional staffs becomes progressively more costly (per employee) as the size of the company decreases. Thus, most small companies must forego all but mandatory training, and they typically provide the latter through part-time instructional personnel or external training sources.

About 95 percent of the companies responding to the survey reported that they provided the required initial orientation training to their own employees, while the remainder relied entirely on external sources for such training, such as local vocational schools. All companies provided the required 8 hours of annual refresher training themselves. In the major categories of nonmandatory training, more than 80 percent of the companies offered some training for foremen, while about one-half reported some formal occupational training programs for production workers, primarily in skilled maintenance occupations. As would be expected, the incidence of the latter training programs varied directly with company size. Thus, the proportion of companies offering formal training in mining skills, including some classroom work in addition to on-the-job

instruction, ranged from only 38 percent in firms with less than 200 employees, to 83 percent in those with 2,500 or more workers.

The amount of training actually provided other than that mandated under Federal or State laws was found to be quite modest, however, even among many of the larger companies included in the survey. For example, among surveyed mines located in the Eastern or Appalachian coal region (including West Virginia), only about 1.1 percent of available production-worker time had been devoted to various categories of formal training activity between July 1978 and June 1979. Nearly 60 percent of these total employee-training-hours were accounted for by mandated courses, including new miner orientation and annual refresher training. An additional 10 percent was used to prepare key personnel for State certification tests. Only about 30 percent of the total training hours, corresponding to 0.3 percent of total production-worker time, was devoted to training primarily designed to develop, or improve, occupational skills and performance. Most of this training, moreover, was in maintenance occupations. With limited exceptions, formal training of personnel assigned to operate mining equipment or other non-maintenance occupations was still limited to that included in their initial orientation courses.[13]

The larger coal companies usually provide occupational training, such as training in maintenance or supervisory skills, at their own facilities and with their own training staffs. More than 70 percent of the companies indicated that this training was provided at company facilities only, while the remainder made some use of other facilities, such as local schools or community colleges. Similarly, most responding companies relied on either full-time company instructors or on other company employees to handle their training programs. About one-fourth of the companies reported some use of outside instructors in their skills training programs.

These responses and much collateral information all suggest that the larger coal companies, which account for a major portion of the industry's total output and employment, are the primary providers of general safety training and of more specialized occupational training for their own employees. Our interviews with company training officials indicate that this preference for "inhouse" training, where practicable, stems from (1) a need to adapt training content to the specific equipment and operational configurations of individual mines, (2) a desire to have direct control over training content and quality, and (3) the economies inherent in onsite instruction.

Nevertheless, the ability of companies to provide comprehensive inhouse training programs is subject to obvious constraints. In West Virginia, for example, of a total of 927 bituminous coal mining establishments in the 1977 Census of Mineral Industries, 535 had reported fewer than 20 employees; an additional 240 mines reported between 20 and 99 employees.[14] It may be assumed that few, if any, of these smaller mines could separately provide specialized formal training to their employees. Such mines must either continue to rely upon informal, on-the-job training methods or upon external sources of formal training, such as local schools or vendors. The same limitations of scale, moreover, are likely to apply to many larger companies during periods of limited hiring activity, such as that recently experienced in the West Virginia coal mining industry.

Vocational and Technical Education Programs

A second major component of the coal industry training infrastructure in West Virginia--and one of primary concern in the present report--consists of public and private educational institutions that provide courses to prepare enrollees for work in coal mining occupations or to enhance the skills of those already working in the industry. The major categories of educational institutions that provide such training are (1) public vocational and technical schools and general high schools, offering at least five vocational programs; (2) public community and technical colleges; (3) private institutions of higher education, including community colleges and university extension departments.

The West Virginia public vocational education system is the largest of these categories of educational institutions, in terms of its contributions to miner occupational training within the State. It is administered by the Bureau of Vocational, Technical, and Adult Education in the State's Department of Education. With substantial financial assistance from the Appalachian Regional Commission, the State's network of vocational-technical training centers has expanded rapidly from only seven vocational centers in 1963 to a total of 40 modern, well-equipped area vocational centers and seven multi-county centers by 1978.[15] Of these, some 38 schools offered at least one course in mining subjects in 1978. These courses range from the basic miner orientation courses to specialized courses in mine machinery repair or in mine supervision. These programs are offered to secondary students, postsecondary students, and adult trainees. They include preemployment orientation and training courses, as well as courses designed to upgrade the skills and qualifications of working miners. A

more detailed description of these courses and of enrollment trends in these programs appears in the following chapter.

At the higher education level, the State, through a Board of Regents, administers a network of 16 public institutions of higher education, including community colleges, 4-year colleges, and universities. Five of these institutions offer occupational training in mining technology, mine maintenance, or related subjects leading to either 2-year associate degrees in mining technology or 1-year certificates.

Similar programs are offered by a few of the private institutions in the State, including Beckley College, Salem College, and West Virginia Wesleyan College.

The Mine Extension Service of the University of West Virginia offers not only degree or certificate-level programs, but also shorter courses similar to those offered mine employees by the vocational education system.

Federal and State Mining Agencies

In addition to the training provided by publicly funded educational institutions, the government agencies responsible for administration of mine safety laws have been assigned responsibilities for provision of training assistance in mine safety and health. This assistance has ranged from the development of training courses and related materials, to training and qualification of mine safety instructors, and, in some instances, to the direct provision of training by their own staffs.

At the Federal level, the Bureau of Mines since its inception in 1910 has had responsibility for programs to improve mine safety; the Bureau initiated some limited training in simple first aid courses as early as 1913. This responsibility was broadened under the 1969 Federal Mine Health and Safety Act and assigned to the Mining Enforcement Safety Administration (which, as has been noted, was transferred to the Department of Labor in 1977 and redesignated as the Mine Safety and Health Administration).

This agency, operating through 10 regional offices, reviews and approves plans for the federally mandated health and safety training that all mine operators must submit; the agency also conducts inspections to monitor adherence to these and other provisions of the law. Its training activities have included the direct provision of safety training to miners and mine supervisors (primarily in small companies); the training and

certification of "cooperative instructors" who are, in turn, authorized to conduct the required courses in their own companies or educational institutions; and the development and dissemination of a variety of training materials on these subjects.

The direct provision of safety training to mine personnel by MESA/MSHA staff was designed particularly to help small mine operators (those with fewer than 20 employees) to comply with the Federal training requirements. This activity began shortly after enactment of the 1969 act and appears to have peaked in 1974, when 88 full-time instructors, based at MESA regional training centers, provided 108 different courses in mine safety subjects, with gross national attendance of 51,624 mine personnel. In West Virginia, 12 separate courses for underground coal miners were provided in subjects such as first aid methods, mine rescue procedures, electrical training, coal mine ventilation, and the provisions of the Coal Mine Health and Safety Act.

Eleven full-time instructors taught these courses at various locations, including the MESA Training Center at Beckley, West Virginia, the district office in Fairmont, and various mine sites. In 1974, enrollment in these courses totaled 18,500; because some individuals attended more than one course, the number of persons instructed was undoubtedly much smaller than the total.[16] These direct miner training activities have since been largely discontinued, at least in West Virginia, where, according to key training center personnel, the emphasis now is on training and certification of instructors and on the agency's monitoring and compliance functions.

The MSHA has, however, continued to play an important role in mine safety training through its National Mine Health and Safety Academy at Beckley, where it has provided courses in a range of safety-related subjects for Federal and State mine inspectors, company safety directors, and college students specializing in this field. MSHA also has an extensive program of publication of instructional materials, including a recent series of programed-instruction workbooks on 19 separate mine safety subjects.

At the State level, the West Virginia Department of Mines has, in addition to its certification functions, directly provided safety training to mine personnel for more than a decade. This training, now conducted by a staff of eight instructors, is designed to help mine operators wih fewer than 50 employees, and typically consists of short "refresher" courses on such subjects as the use of self-rescuers and other safety instruments or apparatus. The 1977 report of the department indicates that

about 35,000 persons were "trained and certified" in these safety classes that year.[17] The author has learned, however, that the department is phasing out this training activity on grounds that other sources of safety training now being provided to the State's miners have made this program unnecessary.[18]

Other Nongovernmental Training Programs

Programs offered by mining machine manufacturers or by private consultant firms that specialize in training of mining personnel are an additional source of training in mining skills. The only systematic data on the scope of these programs is available from a survey conducted by Duane Letcher of the University of West Virginia in 1975. Of 10 large mining machine manufacturing companies active in the State, four companies reported that they conducted training or instructional programs, primarily on mine equipment maintenance, at various mine sites. Joy Manufacturing Company, which conducted the largest of these programs, reported that it had provided train- ing to 713 students in West Virginia in 1974. Three other companies, the Lee-Norse Company, the National Mine Source Company, and Jeffrey Mining Machinery Company, trained a combined total of 250 students that year.[19]

The Letcher survey also identified two private training consultant firms. One of these, Perry and Son, specialized in safety training; it conducted a number of short courses on various safety procedures that were attended by 2,500 students in 1974. A second firm, Coal Mine Training Materials, Inc., provided training for about 350 mine foremen and management personnel in 1974.[20]

Although mine equipment manufacturers and consultant firms have continued their miner training activity (as evidenced by their participation at various recent conferences of mine training officials), no systematic data on the scope of that activity have been compiled since the 1975 survey.

Summary

This chapter has reviewed the major developments leading to the creation of a "market" for training in coal mining occupations during the past decade and, based primarily on West Virginia data, has described the variety of programs developed to meet this demand. The experience of the coal mining industry during this period was unique in several respects: the virtual absence of any systematic training programs for coal mine occupations prior to the late 1960's; the establishment by law of the principle that coal mine operators are responsible for

providing prescribed types of training to their own employees; and the concurrent resurgence of coal industry employment and hiring activity. The response to these new demands was a largely uncoordinated growth of public and private programs to fill this training vacuum. Thus, miner health and safety training courses have been provided by various public educational institutions at the secondary school, postsecondary, and higher educational levels, by Federal and State mining agencies, by private consulting firms, and by coal mine operators themselves. Miner skills training and supervisory training courses similarly are available through public vocational technical schools and community colleges and from some private firms, as well as through company-operated training programs.

State education planners have, of course, long recognized a need to better coordinate and articulate these public and private training activities. In its annual report for 1973, the West Virginia Advisory Council on Vocational Education noted:

> Consideration must be given not only to training provided in the public school system, but also to the output of private vocational schools, public and private institutions of higher education, labor unions and industry, and publicly funded manpower training programs . . . That this total training effort is largely uncoordinated is perhaps best documented by the note in the FY 1973 State Plan for Vocational Education indicating information on other sector outputs is not available. . . .
>
> There must be coordination of the various manpower training programs in the State. Obviously, the vocational education system cannot continue to operate in a vacuum. . . .[21]

Eight years later, although some progress had been made in this direction, significant problems in planning of the State's total vocational education effort in the coal mining industry persist, as will be evident from our review of vocational education enrollment and placement trends in the next chapter.

Notes

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2. Bituminous Coal Operators' Association, UMWA-National Agreement, Coal: Today's Reality Vs. Tomorrow's Promise, January 23, 1981, p. 7.

3. Bureau of Labor Statistics (BLS), Employment and Earnings, States and Areas, 1939-78, Bulletin 1370-13, 1979.

4. Harold Wool and John B. Ostbo, The Labor Outlook for the Bituminous Coal Mining Industry, Palo Alto, California: Electric Power Research Institute, August 1980 (EA-1477), table 5-3.

5. Wool and Ostbo, op. cit., table 6-3.

6. National Coal Association, Coal Facts, p. 82.

7. Based on analysis of special tabulations from the BLS Occupational Employment Survey, as of May 1978.

8. Data for 1960 from A Study of Optimum Sample Selection and Occupational Patterns in the Bituminous Coal Mining Industry of West Virginia, West Virginia Department of Employment Security, September 15, 1971, table E. Data for 1978 from the Occupational Employment Statistics Survey of the Bituminous Coal Mining Industry conducted in May 1978.

9. West Virginia Administrative Regulations, Department of Mines, Rules and Regulations Governing the Standards for Certification of Coal Mine Electricians in West Virginia, 1979.

10. Letcher, op. cit., p. 88.

11. Ibid.

12. Bendix Energy, Environmental and Technical Office, Review and Evaluation of Current Training Programs Found In Various Mining Environments, vol. 1, 1975, p. 8.

13. Wool and Ostbo, op. cit., tables 5-7 and 5-9.

14. 1977 Census of Mineral Industry Series. Bituminous Coal and Lignite Mining, November 1980, table 3a.

15. West Virginia Department of Education, Progress: Vocational Education's Commitment to West Virginia's Economy, 1978.

16. Letcher, op. cit., p. 64.

17. West Virginia Department of Mines, Annual Report, 1977, p. 39.

18. Telephone interview with Chris Hamilton, Training Director, West Virginia Department of Mines, March 2, 1981.

19. Letcher, op. cit., pp. 114-117.

20. Ibid., pp. 117-123.

21. West Virginia Advisory Council on Vocational Education, Fourth Annual Evaluation Report, 1973, pp. 55-57.

Chapter 3

Vocational Education For Coal Mining In West Virginia

> It would be difficult to single out a major American industry with a more certain future than the mining, production and processing of coal. . . It's a new beginning filled with many opportunities for young men and women. New levels of achievement, monetary reward and personal satisfaction will exist in numbers that have never existed before. Advancement will be accelerated in an expanding industry. It's a bright future for those who live in coal-rich West Virginia.[1]

This excerpt from a widely disseminated booklet, describing career and training opportunities in the West Virginia coal industry as perceived in the mid-1970's provides a fitting point of departure for reviewing the changing fortunes of coal industry vocational education programs in that State during the past decade.

Prior to the 1970's, the coal industry had been part of the "problem," rather than a claimant for the products of the State's vocational education system. In the early 1960's, as a result of the severe post-World War II slump in coal mining employment, West Virginia had the dubious distinction of ranking at or near the top among the States in incidence of unemployment. This situation generated a stream of Federal financial aid for manpower training and related economic development purposes. In vocational education, a special program geared to retrain unemployed adults (the New and Expanding Industry Training Program of the Bureau of Vocational, Technical, and Adult Education) provided training for thousands of unemployed coal miners or members of their families for jobs in other industries in the State.[2]

As the preceding chapter described, however, coal mining employment "bottomed out" by the late 1960's and began to rise significantly in West Virginia in the early 1970's. This resurgence in coal mine employment, combined with the large-scale retirement of many older miners, stimulated active recruitment of new entrants to the industry and generated demands on the public vocational education system to provide preemployment training and orientation courses to help prepare students for mining careers.

The initial impetus for provision of vocational courses in coal mining appears to have come from local demands, rather than from any statewide initiative. Based on Letcher's survey, conducted in 1975, the first coal mining course offerings, in mine maintenance repair, were at vocational-technical schools in Morgantown in 1968 and in Mingo County in 1969.[3] One course in general mining practice was offered in Logan County beginning in 1970.[4] In the 1973-74 academic year, course offerings were still limited to nine courses in only six of the State's more than 30 mining counties, with a total enrollment of 243 students. Meanwhile, pressure mounted for a greater statewide initiative in coal mining training. As early as December 1972, the West Virginia Advisory Council on Vocational Education had included the following recommendation in its report:

> Several successful mining-related occupational training programs exist in the State. However, in view of the expected increase in the labor demand in this industry, greater emphasis at the State level should be given to expanding training capacity . . . Additionally, the State should provide centralized coordination among schools, labor, and industry to develop a strong, cooperative and responsive system for meeting the projected manpower demands.[5]

The "expected increase" in labor demand in the West Virginia coal mining industry did in fact materialize shortly after issuance of this report, but for reasons which could scarcely have been anticipated by the authors. The Arab oil embargo of 1973 and the subsequent escalation of oil prices by the Organization of Petroleum Exporting Countries caused coal prices to rise sharply as utilities and other major users bid up spot-market prices for available coal supplies. This price increase encouraged many marginal, high-cost mine operations to enter or reenter active production, thus increasing labor demand while depressing the industry's productivity averages. Thus, between 1973 and 1976, the number of active coal mines in the State rose from 932 to 1,167 and employment increased from 44,800 to 54,400. There was a particularly sharp rise in coal employment between 1974 and 1976, at an annual rate of about 11 percent, and competition for trained and experienced coal miners intensified.

Concurrently, the West Virginia legislature enacted a law requiring preemployment safety training of 80 hours for apprentice underground miners, and 40 hours for surface miners, effective March 1976. Although the Department of Mines had been given responsibility for this program, that agency clearly did

not have the capability of undertaking a large-scale training program of this type and therefore assigned primary responsibility for providing this training to the State's vocational education system.

Also during this period the Comprehensive Employment and Training Administration (CETA) established a program to train unemployed workers, primarily from disadvantaged backgrounds, in coal mining occupations. In West Virginia a single State agency, the Employment and Training Division of the Governor's Office of Economic and Community Development, is responsible for administering CETA projects statewide. In 1974, the coal industry, with its rapidly expanding employment and apparently bright long-term outlook, appeared to be a logical target for training of CETA enrollees. The State's vocational education system began providing training in coal mining skills to substantial numbers of CETA enrollees, under contractual arrangements with the Employment and Training Division.

The combined effect of these developments was a sharp expansion in the number and types of coal mining training programs offered by the State's vocational education system. From modest beginnings, various coal mining training courses became available in the vocational-technical or other secondary schools of nearly every coal mining county of West Virginia by the end of the 1976-76 school year. Total enrollments in these courses, in turn, mushroomed from only about 200 students in 1973-74 to a peak of more than 13,000 in 1976-77, including about 11,600 in the new-miner orientation courses. (See table 11.)

In addition to the mandatory miner-safety orientation courses, the State's vocational schools now offer about 6 courses that provide preparatory training for various mining occupations. These can be broadly grouped into mine maintenance courses and general mining courses. Included in the former category are three, 2-year (1,080-hour) courses for 11th- and 12th-grade students: Mine Electricity, Mine Machinery Repair, and Mine Maintenance. These courses also are available as 1-year programs, for full-time postsecondary students, and they have been adapted for use in adult training programs such as those provided under CETA. The "general mining" category consists of shorter courses designed to prepare either adults or high school seniors for the less-skilled, entry-level mining occupations, such as mine equipment operators or brattice men.

The most popular course in this category is "Mining, General," or "Mining I." Course lengths are 8 weeks (320 hours) for adults; 180 days (540 hours) for secondary schools. Some of the State's secondary schools also offer an 180-hour course,

Table 11

Enrollments in Coal Miner Training Programs of the West Virginia Vocational Education System, by Major Program Category

Fiscal Year Ending	Total	Regular Vocational Education	CETA	New-Miner Orientation
1974	243	243	- -	- -
1975	2,855	1,347	1,508	- -
1976	5,343	1,859	324	3,160
1977	13,052	421	1,127	11,604
1978	12,459	1,126	1,000	10,333
1979	9,287	745	528	8,014
1980	7,953	838	467	6,648

SOURCE: Based on statistical records of the Bureau of Vocational, Technical, and Adult Education, West Virginia Department of Education.

"Introduction to Mining," as a general orientation course for 10th-grade students interested in a mining career. As shown in table 12, enrollments in maintenance courses have accounted for a major share of total enrollments in miner occupational training since 1977.

In addition to the vocational courses already mentioned, programs leading to associate degrees in mining technology are offered by five public community colleges or other institutions of higher education. The oldest of these programs began at Bluefield State College and Fairmont State College in 1969. Other programs have been established in the West Virginia Institute of Technology (1972), Southern West Virginia Community College (1976), and Northern West Virginia Community College (1976). These are typically 2-year programs designed to qualify graduates for technical and supervisory jobs in the mining industry, subject to the required minimum periods of underground or surface mining experience.

The mining engineering technology curriculum of Fairmont State College, which has one of the oldest of these programs in the State, has a broad range of courses, from specific technical aspects of coal mining and basic science and mathematics, to subjects such as technical report writing, personnel problems, and safety supervision. Part-time students make up a large proportion of enrollments in these programs, as is evident from the disparity between recent enrollment levels and degrees (or certificates) awarded. As is the case with the vocational training programs, enrollments have recently declined, from about 1,600 in the 1978-79 school year to about 900 in 1979-80 (see table 13).

From the foregoing discussion it will be apparent that public vocational education for coal mining occupations has been conducted in West Virginia under four separate program categories, of which only one, "regular vocational education," falls within the exclusive administrative control of the State's vocational education agency, the Bureau of Vocational, Technical, and Adult Education. In the case of miner orientation training, responsibility has been shared with the State's Department of Mines, which is designated as the agency responsible for establishing training standards and certifying course graduates. In the case of the CETA program, the bureau serves as a "contractor" responsible for providing the training programs requested by the Employment and Training Division, which in turn is responsible for allocation of the CETA funds among various categories of training. Finally, the bureau has no direct involvement in the postsecondary degree programs at the State's

Table 12

Enrollments in West Virginia Miner Occupational Training Courses Under Vocational Education and CETA Programs, 1974-1980

Year Ending	Maintenance Courses			General Mining and Other Courses		
	Total	Voc. Ed.	CETA	Total	Voc. Ed.	CETA
	(Enrollments)					
1974	243	243	--	--	--	--
1975	954	514	440	1,155	387	768
1976	894	758	136	1,079	891	188
1977	1,430	886	544	1,108	525	583
1978	1,144	726	418	983	400	583
1979	814	545	269	461	202	259
1980	719	552	167	586	286	300

SOURCE: Bureau of Vocational, Technical, and Adult Education, West Virginia Department of Education.

Table 13

Enrollments and Graduates in Mining Technology Programs at West Virginia Public Community and Technical Colleges

Year Ending	Enrollments[a]	Graduations[b]
1974	NA	22
1975	NA	15
1976	NA	26
1977	NA	32
1978	888	97
1979	1,625	122
1980	912	119

SOURCE: Unpublished data, Board of Regents, West Virginia.

a. Data on enrollments not available prior to the 1977-78 school year. Enrollment data include part-time and full-time students.

b. Includes both 1-year certificates and 2-year associate degrees.

public community colleges, which are under the administrative control of the State's Board of Regents. The following sections examine the experience under each of these programs.

Miner Orientation Training Programs

The program of miner orientation training, initiated in response to the requirements of the West Virginia Miner Training, Education and Certification Act of 1974, is unique in several respects. First, it was the first legislative enactment of any State establishing a requirement for preemployment training for all persons entering coal mining. Second, the training provided (80 hours for underground miners and 40 hours for surface miners) is not "vocational education," in the normal usage of that term, but rather was designed to provide the basic knowledge and skills needed by all miners to enable them to function safely in a dangerous environment and to cope with accidents. In this sense, this orientation training is analogous to basic training provided to new military recruits prior to their assignment for more specialized training in a particular military occupational specialty. Finally, because this training was to become a legal condition for entry into coal mining employment, the State's vocational education system was required to provide access to this training to persons seeking jobs in the industry (including women and members of minority groups), and to assure that a sufficient pool of trained and certified applicants would be available to meet the industry's hiring needs when the requirement became operative in May 1976.

One problem confronting the planners of this new effort at the outset was the lack of reliable data on the West Virginia coal industry's requirements for new miners. (This handicap was, of course, not unique to this industry since, with limited exceptions, data on actual entries and separations of personnel from particular occupations or industries still are not routinely provided by existing Federal or State statistical programs.) To meet this need, the West Virginia Coal Association, whose members include most of the State's larger underground coal operators, conducted a survey of its member companies in 1975 to obtain employers' forecasts of their hiring needs in the next 5 years. Based on this survey, which covered companies accounting for 70 percent of the State's total coal output, the association projected a need for recruitment of 38,000 workers into the West Virginia coal industry--22,000 to fill new jobs and 16,000 to replace workers separating because of retirement and normal attrition.[6]

In retrospect, these projections appear to have fairly accurately reflected actual employment and hiring trends in the industry at about the time that the forecasts were made. Between 1974 and 1976, employment in the West Virginia bituminous coal mining industry had actually increased by 9,700 or at an average rate of about 4,800 new jobs per year, as compared with the average growth of 4,400 in new jobs per year projected in the industry survey. Moreover, based on an analysis of a 10-percent sample of Social Security records of workers with earnings in the industry, we have estimated that 14,900 workers entered the industry in West Virginia between the first quarter of 1973 and the first quarter of 1975 at a rate of about 7,500 per year--a figure that also corresponds closely to the projected average requirement of 7,600 per year between 1975 and 1980, based on the company survey.

The program which the State's vocational education agency, working with the Department of Mines, developed, based on the assumption that all such training would be provided exclusively in public schools, also was consistent with the projected hiring needs. Miner orientation courses were provided in vocational schools, secondary schools, or other facilities in some 20 counties, which accounted for all but a small fraction of the State's coal mine employment. Underground miner training classes began in March 1976, and surface miner training began later in the same year. In fiscal year 1977, the first full year of the program's operation, more than 500 classes were held throughout the State with a total enrollment of about 11,500. Despite this relatively large-scale effort, the demand for this training on the part of prospective applicants for coal mining jobs substantially exceeded the available openings, and considerable backlogs of applicants for training developed in many communities.

The large supply of applicants for coal mine training and jobs illustrated by this experience may appear surprising to outside observers whose image of coal mining is that of a dirty, dangerous, confining, and unpleasant type of work. However, coal mining is also among the highest paid of blue-collar occupations and, particularly in regions such as West Virginia, it offers earnings and fringe benefits far exceeding those provided by most other types of jobs for persons with similar educational backgrounds. The applicant supply was further enhanced by (1) extensive publicity in the local media concerning the prospective boom in coal employment, and (2) the new phenomenon of a significant trend toward employment of women in underground coal mining jobs--a trend that was furthered by several successful legal actions filed by women's and civil rights organizations against major coal operators, under Federal and State equal employment opportunity laws.

As shown in table 14, total enrollments in these miner orientation classes peaked in fiscal year 1977 and subsequently declined each succeeding year to an annual total of about 6,600 in fiscal year 1980. The decline was sharpest in the case of the 80-hour underground mining course, for which enrollments fell from nearly 10,900 in fiscal year 1977 to about 3,900 in 1980. Enrollments in the 40-hour surface mining course were however much more stable, peaking in fiscal year 1978, the first full year in which these courses were offered. The increasing interest of women in coal mining jobs in the State is illustrated by the steady growth in the proportion of women enrollees, from 3.9 percent in fiscal year 1976 to 8.6 percent in fiscal year 1980. In contrast, minority enrollments in these courses (mainly black) have averaged only about 3 percent during this period and have been confined chiefly to the underground mining courses (see table 15).

The sharp, overall decline in enrollments under this program can be attributed largely to negative feedback resulting from the poor placement experience of course graduates. As shown in table 16, placement rates of enrollees completing the underground mining course fell from 29 percent for those completing the course in fiscal year 1976 to less than 20 percent in fiscal years 1978 and 1979. Placement rates were slightly higher, but still clearly unsatisfactory, for persons completing the surface mining course. Based on data for the underground mining course graduates only, placement rates for women closely approximated the rates for male graduates. In the case of the small proportion of minority race members enrolled in these courses, the placement rate averaged only about 10 percent in fiscal year 1978 and fiscal year 1979, or only slightly more than half of the corresponding rates for white enrollees (see table 17).

This poor overall experience can be attributed to several factors. First, and, we believe, most important, was the slowdown in employment growth and subsequent decline in employment throughout the industry over this period. Thus, between 1975 and 1980, coal mining employment as reported by the West Virginia Department of Mines actually experienced a net reduction of 1,000 jobs, from 57,300 to 56,300, in contrast to the increase of 22,000 jobs originally projected by the West Virginia Coal Association. Some hiring was, of course, still required in the industry to replace workers separating for various reasons. However, experienced, unemployed coal miners, rather than new entrants, filled an increased proportion of these jobs.

Table 14

Total Enrollments and Female Enrollments in Public Miner Orientation Courses, FY 1976-80

Fiscal Year	Total	Underground Mining (80 hours)	Surface Mining (40 hours)
		Total Enrollees	
1976	3,160	3,160	- -
1977	11,604	10,887	717
1978	10,333	7,504	2,829
1979	8,014	4,722	3,292
1980	6,648	3,929	2,719
		Women Enrollees	
1976	123	123	- -
1977	535	531	4
1978	609	542	67
1979	640	479	161
1980	569	386	183
		Women as Percentage of Total Enrollees	
1976	3.9	3.9	- -
1977	4.6	4.9	0.6
1978	5.9	7.2	2.4
1979	8.0	10.1	4.9
1980	8.6	9.8	6.7

SOURCE: Bureau of Vocational, Technical, and Adult Education, West Virginia Department of Education.

Table 15

Minority Enrollments in West Virginia Miner Orientation Courses, Fiscal Years 1976-1980

Fiscal Year	Total		Underground		Surface	
	Number	% of Total Enrollees	Number	% of Total Enrollees	Number	% of Total Enrollees
1976	150	4.7%	150	4.7%	- -	- -
1977	478	4.1	476	4.4	2	0.3%
1978	349	3.4	343	4.6	6	0.2
1979	199	2.5	170	3.7	29	0.9
1980	166	2.5	131	3.3	35	1.3

SOURCE: Bureau of Vocational, Technical, and Adult Education, West Virginia Department of Education.

Table 16

Placement Rates in West Virginia Miner Orientation Program, Underground and Surface, Fiscal Years 1976-79

(Placement as a percentage of course completions)

Fiscal Year	Total	Underground	Surface
1976	29.2	29.2	- -
1977	24.0	23.7	28.2
1978	21.5	18.2	29.7
1979	21.2	19.5	23.5

SOURCE: Bureau of Vocational, Technical, and Adult Education, Summary Table, October 29, 1979.

Table 17

Placement Rates in West Virginia Underground Mining Orientation Program, By Sex and Race, Fiscal Years 1977-79

(Placements as a percentage of course completion)

Fiscal Year	Total, All Enrollees	Sex		Race	
		Male	Female	White	All Other
1977	23.7	23.5	26.5	23.6	24.3
1978	17.8	17.8	18.4	18.2	10.2
1979	19.3	19.6	16.3	19.6	9.9

SOURCE: Bureau of Vocational, Technical, and Adult Education Report ME 0002-A. (Placement rates vary slightly from those shown for underground courses in table 16, due to minor differences in report coverage.)

A second contributing factor was a decision of a number of the State's largest coal companies to conduct their own 80- and 40-hour orientation training, rather than to rely on the State's vocational education system. These companies apparently preferred to control the selection of their own personnel; they also were uncertain that the graduates of the State program would be adequate, quantitatively and qualitatively, to meet these companies' anticipated hiring needs. In the past 2 years, however, the employment downturn and the availability of a large pool of unemployed, experienced miners have caused these companies to discontinue their courses, except for the postemployment training required under the union contract. Nevertheless, the initial reliance of these larger companies on their own orientation training courses clearly added to the oversupply of workers who qualified for coal miner apprenticeship certificates during this period.

This poor placement record has been a cause of concern to vocational education officials and to industry spokesmen. In a statement issued in March 1977, after the program had been in effect for about a year, the West Virginia Coal Association cited at least two reasons for the poor record: a slower-than-expected rate of hiring in the industry, and an alleged lack of qualification of many of the trainees for coal mining jobs. "For a variety of reasons," the statement noted, "a significant number of the trainees completing the course are not ideally suited for employment." The association recommended that employers "prescreen" persons applying for the course for their hiring potential before those persons actually enrolled in the course--a procedure that was apparently adopted by a number of local school districts in the State, although it was officially discouraged at the State level.[8]

Finally, vocational education officials have suggested that the reported placement statistics may significantly understate the total number of training course graduates who entered coal mining jobs because placement data include only trainees who entered mining jobs within 8 weeks after completing the course, even though the certification is valid for a full year.[9] Unfortunately, the absence of detailed statistics on "nonresponse" rates in the 8-week followups and the absence of longer-term followup surveys for these or other students completing vocational education courses have precluded assessment of the possible understatement of placement rates.

Regular Vocational Education Courses

Enrollment trends in coal mining training courses offered by the State's vocational schools as part of their regular curricula, as summarized in table 18, closely parallel those of

Table 18

Enrollments in West Virginia Vocational Education Mining Courses, By Student Category, Fiscal Years 1974-80

School Year Ending	Total Enrollments[a]	Secondary	Post-secondary	Adult Preparatory[a]
1974	243	162	81	- -
1975	901	546	209	146
1976	1,649	672	228	749
1977	1,551	671	115	765
1978	1,091	789	93	209
1979	744	627	5	112
1980	840	603	- -	237

SOURCE: Bureau of Vocational, Technical, and Adult Education Report VE-0004.

a. Excludes miner orientation courses.

the miner orientation training program. Participation in these courses peaked in fiscal year 1976, when enrollments exceeded 1,600 exclusive of those in mining orientation courses. Enrollments declined by about half, to an average level of about 800 in fiscal years 1979 and 1980. This decline was concentrated in the postsecondary and adult preparatory course categories. At the secondary school level, the number of students in miner vocational courses has remained fairly stable since the 1975-76 school year, with an average annual enrollment of about 700.

Placement statistics for persons completing these courses are based on the number of trainees actually known to be available for employment, excluding those who continuing their education or who were not seeking work for other reasons, as well as trainees for whom data were not available. As shown in table 19, the placement rates for secondary-school graduates have dropped steadily, from 69 percent in the school year ending 1974 to 41 percent in 1979, the last year for which placement data are available. The placement rates for persons completing the adult preparatory courses, such as "Miner I," have declined even more rapidly, with the exception of the school year ending 1979, which is based on a small number of course completions.

The placement data by course category (table 20) indicate that graduates of the maintenance training courses, as well as graduates of the shorter courses in equipment operation, have shared in this decline.

In interpreting these placement rates, one should note that under existing reporting procedures, a placement in an unskilled, entry-level mining job is defined as training-related even though the trainee may have completed 2 years of specialized training in a specific mining occupation, such as mine machinery repair or mine electricity. This definition stems from prevailing practice in the industry, reinforced by union contract provisions and certification requirements in State mining laws, which provide that all newly hired miners, regardless of prior training, must enter at the bottom rung of the occupational ladder and must acquire specified underground mining experience and on-the-job training before being eligible for assignment to more skilled occupations. Thus, in West Virginia, 3 years of experience in underground mine electrical work or closely related work are required, in addition to other qualifications, before a worker can be a "certified" mine electrician. Moreover, under the UMWA contract, eligibility for assignment to mine electrican work in a helper or trainee status is subject to strict job-bidding procedures, with selection based primarily on seniority. Thus, although trainees who have completed a 1,000-hour vocational school program in

Table 19

Placement Experience in West Virginia Miner Vocational Education Programs, By Student Category, 1974, 1976-79

School Year Ending	Student Category	Course Completions	Available for Placement[a]	Employed in Coal Mining	
				Number	Percentage of Available
1974	Secondary	48	42	29	69.0
	Postsecondary	162	152	133	87.5
	TOTAL	210	194	162	83.5
1976	Secondary	200	185	101	54.6
	Postsecondary	377	277	208	75.1
	Adult prep.	560	504	365	72.4
	TOTAL	1,137	966	674	69.8
1977	Secondary	224	194	103	53.1
	Postsecondary	9	9	7	b
	Adult prep.	763	375	188	50.1
	TOTAL	996	578	298	51.6
1978	Secondary	235	162	73	45.1
	Postsecondary	29	21	4	b
	Adult prep.	160	90	33	36.7
	TOTAL	424	273	110	40.3
1979	Secondary	273	193	79	40.9
	Postsecondary	1	- -	- -	- -
	Adult prep.	65	62	44	71.0
	TOTAL	339	255	123	48.2

SOURCE: Bureau of Vocational, Technical, and Adult Education Report VE-001B.

a. Excludes students whose status is unknown, as well as those not available for placement because of continuing education or other reasons.

b. Percentage not statistically significant.

Table 20

Placement Rates in West Virginia Miner Vocational Education Program, By Course Category

(Placements as a percentage of available course graduates)

School Year Ending	Total	Maintenance Courses	General Mining and Other Courses
1974	83.5	83.7	- -
1976	69.8	63.9	73.1
1977	51.6	55.6	43.7
1978	40.3	47.2	25.9
1979	48.2	38.3	65.6[a]

SOURCE: Bureau of Vocational, Technical, and Adult Education, West Virginia Department of Education.

a. Relatively high placement rate due to report of 100 percent placement in one adult course.

mine electricity or mine maintenance may have already acquired much of the basic knowledge and skills needed for working in that occupation, they may still be required to spend considerable time in unskilled labor. Moreover, the trainees are not necessarily assured of an opportunity for assignment to the area of their vocational training even at a "helper" or "trainee" level.

These constraints obviously prompt questions about the cost effectiveness of publicly financed preemployment training for specialized mining skills, as compared with the provision of training (whether through inservice or school courses) only to persons who have prior mining experience and who are in a position to directly use the training in their jobs. In the course of our study, this question was posed to vocational education administrators at the State and local levels, and to industry and labor spokesmen. Several justifications for continuation of such occupational programs have been advanced:

1. Employers are likely to give hiring preference to applicants who have completed a mining vocational training course over applicants without such training. George Pudlo, training director of Consolidation Coal Company, the industry's largest employer, has stated, for example, that the graduates of West Virginia's maintenance training courses whom his company hired have proved to be among the best of his company's mechanics; Pudlo strongly supports this program. He and other industry representatives have noted, however, that preemployment training did not take the place of the more specific, intensive training offered by coal operators, a major portion of which consists of supervised on-the-job training under actual operating conditions.

2. A second justification for these training programs relates to the needs of smaller companies that are not in a position to conduct systematic, inhouse training to meet their skilled personnel needs. Although no systematic data on characteristics of companies hiring vocational school graduates were available, some of the local vocational center directors interviewed in the course of our study suggested that their graduates were more likely to be placed in these smaller companies than in the larger ones. The director of one of these centers that is located in a county containing mainly smaller, nonunion mining operations commented that these local companies directly assigned graduates of the school's mine maintenance course to the position of mine mechanics helper, rather than to less-skilled, entry-level jobs. Their strong support of the program was further illustrated by the fact that these local employers had contributed $75,000 for the construction of a mine facility at the vocational school.

Although generally supportive of their coal miner training programs, State vocational education officials have recognized the limitations of programs geared too narrowly to the needs of a specific industry, such as coal mining, in view of its past wide fluctuations and its uncertain short-term employment prospects. For this reason, the current curriculum of the mine maintenance (cluster) course, which accounted for nearly one-half of secondary-school enrollments in miner training programs in the 1979-80 school year, is being broadened. The course title has been changed to "Industrial Equipment Maintenance," and the training will be applicable to a wider range of heavy industrial equipment.

CETA Training

The CETA training program in mining skills is performed by the State's vocational education system under contract with the Employment and Training Division (the State agency responsible for allocation of CETA funds). Two courses, the General Miner Course (Miner I) and a course in mine machinery mechanics, have accounted for most of these CETA enrollments in the past 4 years. As shown in table 21, the placement trend for CETA enrollees completing these courses has closely paralleled that of regular vocational education.

The State's employment security offices, rather than the local schools, collect placement data on CETA trainees; the data include information on some trainees who obtained mining jobs even though they did not complete the courses. The placement rates proved very satisfactory in the initial 2 years of the program, fiscal years 1975 and 1976, but the rates declined rapidly to 44 percent in fiscal year 1978, 38 percent in fiscal year 1979, and 28 percent in fiscal year 1980. Because of the rise in coal miner unemployment and the resulting decline in placements, the Employment and Training Division decided to discontinue this training as of fiscal year 1981.

Mining Technology Courses

The West Virginia Board of Regents, which administers the State's public higher educational institutions, has maintained records of enrollments and graduations for the past several years (table 13), but began to compile systematic data on placement experience only in the 1978-79 school year. Enrollments in these courses, which include a large proportion of part-time students, apparently peaked in the 1978-79 school year and declined sharply the next year. Of the 122 graduates who received mining technology degrees in 1978-79, postgraduation

Table 21

Placement Experience in West Virginia
CETA Miner Training Programs, Fiscal Years 1975-80

Fiscal Year Ending	Completed Training	Placed[a] Number	Placed[a] Percentage
1975	901	700	77.7%
1976	257	248	96.5
1977	974	666	68.4
1978	915	444	48.5
1979	372	142	38.2
1980	244	69	28.3

SOURCE: Employment and Training Division, Governor's Office of Economic and Community Development, West Virginia.

a. Placements include some trainees who obtained jobs prior to completion of CETA course, thus accounting for high placement rate in fiscal year 1976.

status was unknown for 55 graduates, while 23 more were continuing their education. Of the remaining 45 graduates, 30, or two-thirds, reported employment in positions related to their training.

This very limited sample of placement experience for recent mine technology graduates is clearly an inadequate basis for evaluating the program's performance. There is, however, considerable collateral evidence that mining technology programs, too, have experienced problems in finding appropriate job opportunities for their graduates in the coal industry of West Virginia or in adjacent coal mining States. These difficulties are illustrated by a recent communication to us from a coordinator of mining training programs at Pennsylvania State University:

> Our main problem at present is the lack of a significant growth in the mining industry. Pennsylvania State University initiated Mining Technology long before it became popular to do so. In the meantime, approximately 40 other schools in the United States have started these programs, and have simply flooded the market with this type of graduate. If the industry were growing significantly each year, this would be no problem. However, the promise of the growth in the industry has simply not taken place to date. Thus a significant number of our graduates in the last two years have not found jobs in the mining industry. As a result, our enrollment has suffered and the potential of this type of graduate in the future is somewhat in doubt.[10]

Data Limitations

A recent brochure issued by the West Virginia Bureau of Vocational, Technical, and Adult Education proudly proclaims some of the overall accomplishments of the West Virginia vocational education system, which now enrolls more than 60 percent of the State's secondary school students:

- "Nearly everyone who completes a vocational program finds employment.
- People receive education for a career, not just a job, enabling them to be flexible in a changing economy.
- Vocational curriculum is planned around the needs of business, industry, and students."

In our review of the available data with respect to vocational education for mining skills, not all these claims could be verified equally well. The only statistical data currently available for this purpose are those based on the short-term followup surveys of student placements and administered for several years by the vocational education system and by CETA, and which have only recently been certified by the Board of Regents with respect to schools under its jurisdiction. These data suffer from several technical limitations:

- o Sizable "status unknown" rates in some program categories reduce the statistical reliability of the reported rates.
- o Variations in the followup period since initiation of these surveys limit the comparability of the data over a period of years.
- o Subjective definitions of "training-related" employment, either by respondent or by the person administering the survey, limit usefulness of the data.

Systematic evaluation of the efffectiveness of miner vocational programs in relation to stated objectives was particularly stymied by the absence of any of the following types of data:

- o Information on the characteristics of jobs obtained by course graduates (earnings, occupation, size of firm) and on placement rates, by characteristics of trainees.
- o Longer-term followup data to permit systematic comparisons of advancement rates, and mobility, of trainees as compared to other entrants into coal mining jobs. Such surveys have been repeatedly recommended by the State Advisory Council on Vocational Education but have never been executed apparently because of the difficulty of executing such surveys through the available administrative machinery.[11]
- o Lack of any systematic followup surveys of employer satisfaction with the training received by vocational school graduates whom they employ.

These and other limitations are, of course, not unique to data on miner vocational education or to the State of West Virginia, but are still generally applicable to the system as a whole, as noted by Arthur Lee, in his paper on the Vocational Education Data Base, prepared for the National Institute of Education's Vocational Education Study.[12]

Notes

1. West Virginia Coal Association, Coal: The 500 Year Career, 1976.

2. Eighth Annual Report of the West Virginia Advisory Council in Vocational Education, FY 1977, p. 14.

3. Duane A. Letcher, Identification and Structural Analysis of Instructional Programs for the Underground Coal Miner in West Virginia, Mining Extension Service, West Virginia University, July 1975, pp. 88, 90.

4. Based on interview with Gary White, Chairman, Mining Training Advisory Committee.

5. West Virginia Advisory Council on Vocational Education, Third Annual Evaluation Report, 1972, pp. 30-31.

6. From statement by West Virginia Coal Association, dated March 18, 1977, "An Assessment of Vocational Education Needs in the Coal Industry," p. 2.

7. For a detailed analysis of factors affecting labor supply in the coal mining industry, see Harold Wool and John B. Ostbo, The Labor Outlook for the Bituminous Coal Mining Industry, Palo Alto, California: Electric Power Research Institute, August 1980 (EA-1477), chapter 4.

8. West Virginia Coal Association, op. cit., p. 3.

9. Interview with Harold W. Sullivan, Assistant Director for Administration and Planning, Bureau of Vocational, Technical, and Adult Education, January 15, 1981.

10. Communication from Jan M. Matusky, Mining Center Coordinator, The Pennsylvania State University, Fayette Campus, February 19, 1980.

11. West Virginia State Advisory Council on Vocational Education, Tenth Annual Evaluation Report, Fiscal Year 1979, p. 25.

12. Arthur M. Lee, "The Vocational Education Data Base," in The Planning Papers for the Vocational Education Study, N.I.E, Vocational Education Study, Publication No. 1, pp. 73-100.

Chapter 4

Implications for Vocational Education Planning

Despite the limitations of the available statistical indicators, the experience of the West Virginia vocational education system with training for coal mining occupations provides a classic illustration of the "cobweb" effect--that is, the overresponse of educational institutions to the perceived demand for skilled personnel in a specific industry or occupation. The resurgence of coal industry employment at the beginning of the 1970's, combined with the demands generated by the new mine safety legislation, generated a quick response by the educational system. Assisted by an infusion of local, State, and Federal funds, a new training infrastructure to meet the needs of this key industry was created within a few years. High placement rates of the first vocational education graduates and extensive publicity about the glowing career prospects in this revitalized industry contributed to the "boom" psychology, as illustrated by the large backlog of applicants for the short miner orientation training course. Yet, almost as suddenly, this training boom was followed by a training "bust," as evidenced by plummeting placement rates, sharply reduced enrollments, and the complete halt of CETA funding for coal miner training courses.

Although comprehensive data on costs per trainee for mine vocational education courses are not available, it will be evident that the cumulative costs of excessive training, in relation to industry's demand for course graduates, have been sizable. Probably equally significant are the "opportunity costs" to the trainees, who devoted periods of time ranging from as little as a week to as much as 2 years to specialized training for mining jobs that did not materialize.

Our review of the record and discussions with the State's vocational education officials demonstrate that there is no single convenient scapegoat for this poor recent performance. From the perspective of the State's vocational education and CETA planners, the most obvious causal factor was the failure of the West Virginia coal mining industry to live up to its own optimistic employment and hiring expectations. Other observers however, have criticized the vocational education system for failing to cut back its miner training programs when it became apparent, for example, that placement rates in some courses such as miner orientation training were disappointingly low.

From the standpoint of vocational education planners, this experience (1) highlights some of the limitations of the labor market data available at the State and local levels, and (2)

raises the broader issue of the extent to which the system should attempt to target its training to meet the specific needs of a particular industry. These points are discussed in the next section.

Labor Market Data

The initiation of miner safety orientation training courses on a statewide basis in early 1976 illustrates the reliance of vocational education planners on detailed labor market data, including estimates of current and future hiring needs by occupation. Specifically, planners needed information on the number of new, inexperienced miners that the State's underground and surface mining industries would be hiring each year over the next several years. In the absence of data on current or projected hiring of new coal miners from any government agency in the State, planners relied on the results of a special survey conducted by the West Virginia Coal Association, in which companies were asked to project their requirements for the next 5 years. This survey, as noted in chapter 3, provided a realistic picture of the industry's current, or recent, hiring requirements, but proved quite unrealistic as a projection of future needs. This experience is in fact, fairly typical of such projections; hence, manpower analysts generally discount the employer survey as a useful means of forecasting manpower requirements, except for short periods of a few months ahead.[1]

Unfortunately, the longer-term forecasting record for the mining industry, based on alternative approaches, has not proved any more encouraging. We examined two projections of coal industry employment for West Virginia issued by the West Virginia Department of Employment Security in the past decade. The first, published in February 1972, forecast that the State's coal output in 1980 would range between 210 million and 310 million tons and that employment would range from 60,000 to 86,000 in 1980.[2] The second projection, released in March 1977, forecast an employment level of about 65,000 in the State's mining industry in 1980, based on our interpolation between the 1974 base year and 1985.[3] Our own recent estimates indicate very little net change in coal mining employment for the Appalachian region, including West Virginia, between 1977 and 1985.[4] It is much too soon to assess whether our forecast will prove any more reliable than the others we have cited.

The generally poor record of recent employment forecasts for the coal industry can be attributed in part to the wide fluctuation in labor productivity, a variable which, in earlier periods, could have been forecast with some assurance based on

longer-term growth trends. The poor record illustrates a more fundamental problem in using available manpower projections for vocational education planning. The "track record" of such projections for specific occupations and industries has been poor, nationally; it has been somewhat more satisfactory for major occupations or industry groups. The further disaggregation of detailed occupational employment projections by State or area, under procedures now recommended by the Bureau of Labor Statistics, inevitably increases the error rate in these projections. Yet agencies like the State Occupational Information Committee devote a considerable portion of their current effort to compiling these data.

We believe this effort might be more productively expanded in development of current data on occupational turnover, including estimates of new entries to, and separations from, various occupations and industries. If data like these had been available in West Virginia, they could have provided a better base for estimating future coal miner training requirements than did data based on projections of requirements.

Training Supply

Under current West Virginia vocational education procedures, local administrators are responsible for coordinating their own training plans with other sources of training in the community, including community colleges, private schools, and industry. We are not in a position to assess the extent to which this coordination takes place or the extent to which the coordination is actually reflected in the overall vocational education plan. In the area of coal mining training, a special advisory committee, including training officials of major coal companies, provides one means of obtaining this information at the State level. Vocational education planners apparently made little or no allowance for the fact that a number of major companies were already providing miner orientation training to their own applicants for mining jobs, thus contributing to the oversupply of these apprentice-trainees and reducing the placement opportunities for persons completing the vocational education courses.

The second major limitation of the existing data base for vocational education planning, therefore, is a lack of comprehensive data on the number of persons completing training for entry into various occupations, including those trained by private industry as well as in the educational system. Based on our recent experience in surveying industry training programs, these data are difficult and costly to collect, and may not be reliable.

The limitations of data on both demand and supply of trained personnel are not likely to be remedied in the near future, particularly under current fiscal constraints. As a result, the most useful "market data" available to vocational educators may be the feedback based on their own placement reports. The situation highlights the need, however, to increase the reliability and scope of the reporting system, as was discussed at the end of chapter 3.

Broadening the Scope of Vocational Training

The boom-and-bust experience of the coal industry--plus our inability to forecast these trends--provides a strong case for avoiding narrow, industry-specific criteria in development of vocational education curricula and programs. With considerable foresight, the State's Advisory Council on Vocational Education, when it recommended an expansion of mining-related programs in 1972, also emphasized the need for a flexible training approach:

> A valid mining-related occupational training program should take into consideration a flexible training program designed to provide the worker with basic skills that may be applicable to other industries besides mining. If a major mining slump materializes, these workers will have the opportunity to shift to other maintenance positions not wholly unrelated to the mining industry.[5]

It is noteworthy that the State's vocational education planners, nearly 10 years later, are moving precisely in this direction as they redesign their maintenance training program.

Notes

1. Roger H. Bezdek, Long-Range Forecasting of Manpower Requirements, I.E.E.E. Manpower Monograph, New York, 1974, p. 2-2.

2. West Virginia Department of Employment Security, Coal Outlook to 1980, RS Series No. 123, February 1972, p. 8.

3. West Virginia Department of Employment Security, Projections to 1985, Industry and Occupation, March 1977, Table 1.

4. Harold Wool and John B. Ostbo, The Labor Outlook for the Bituminous Coal Mining Industry, Palo Alto, California: Electric Power Research Institute (EA-1477) August 1980, Chapter 4.

5. West Virginia Advisory Council on Vocational Education, Third Annual Evaluation Report, 1972, p. 31.

THE CETA/VOCATIONAL EDUCATION WORKING RELATIONSHIP: A STATUS REPORT ON THE PERCEPTIONS OF CETA AND VOCATIONAL EDUCATION ADMINISTRATORS

by

The United States
Conference of Mayors

THE CETA/VOCATIONAL EDUCATION WORKING RELATIONSHIP: A STATUS REPORT ON THE PERCEPTIONS OF CETA AND VOCATIONAL EDUCATION ADMINISTRATORS

Section 1

Introduction

The CETA Amendments of 1978 carry forward the statement of purpose contained in the original act: the provision of job training and employment opportunities for economically disadvantaged, unemployed, or underemployed persons. In addition, the amendments expand upon this purpose, stressing the importance of coordinated service delivery:

> "It is further the purpose of this Act to provide for the maximum feasible coordination of plans, programs, and activities under this Act with economic development, community development, and related activities, such as vocational education, vocational rehabilitation, public assistance, self-employment training, and social service programs."

This expanded CETA purpose introduces the coordination requirements that appear throughout the act. Coordination with vocational education is prominent among these requirements.

Title V of the 1978 act describes the National Commission for Employment Policy. The Commission examines broad issues of development, coordination, and administration of employment and training programs, and advises the President and the Congress on national employment and training issues. This Commission serves as the CETA counterpart to the National Advisory Council on Vocational Education.

One of the 10 designated functions of the Commission is to

> "identify, after consultation with the National Advisory Council on Vocational Education, the employment and training and vocational education needs of the Nation and assess the extent to which employment and training, vocational education, vocational rehabilitation, and other programs assisted under this and related Acts represent a consistent, integrated, and coordinated approach to meeting such needs."

In carrying out this function, and in anticipation of the fiscal year (FY) 1982 reauthorization of both the Comprehensive Employment and Training Act and the Vocational Education Act,

the Commission asked the U.S. Conference of Mayors to assemble information on the current status of CETA and vocational education coordination across the country. The results of that information collection effort, contained in this report, indicate that public vocational education programs have played a major role in the provision of skill training for CETA clients, and that CETA administrators consider the quality of the training provided to be relatively high. While CETA administrators held a generally positive view of the CETA-vocational education relationship, the view held by vocational education administrators was more positive in many respects. Almost all vocational educators contacted said that they would like an expanded working relationship with CETA. With regard to future CETA and vocational education legislation, the two groups of administrators called for the alignment of CETA and vocational education funding cycles to eliminate the problems associated with the current funding cycle mismatch, for increased flexibility in developing, operating, and funding joint programs, for simplification of administrative requirements associated with joint programming, and for continued efforts to eliminate duplication of services and to increase sharing of resources. CETA administrators believed that, for CETA and vocational education coordination to be improved, coordination activities must be mandated in both pieces of legislation.

Objectives

The overall objective of this effort was to assess the status of CETA and vocational education coordination, based on the perceptions of the CETA and vocational education administrators who have been engaged in collaborative working relationships. Because publicly funded vocational education programs represent the major sources of occupational training in most communities across the country, such collaborative relationships can be expected to exist within almost all CETA prime sponsor jurisdictions.

Within this overall objective, specific objectives were the analyses of both CETA and vocational administrators' perceptions to determine the following:

1. How the CETA Amendments of 1978 have affected the coordination of CETA and vocational education planning and operations;

2. To what extent services other than skill training are provided to CETA clients by vocational education programs;

3. To what extent CETA funds other than vocational education set-asides are used to procure vocational education services from the public school system;

4. How performance of vocational education programs compares to performance of other service deliverers, in terms of compliance and participant outcomes; and

5. What requirements and mechanisms for coordination should be included in the reauthorized versions of both the Comprehensive Employment and Training Act and the Vocational Educational Act.

Approach

Information needed to meet the specific objectives of this effort was obtained through individual telephone interviews with selected CETA and vocational education administrators. A 25-percent stratified random sample of CETA prime sponsors was drawn. The current universe of 481 prime sponsors was arrayed by the 10 Department of Labor regions, and by State within each region. Within each State, the prime sponsors were arrayed by type--city, county, consortium, balance of State, and other--and were drawn on a random basis in proportion to their presence in each State. (The "other" category consisted of two Concentrated Employment Program agencies.)

The 120 prime sponsors selected were distributed, by region and type, as follows.

DEPARTMENT OF LABOR REGION:	I	II	III	IV	V	VI	VII	VIII	IX	X
PRIME SPONSOR TYPE:										
City.....	1	5	2	2	4	1	1	-	4	1
County.....	1	8	7	8	12	3	1	3	6	2
Consortium.....	2	2	3	6	8	6	2	1	1	1
Balance of State..	2	1	1	2	1	1	1	2	2	1
Other.....	-	-	-	-	1	-	-	1	-	-

For each selected prime sponsor, a telephone contact was made during the month of May 1981 with the CETA director or other administrator having direct responsibility for implementing and maintaining the working relationship with the vocational education program(s) in the prime sponsor jurisdiction. In this telephone contact, specific information was obtained to address each of the five specific objectives listed above.

Also obtained was the name of the vocational education administrator with whom the CETA administrator cooperated most closely on program planning or operation. These administrators were then contacted by telephone to obtain their perceptions of the CETA and vocational education relationship. Most of the specific information items sought from CETA administrators was also sought from the vocational educators. Contacts were made with administrators associated with local school systems, community colleges, skill centers, vocational-technical institutes and colleges, State departments of education, and other agencies (e.g., BOCES in New York State). Types of agencies and institutions identified by types of prime sponsors are illustrated as follows:

AGENCY/INSTITUTION TYPE:	School District	Commun. College	Skill Center	Voc./Tech. School	State Dept.	Other
PRIME SPONSOR TYPE:						
City.....	10	2	2	3	4	-
County.....	10	10	2	15	5	5
Consortium.....	9	5	2	5	3	1
Balance of State..	-	-	-	-	15	-
Other.....	-	-	-	-	2	-

Although 120 prime sponsors were contacted and asked to identify vocational administrators, only 110 of these administrators were contacted. In several cases, the same administrator was identified by more than one prime sponsor. In other cases, the vocational administrators could not be located or could not provide information requested prior to the end of the information collection phase of the study.

Organization of Report

Section 2 of this report analyzes prime sponsor perceptions of the CETA-vocational education working relationship, and prime sponsor recommendations for changes in CETA and vocational education legislation to improve coordination. Section 3 contains the analysis of vocational educator perceptions of the working relationship and their recommendations for legislative changes to improve coordination. Section 4 compares the perceptions of the CETA administrators and the vocational administrators, summarizes the legislative recommendations common to both groups, and describes the overall perceptions of both groups in regard to the CETA-vocational education relationship.

Appendix A summarizes counts of prime sponsors providing information for the study; appendix B summarizes counts of vocational educators who provided information. The counts contained in these appendixes were the bases for the analyses contained in sections 2, 3, and 4. It should be noted that the percentages reported in the analyses of perceptions contained in sections 2, 3, and 4 are based on counts of the CETA and vocational administrators who provided information for each individual information item; these percentages do not use a base of 120 prime sponsors for each item in section 2 or a base of 110 vocational educators for each item in section 3. In most cases there are minor variations from one item to another in the number of CETA or vocational administrators providing information.

Section 2

Prime Sponsors' Perceptions of the CETA Vocational Education Relationship

Working Relationship Following the CETA Amendments of 1978

Perceptions of increased planning activity and increased use of vocational education programs in service delivery were sought as an indication of the effect of the 1978 CETA amendments on CETA-vocational education working relationships across the country. Views of prime sponsor staff were sought on three indicators following the implementation of the 1978 amendments:

1. The involvement of vocational educators in CETA planning activities,

2. The role of prime sponsor staff in vocational education planning activity, and

3. The level of use of vocational education programs by prime sponsors.

More than half (56 percent) of the CETA prime sponsors contacted said that since the amendments went into effect, there has been greater involvement of vocational educators in their CETA planning activities. In most cases, this increased activity took the form of increased involvement of vocational educators in Prime Sponsor Planning Council activity. Some commented that the increased activity would have come about regardless of the 1978 amendments; they believed that it would have occurred with the passage of time, as CETA and vocational education staff gained experience in working together.

Almost one out of four persons contacted offered a positive comment concerning their relationship with vocational educators, or noted that, while the involvement of vocational educators had not increased for them, it had always been satisfactory and did not need to increase. Only one negative comment concerning vocational education involvement in CETA planning was recorded.

The same number of prime sponsors who reported increased vocational education involvement in their planning also reported that their involvement in vocational education planning had increased since the amendments went into effect. It is not surprising to find that as contacts between CETA and vocational education staff increase in the context of CETA planning, those same contacts would result in a more active role for CETA staff on vocational education advisory councils and in other planning mechanisms.

With regard to use of public vocational education programs for delivery of services to CETA clients, 62 percent of the prime sponsors contacted said that an increase had been experienced since the 1978 amendments became effective. All but two of the remaining prime sponsors reported that their use of public vocational education had remained the same. Again, those increasing their use of vocational education programs could not always credit the passage of the amendments for the increase; in some cases it was due simply to the availability of more space for CETA clients in vocational programs. Nevertheless, there has been increased or stable use of vocational programs by 98 percent of the CETA prime sponsors contacted.

Role of Vocational Education in CETA Service Delivery

Prime sponsors contacted were asked for information on the extent to which public vocational education programs have been relied upon to provide skill training and other services to CETA clients, and the extent to which CETA training funds, specifically title II funds, have been provided to vocational education institutions. Prime sponsors were asked to assess the following:

- How public vocational education programs compared with other service deliverers in terms of the amount of money provided by prime sponsors to purchase skill training services,

- Whether CETA title II funds in addition to the title II, section 204, vocational education set-aside funds were being used to purchase services from vocational education institutions,

- What percentage of title II funds other than the section 204 funds were used to purchase services from vocational education,

- Whether services other than skill training were being purchased from vocational education,

- What percentage of title II funds for vocational education were used to purchase services other than skill training, and

- What percentage of title II funds for vocational education were used to pay training stipends and allowances for CETA clients.

Over half (57 percent) of the CETA prime sponsors contacted said that public vocational education programs received more CETA funds for skill training than did the other skill training providers in their areas. A few commented that this may have been due to the higher cost of the public vocational education programs. These comments were offset, however, by those indicating that public vocational education was less expensive than alternative skill trainers. Several comments indicated that public vocational programs received almost all title II training funds.

Another 17 percent of the prime sponsors said that public vocational programs were funded at the same level as other service deliverers in their areas. This means that three out of four prime sponsors are funding vocational education at a level that is at least the same as, and usually higher than, the level of other skill trainers such as community-based organizations and private schools.

Only a few of the prime sponsors contacted were not using title II funds in addition to their section 204 vocational education funds to purchase services from public vocational institutions. Ninety-two percent of the prime sponsors were using additional title II funds for public vocational education services. A few spent 5 percent or less of these funds on vocational education; a few spent more than 75 percent of their title II funds. The prime sponsors' estimates indicate that an average of 27 percent of title II funds beyond section 204 funds were provided to public vocational education.

While skill training is the primary service purchased from vocational education programs, almost half (47 percent) of the prime sponsors contacted said that additional supportive services were also being purchased for CETA clients through vocational education programs. Services most often described were these:

- Assessment/testing,
- Counseling for various job-related purposes,
- General educational development,
- Basic education and skill development,
- Remedial education,
- Work experience activities,
- Job development and placement,
- Language training for persons whose English was limited, and
- Career planning.

Prime sponsors were asked to estimate the percentage of all title II funds provided to vocational education that were used to purchase these services. As might be expected, estimates varied widely; the average expenditure reported for this purpose was 12.5 percent.

Because training stipends and allowances for CETA clients enrolled in vocational training represent a major investment for most prime sponsors, persons contacted were asked to take into consideration all title II funds provided to public vocational education, and to estimate the percentage of those funds used to pay stipends for CETA clients. One hundred of the prime sponsors contacted provided estimates; these estimates ranged from very small percentages to very high ones in cases in which prime sponsors were spending almost all of their title II vocational education funds for client stipends and allowances. On the average, however, prime sponsors spent about 43 percent of these funds for stipends and allowances. As a group, city prime sponsors spent the most (48 percent) for this purpose; county, balance-of-State, and consortium sponsors spent 41, 42, and 43 percent, respectively.

Assessment of Vocational Education Performance

Choice of service deliverers for CETA clients should be based in large measure on prime sponsor perceptions of the ability of service deliverers to meet performance standards. To improve understanding of how public vocational education is viewed in terms of performance, prime sponsors were asked to rate vocational education programs in comparison with other service deliverers they had used. Ratings were requested on five dimensions of performance:

1. Quality of skill training,
2. Quality of other services provided,
3. Compliance with contracts or agreements,
4. Program completion rates for CETA clients, and
5. Job placement rates for CETA clients following training.

Somewhat less than half of the prime sponsors contacted (48 percent) rated public vocational education better than other service deliverers in terms of quality of skill training. Most of the rest (43 percent) said that vocational education programs were the same as other service deliverers in the quality of skill training.

Fewer prime sponsors felt that vocational education was better than other service deliverers in terms of the quality of other, nontraining, services. Thirty-five percent of the prime sponsors using vocational education institutions to provide these services indicated that these institutions performed better than other service deliverers. Almost half the prime sponsors (48 percent) felt that vocational education was about the same as other service deliverers in regard to other types of services. Seventeen percent of the prime sponsors gave vocational education a low rating in this area.

In terms of compliance with contracts, 42 percent of the prime sponsors said that vocational education was better than other service deliverers. Exactly half the prime sponsors felt that vocational education was the same as others on contract compliance.

When asked about program completion rates for CETA clients and job placement rates following training, the majority of prime sponsors indicated again that vocational education performed at least as well as other service deliverers, but some lower ratings were given. In terms of program completions, 38 percent of the prime sponsors said vocational education was better than others; another 44 percent said it was the same, while 18 percent said it was worse. In terms of job placement after training, 32 percent of the primes said vocational education was better than other service deliverers; another 45 percent said that it was about the same; 23 percent--less than one out of four--felt that vocational education was worse than other service deliverers on placement following training.

To shed additional light on the placement situation, prime sponsors were asked whether they cooperated with vocational educators in job development and placement. A little less than half the prime sponsors contacted (47.5 percent) were working with vocational educators to place CETA clients. In the remaining cases, job development and placement were the sole responsibility of the prime sponsor, the vocational education program, or another agency.

Mismatch of Funding Cycles

Because programs operated under CETA are funded on a Federal Government fiscal-year basis while public vocational education programs are forward-funded on a school-year basis, serious planning and coordination problems have been noted in reports on CETA and vocational education. To assess both the severity and effect of this mismatch, prime sponsors were asked whether the problem was serious enough to actually discourage their use of vocational education programs in public education systems.

Ninety-one percent of the prime sponsors contacted stated that their problems with the mismatch of funding cycles did not discourage use of public vocational programs. Some said that good administrators could easily overcome the problems, or that the problems affected vocational educators much more than prime sponsors. Many stated, however, that although mismatch problems did discourage them from using vocational education programs, the problems were serious and deserved attention. In general, consortium and balance-of-State prime sponsors were more discouraged by the mismatch of funding cycles than were city and county primes.

Public School Support of CETA Clients

Information was sought from prime sponsors on ways in which the public school systems in their areas were investing in the CETA clients who were sent to them for skill training and other services. Both financial and nonfinancial indicators of support for CETA clients were sought. Prime sponsors asked for the following information:

- Were school system funds being combined with CETA funds to provide additional services for CETA clients?
- Had school systems with which they worked been awarding academic credit to CETA clients enrolled in vocational education programs?
- What percentage of all clients enrolled in vocational education during the past year received academic credit for their vocational training?

Slightly more than half the prime sponsors responding to these inquiries (51 percent) said that, to their knowledge, public school funds were being combined with CETA funds to serve CETA clients. In many instances, CETA clients are exposed to all the services available to regular vocational students. In others, the school systems provide all instructional services, and CETA funds are used only for books and supplies.

Almost three out of four prime sponsors (72 percent) said that the school systems with which they worked were awarding academic credit to CETA clients in vocational programs. Most prime sponsors provided estimates of the percentage of their clients that received academic credit from vocational programs during the past year. These ranged from some very low percentages to very high, 100 percent in many cases. Overall, prime sponsors estimated that about half (49 percent) of their clients in vocational education programs received academic credit. Many prime sponsors noted that credit was available to all clients who successfully completed their vocational courses or programs. Other prime sponsors indicated that certificates of completion were awarded to clients in place of credit hours for special CETA courses or programs that were not operated as part of the regular curriculum at the vocational institutions involved.

Assessment of Assistance Available from Other Organizations

Because the movement of clients from training programs to employment in the private sector is a major goal of all CETA prime sponsors, and because all prime sponsors are called upon

to use and to coordinate all available community resources to accomplish this goal, information was sought from prime sponsors on the value of the job development and placement assistance that they had been receiving from certain other organizations in their areas.

Inquiries were made regarding the activities of these groups:

- o The Private Industry Councils (PIC's),
- o The Employment Service (ES) offices,
- o Organized labor groups.

Prime sponsors were asked to rate the effectiveness of their Private Industry Councils in developing private sector job opportunities for CETA clients and vocational education students during the past year. Most prime sponsors (44 percent) said that their PIC's were effective in the development of private sector jobs. Another 16 percent of the primes rated their PIC's "very effective" in this regard. However, the remaining prime sponsors (40 percent) said that their PIC's had been ineffective in developing jobs. Many of the prime sponsor comments concerning the PIC's were quite negative. However, most comments indicated that ineffectiveness was attributable to the fact that the PIC's had concentrated on activities other than job development. Many prime sponsors said that their PIC's were now moving in this area, that they were improving, and that they had good potential.

Prime sponsors were asked to rate the effectiveness of their area Employment Service offices in helping to match CETA clients and vocational education students with job opportunities in the private sector. Of the prime sponsors responding, 38.5 percent said that their ES offices had been effective; another 9 percent gave the Employment Service a rating of "very effective" in helping to match clients and jobs. The majority of the prime sponsors contacted (over 52 percent), however, rated the Employment Service as ineffective. Most of the comments offered by prime sponsors in regard to their Employment Service offices cited problems or limitations, or indicated that the Employment Service was simply not being used. A number of prime sponsors offered more positive comments, explaining that the poor economy in their areas had limited the effectiveness of the Employment Service offices, and that the Employment Service had been cooperative and had worked well with them.

Prime sponsors were asked to rate the level of involvement of organized labor in their efforts to coordinate CETA, vocational education, and job opportunities in their communities. Almost 41 percent said that organized labor in their areas had been active, with representatives serving in many cases on Prime Sponsor Planning Councils and working on additional projects. Another 5 percent of the primes considered organized labor's involvement to be "very active." For the majority of the prime sponsors, the involvement of labor in coordination efforts was given a low rating: More than 54 percent of the primes considered labor to be inactive in this regard. Many commented that labor's involvement should go beyond minimal participation on CETA planning councils--that labor should do more. Others attributed the inactivity to lack of labor presence in their areas and lack of opportunities for labor to become involved. Many of the prime sponsor comments were positive, indicating that relationships with unions had not been bad or were improving.

Legislative Changes to Improve Coordination

The prime sponsors contacted were invited to suggest changes in the CETA-vocational education relationship that should be made in the reauthorized versions of both the Comprehensive Employment and Training Act and the Vocational Education Act. Prime sponsor staff members were invited to draw upon their experience in recommending changes to improve the future coordination of CETA and vocational education. About one-third of the primes responded to this invitation; most of these recommended that CETA and vocational education coordination is to be maintained and improved, coordination activities must be mandated in both pieces of legislation.

Because CETA now stresses coordination, this recommendation applies chiefly to the Vocational Education Act. Prime sponsors believe that the vocational education legislation should contain the "teeth" needed to ensure that coordination will occur; many stated that the legislation should require a role for prime sponsor representatives in vocational education planning mechanisms. Clearly, the two pieces of legislation must contain corresponding language in regard to coordination responsibilities.

In addition to this general call for stronger coordination language, the following recommendations were shared by many of the prime sponsors which responded:

- Steps should be taken to minimize the problems created by the mismatch of CETA and vocational education funding cycles. A provision for forward-funding of CETA training programs would be of great value.

- The 6-percent set-aside of funds for vocational education, currently managed by the governors' offices and State education departments, should be provided directly to prime sponsors, to eliminate confusion and administrative costs.

- If the set-aside of CETA funds for vocational education continues to be administered at the State level, the administration of these funds should be simplified to the extent possible, and the roles of State and local vocational education personnel involved in the administration of the funds should be clarified.

- The vocational education legislation should encourage greater flexibility in program planning, design, and operation at the local level. Vocational educators should be encouraged and helped to develop alternatives to traditional vocational education approaches, to better meet the needs of CETA clients. Operating open-entry, open-exit programs, and short-term programs on a 12-month basis is suggested.

- Steps should be taken to eliminate the duplication of services that still exists. Both pieces of legislation should encourage greater exchange of information and sharing of facilities and services.

- The vocational education legislation should encourage the matching of CETA funds with vocational education funds, to provide additional services, stipends, and the like. Incentives to encourage such matching should be considered.

- The CETA legislation should ease the restrictions that have been placed on prime sponsors in regard to administration and funding of programs.

- The CETA legislation should establish uniform eligibility for participation across all programs.

A few prime sponsors called for the consolidation of CETA and vocational education or for the combining of Federal funding and service delivery systems. These recommendations were offset by other prime sponsor recommendations that CETA and vocational education be kept separate, and that all training funds be provided to either CETA or vocational education, to eliminate division of responsibility.

Summary of Prime Sponsor Information

An item-by-item summary of the information provided by CETA prime sponsors contacted is contained in appendix A to this report. The matrix in the appendix contains the counts of prime sponsors responding to each information item listed.

Section 3

Vocational Educators' Perceptions of the CETA Vocational Education Relationship

Working Relationship Following The CETA Amendments of 1978

Vocational educators' perceptions of increased CETA-vocational education planning activity and program activity were sought as an indication of the effect of the 1978 CETA amendments on CETA-vocational education working relationships. Their perceptions were sought on three indicators, following the implementation of the 1978 amendments:

- The involvement of vocational educators in CETA planning activities,
- The role of prime sponsor staff in vocational education planning activity, and
- The level of use of vocational education programs by prime sponsors.

More than 81 percent of the vocational education administrators contacted said that since the amendments went into effect, vocational educators have been much more involved in CETA planning activities. Almost all the remaining vocational educators indicated that while their involvement in CETA planning had not increased, neither had it decreased over the past couple of years.

More than 69 percent of the vocational educators said that since the CETA amendments went into effect, CETA staff members have played a more active role in their vocational education planning activities. Here again, almost all the remaining vocational educators contacted said that neither an increase nor a decrease in CETA involvement had been observed.

In regard to the level of involvement of public vocational education in the delivery of services to CETA clients, three out of four vocational educators stated that an increase had been experienced since the CETA amendments were initiated.

Another 15 percent said that their level of involvement had remained the same over the past years. This means that, for nine out 10 of the vocational educators contacted, service to CETA prime sponsors has been stable or increasing since the introduction of the amendments.

Role of Vocational Education in CETA Service Delivery

Vocational educators' roles in CETA service delivery were examined in the context of both current activity and expectations for the future. The vocational education administrators were asked to assess the following:

- Whether the funds received from CETA represented an important or significant part of their vocational education budgets,
- Whether services other than skill training had been provided to CETA clients, and
- Whether they wanted to expand their working relationship with the CETA prime sponsor by serving more clients, training in more areas, or providing more services.

More than 72 percent of the vocational educators contacted believed that the funds they received for services to CETA clients represented an important or significant part of their budgets. In many cases, the actual percentages of CETA funds contained in the vocational education budgets were small (10 percent or less), but the administrators contacted nevertheless viewed the funds and the services provided with them as important parts of their operations--parts that they would not wish to give up.

In the majority of cases, the vocational educators' estimates of the percentages of CETA funds contained in their budgets were higher. The percentages varied greatly, not only because the amounts of CETA funds provided by prime sponsors varied but also because the size and type of vocational programs varied. CETA funds represented an average of 24 percent of the budgets of all vocational education programs, institutes, community colleges, and skill centers contacted. Administrators of programs serving city and consortium prime sponsors gave higher estimates than other administrators did. Programs working with the balance-of-State prime sponsors reported the lowest budget percentages, averaging less than 10 percent.

Eighty-six percent of the vocational educators contacted said that they had been providing services other than skill training for their CETA prime sponsors. Many stated that CETA clients were offered the full range of services provided to all regular vocational education students. Almost all vocational educators offered examples of the nonskill training and supportive services they provided, which, for the most part, paralleled those provided by the CETA prime sponsors contacted (as described earlier in this report): assessment/training, counseling for various job-related purposes, general education development, basic education and skill development, language training for persons whose English was limited, and job development and placement.

More than three out of four of the vocational educators contacted said that they cooperated with CETA prime sponsors in job development and placement efforts for CETA clients. All but a few of the vocational educators contacted (96 percent) said that they would like to expand their working relationship with CETA. This figure probably offers the most straightforward assessment of the perception that vocational educators hold of the CETA program and its potential.

Mismatch of Funding Cycles

Because serious planning and coordination problems have been attributed to the mismatch between CETA's Federal fiscal-year budgeting and the public schools' need to forward-fund programs on a school-year basis, vocational educators were asked whether, in their personal experience, the mismatch problems were serious enough to discourage them from working with the CETA prime sponsor(s) in their area. Eighty-nine percent of the vocational educators stated that the problems did not discourage them. Based on the comments of many of the persons contacted, however, it was clear that they consider the problems to be serious, and would welcome a solution to the mismatch problem in general.

Public School Support of CETA Clients

Vocational educators were asked about the financial and nonfinancial ways in which their institutions or their school systems were investing in the CETA clients being sent to them. The vocational administrators were asked for the following information:

- Were school system funds being combined with CETA funds to provide additional services to CETA clients?

- Had they been awarding academic credit to CETA clients enrolled in vocational education programs?

- What percentage of all clients enrolled in vocational education during the past year received academic credit for their vocational training?

Sixty-nine percent of the vocational educators contacted said that public school funds were being combined with CETA funds. Most of the public schools' investments in CETA clients fell into three general categories:

- Indirect, in-kind contribution of facilities, equipment, and related costs;

- Support of skill training programs, including curriculum services, teachers' salaries, and other instructional costs;

- Support of nonskill training services (as described earlier in this report), including counseling, basic education, and language training.

Several vocational educators said that they used the vocational education fund earmarked for disadvantaged and handicapped students to provide services to CETA clients.

Two out of three of the vocational administrators contacted said that their institutions or school systems were awarding academic credit to CETA clients enrolled in their programs. Estimates of the percentages of CETA client enrollees who received academic credit during the previous year varied widely, from very low to very high percentages, 100 percent in many cases. Across all vocational education programs for which estimates were given, about two out of three CETA clients received academic credit for their training. Many vocational educators reported that CETA clients did not qualify under State law for academic credit, that certificates of completion were awarded to their students in place of academic credit, or that no academic credit was awarded to any student enrolled in their programs.

Assessment of Assistance Available from Other Organizations

Because vocational education programs and institutes are so often responsible for job development and placement for CETA clients in addition to other disadvantaged students in regular vocational programs, vocational educators were asked for their perceptions of the value of the job development and placement

assistance that they had been receiving from other organizations operating in their areas. Inquiries were made regarding the activities of the following groups:

- The Private Industry Councils (PIC's),
- The Employment Service (ES) offices,
- Organized labor groups.

Vocational educators were asked to rate the effectiveness of the Private Industry Councils in developing private sector job opportunities for CETA clients and vocational education students during the past year. The majority of the vocational educators who responded (56.5 percent) said that the PIC's were effective in developing private sector jobs for clients and students. In addition, more than 17 percent gave their PIC's a rating of "very effective" in developing job opportunities. About one out of four respondents (26 percent) said that their PIC's had been ineffective in this regard. A few of the comments concerning the PIC's were negative, but most qualified the lower ratings that were given by explaining that their PIC's was just getting started, that unemployment in the area was high, and that PIC performance was getting better. About 16 percent of the vocational educators contacted did not know enough about PIC operations to comment.

Vocational educators were asked to rate the effectiveness of their area Employment Service offices in helping to match CETA clients and vocational education students with job opportunities in the private sector. Sixty-three percent of the vocational educators responding said that the Employment Service had been "effective" in matching clients and students with jobs. Another 10 percent said that the ES offices had been "very effective" in doing this. More than one out of four (27 percent) rated the Employment Service as "ineffective." A few vocational educators commented on the ES operations, indicating that the offices were understaffed, that they were dealing only with low-skill jobs, and that their placement activity was not timely. A few comments indicated that the ES offices had tried to be cooperative but had not always succeeded. Again, about 16 percent of the vocational educators contacted did not know enough about the ES operations to comment.

Vocational educators were asked to rate the level of involvement of organized labor in efforts to coordinate CETA, vocational education, and job opportunities in their communities. Forty-one percent of the vocational educators said that organized labor had been "active" in coordination efforts;

another 12 percent said that organized labor had been "very active" in this regard. However, almost half of the vocational educators (48 percent) believed that organized labor had been "inactive." In some cases, this inactivity was attributed simply to lack of labor presence in the area and lack of opportunities for labor to become involved.

Legislative Changes to Improve Coordination

The vocational educators contacted were invited to suggest changes to the reauthorized versions of the Comprehensive Employment and Training Act and the Vocational Education Act to improve the future coordination of the two areas. Vocational educators were asked to draw upon their experience in recommending changes; about three out of four of the persons contacted offered recommendations, which can be summarized as follows:

- Steps should be taken to bring the CETA and vocational education funding cycles into alignment. Provisions for forward-funding of CETA training programs to match the vocational education funding cycle should be considered.

- CETA should increase emphasis on training for clients. Training funds should be provided only to existing public school training programs. Longer periods for training CETA clients should be permitted. Stronger links between training programs and the private sector should be required.

- Requirements for joint planning of CETA and vocational education programs should be strengthened. Vocational educators should be required to participate in and to approve CETA plans. Greater involvement of the private sector in joint planning should be required.

- Prime sponsors should be permitted more individual discretion and flexibility in developing and funding programs. Movement toward a block grant concept should be considered.

- Federally required paperwork associated with CETA-vocational education working relationship should be reduced.

- Steps should be taken to eliminate the duplication of vocational education services that remains. Roles of both CETA and vocational education should be clarified. Sharing of funds, equipment, and staff between CETA and vocational education should be encouraged.

- Coordination of CETA and vocational education should be mandated in the Vocational Education Act.

Several of the vocational educators contacted did not comment on the legislative changes that were needed, but did call for increased funding of CETA and vocational education programs.

Summary of Vocational Educator Information

An item-by-item summary of the information provided by vocational education administrators contacted is contained in appendix B to this report. The matrix in the appendix contains the counts of vocational educators responding to each information item listed.

Section 4

Comparisons of Perceptions of the CETA-Vocational Education Relationship

Most of the information items on coordination that were requested in contacts with CETA administrators and vocational education administrators were the same. The same inquiries were made of both groups to illustrate the extent to which CETA and vocational education administrators who worked together would share the same or similar perceptions of their working relationships.

With regard to the CETA-vocational education working relationship following the CETA Amendments of 1978,

- More than 81 percent of the vocational educators, compared with 56 percent of the prime sponsors, expressed the view that there had been greater involvement of vocational education in CETA planning;

- More than 69 percent of the vocational educators, compared with more than 55 percent of the prime sponsors, expressed the view that there had been greater involvement of CETA in vocational education planning;

- Seventy-five percent of the vocational educators, compared with 62 percent of the prime sponsors, expressed the view that vocational education involvement in CETA service delivery had increased.

Vocational administrators, to a much greater extent than CETA administrators, saw an increase in cross-representation on planning bodies, as well as an increase in vocational education's role in CETA.

With regard to the role of vocational education in CETA service delivery,

- Eighty-six percent of the vocational educators, compared with 47 percent of the prime sponsors, believed that CETA had been obtaining services other than skill training from vocational education;

- Examples of the kinds of nonskill training services provided to CETA clients were essentially the same as those described by both CETA and vocational administrators.

Clearly, vocational educators consider the scope of their service to CETA clients to be far broader than CETA administrators acknowledge it to be.

With regard to the mismatch of CETA and vocational education funding cycles, there was agreement at approximately the same level--91 percent of prime sponsors and 89 percent of vocational educators--that the problems created by the mismatch were serious, but not serious enough to actually discourage one party from wanting to work with the other.

With regard to public school support of CETA clients,

- Sixty-nine percent of the vocational educators, compared with 51 percent of the prime sponsors, believed that public school funds were being combined with CETA funds to provide additional services for CETA clients;

- Seventy-two percent of the prime sponsors, compared with 67 percent of the vocational educators, believed that the school systems had been awarding academic credit to CETA clients enrolled in vocational education programs;

- Prime sponsors believed that about half their clients had received academic credit for their vocational education, whereas vocational educators estimated that about two out of three CETA clients received academic credit.

Vocational administrators, to a greater extent than CETA administrators, perceived support for the CETA client coming from the public education system. As indicated, slightly fewer vocational educators believed that CETA clients were receiving academic credit, but those who did believed that a greater proportion of CETA clients were receiving such credit.

With regard to job development and placement efforts for CETA clients, almost 77 percent of the vocational educators, compared to 47.5 percent of the prime sponsors, believed that such efforts had involved joint CETA-vocational education activity, rather than involving one or another agency exclusively.

With regard to the perceived effectiveness of the Private Industry Council and the Employment Service, vocational educators were more positive in their views than were prime sponsors:

- Seventy-four percent of the vocational educators, compared with about 60 percent of the prime sponsors, gave the Private Industry Council a rating of "effective" or "very effective" on private sector job development for CETA clients and vocational students.

- Seventy-three percent of the vocational educators, compared with 47.5 percent of the prime sponsors, gave the Employment Service a rating of "effective" or "very effective" in helping to match CETA clients and vocational students with private sector jobs.

The views of vocational educators and prime sponsors were more closely aligned on the question of organized labor involvement in coordination. Fifty-three percent of the vocational educators and about 46 percent of the prime sponsors gave organized labor a rating of "active or "very active" in helping to coordinate CETA, vocational education, and job opportunities in their communities.

With regard to suggested changes in CETA and vocational education legislation, there were several areas of agreement between the prime sponsors and the vocational educators contacted. Administrators in both groups called for the following:

- o Alignment of the CETA and vocational education funding cycles, possibly through forward-funding of CETA training programs, to eliminate the problems created by the funding cycle mismatch;

- o Increased flexibility for both prime sponsors and vocational educators in developing, operating, and funding joint programs;

- o Simplification of administrative requirements affecting joint activities, and clarification of the roles of CETA and vocational education in the joint activities;

- o Continued efforts to eliminate duplication of services by CETA and vocational education and to share information, facilities, staff, and so on.

Most of the CETA administrators who commented on legislation felt that CETA-vocational education coordination must be mandated in the vocational education legislation as well as the CETA legislation. Only a few vocational educators expressed a desire for a coordination mandate in both pieces of legislation.

In summary, comparisons of the perceptions of prime sponsor and vocational education administrators suggest that, as a group, vocational educators hold a more positive view of the relationship that exists between CETA and vocational education. Vocational educators generally perceived more coordination in planning, a more active role for vocational education in CETA service delivery, more public school support for CETA clients, and greater effectiveness on the part of other agencies involved in job development and placement for clients and students.

It is important to note that the vocational educators were relatively more positive in their perceptions; clearly, prime sponsor perceptions of the CETA-vocational education relationship should not be considered negative.

APPENDIX A

SUMMARY OF INFORMATION PROVIDED BY CETA ADMINISTRATORS, BY TYPE OF PRIME SPONSOR

	PRIME SPONSOR TYPES				
	City	County	Con-sortium	Bal. of State	Other
1. Since 1978 amendments, greater involvement of voc. ed. in CETA planning.	13	28	18	7	0
2. Since 1978 amendments, greater involvement in CETA in voc. ed. planning.	12	31	15	8	0
3. Since 1978 amendments, greater use of voc. ed. programs by CETA.	14	32	17	10	0
4. Voc. ed. receives more CETA funds for skill training than other service deliverers.	10	24	19	11	2
5. Voc. ed. receives CETA funds for skill training as other service deliverers.	6	6	6	2	0
6. Title II funds in addition to section 204 funds used to purchase voc. ed. services.	20	43	30	14	2
7. Estimated percentage of title II funds in addition to 204 funds used to purchase voc. ed. services (average).	28	26	30	21	30
8. CETA purchasing services other than skill training from voc. ed.	10	27	15	3	1
9. Estimated percentage of title II funds provided to voc. ed. used to purchase other services (average).	10	17	10	6	4

	PRIME SPONSOR TYPES				
	City	County	Con-sortium	Bal. of State	Other
10. Estimated percentage of title II funds provided to voc. ed. used to pay training stipends (average).	48	41	43	42	20
11. Voc. ed. skill training of better quality than other deliverers.	8	23	15	7	0
12. Voc. ed. skill training of same quality as other deliverers.	9	20	13	3	2
13. Other voc. ed. services of better quality than other deliverers.	6	15	5	4	0
14. Other voc. ed. services of same quality as other deliverers.	7	13	16	4	1
15. Voc. ed. contract compliance better than other deliverers.	11	19	13	4	1
16. Voc. ed. contract compliance same as other deliverers.	7	29	15	6	1
17. Voc. ed. program completion rates better than other deliverers.	9	18	8	6	0
18. Voc. ed. program completion rates same as other deliverers.	7	22	15	2	2
19. Voc. ed. job placement rates better than other deliverers.	10	14	16	6	0
20. Voc. ed. job placement rates same as other deliverers.	7	24	14	4	1
21. CETA-voc. ed. funding cycle problem not serious enough to discourage use of voc. ed.	21	45	27	12	2

	PRIME SPONSOR TYPES				
	City	County	Con-sortium	Bal. of State	Other
22. Public school funds being combined with CETA funds to provide added services for CETA clients.	10	28	14	6	0
23. School systems awarding academic credit to CETA clients in voc. ed. programs.	16	33	25	11	1
24. Estimated percentage of CETA clients in voc. ed. programs receiving academic credit (average).	49	50	51	42	DK
25. CETA and voc. ed. involved in joint job development and placement efforts.	7	23	20	7	0
26. Private Industry Council (PIC) very effective in job development for CETA clients and voc. ed. students.	8	2	3	4	0
27. PIC effective in job development for CETA clients and voc. ed. students.	10	20	14	4	0
28. Employment Service (ES) very effective in matching CETA clients and voc. ed. students with jobs.	4	1	3	1	1
29. ES effective in matching CETA clients and voc. ed students with jobs.	5	19	12	6	0
30. Organized labor very active in coordinating CETA, voc. ed., and jobs in community.	4	0	1	1	0
31. Organized labor active in coordinating CETA, voc. ed., and jobs in community.	6	22	13	5	2

APPENDIX B

SUMMARY OF INFORMATION PROVIDED BY VOCATIONAL EDUCATION ADMINISTRATORS, BY TYPE OF PRIME SPONSOR SERVED

		PRIME SPONSOR TYPES				
		City	County	Con-sortium	Bal. of State	Other
1.	Since 1978 amendments, greater involvement of voc. ed. in CETA planning.	17	41	21	8	2
2.	Since 1978 amendments, greater involvement of CETA in voc. ed. planning.	16	32	19	7	1
3.	Since 1978 amendments, increased level of CETA service delivery.	18	28	24	10	2
4.	CETA funds viewed as important or significant part of voc. ed. budget.	16	33	20	5	2
5.	Estimated percentage of voc. ed. budget represented by CETA funds (average).	35	18	39	9	19
6.	Services other than skill training provided to CETA prime sponsors.	19	38	25	10	2
7.	Expanded working relationship with CETA desired.	20	44	26	12	2
8.	CETA-voc. ed. funding cycle problem not serious enough to discourage working with CETA.	19	40	22	13	2
9.	Public school funds being combined with CETA funds to provide added services for CETA clients.	14	27	20	8	2
10.	School systems awarding academic credit to CETA clients in voc. ed. programs.	14	27	18	12	1

	PRIME SPONSOR TYPES				
	City	County	Con-sortium	Bal. of State	Other
11. Estimated percentage of CETA clients in voc. ed. programs receiving academic credit (average).	63	59	83	23	100
12. CETA and voc. ed. involved in joint job development and placement efforts.	18	30	19	10	2
13. Private Industry Council (PIC) very effective in job development for CETA clients and voc. ed. students.	4	8	4	0	0
14. PIC effective in job development for CETA clients and voc. ed. students.	11	25	13	2	1
15. Employment Service (ES) very effective in matching CETA clients and voc. ed. students with jobs.	2	2	4	1	0
16. ES effective in matching CETA clients and voc. ed. students with jobs.	11	27	12	8	0
17. Organized labor very active in coordinating CETA, voc. ed., and jobs in community.	2	4	5	0	1
18. Organized labor active in coordinating CETA, voc. ed., and jobs in community.	11	16	12	2	0

THE ROLE OF FEDERAL VOCATIONAL EDUCATION FUNDING IN PROMOTING SUCCESSFUL REEMPLOYMENT OF PERSONS RECEIVING WORKERS' DISABILITY PAYMENTS

by

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THE ROLE OF FEDERAL VOCATIONAL EDUCATION FUNDING IN PROMOTING SUCCESSFUL REEMPLOYMENT OF PERSONS RECEIVING WORKERS' DISABILITY PAYMENTS

The purpose of this paper is to define an appropriate role for Federal funding in facilitating reemployment of persons who have been physically unable to work because of worksite injuries. The paper particularly addresses the adequacy of vocational education services available to these persons. The authors make specific recommendations to refine administrative practices. Among the questions the paper addresses are the following:

1. Is there a significant relationship between types of rehabilitation services received and return to gainful employment?

2. Is there a significant relationship between injury-related and other characteristics of clients and return to gainful employment?

3. Is there a significant relationship between preinjury employment conditions and return to gainful employment?

Section 1 describes the general disabled population and profiles the industrial accident victim. Also highlighted are current program services offered to the diabled (e.g., State and Federal Vocational Rehabilitation, Vocational Education, Employment and Training, and Job Service programs). This inventory of services excludes private program services available to the disabled. Section 2 explores factors that are thought to be important determinants of the probability of successful return to work. Section 3 examines the results of a survey that was conducted among a sample of Workers' Compensation recipients in Missouri between 1975 and 1979. Section 4 offers specific recommendations for changing current Vocational Education Act (VEA) and Comprehensive Employment and Training Act (CETA) legislative and administrative provisions to offer more effective services to the industrial accident victim.

Section 1

Characteristics of the Disabled and the Industrial Accident Victim

Recent estimates of the disabled population range from 7 percent (based on participation in transfer income programs) to 9 percent (based on a Bureau of Census report), to 12 percent (based on a 1977 Current Population Survey (CPS) [Wolfe, 1979] and a 1974 National Health Interview [Berkowitz, Johnson, and

Murphy, 1976]), to a 17 percent estimate (based on 1966 Social Security Survey of Disabled Adults). Although definition and coverage vary widely, the numbers are uniformly substantial and apparently growing. One reason for this increase in disabled persons is the number of industrial accidents resulting in a permanent disability. One study estimated that 21,000 "disfiguring and often seriously disabling amputations" resulted from industrial accidents in 1977 alone (McCaffrey, 1981). Another study reported a national total of 90,000 permanent, partial injuries and 14,000 deaths in 1977 (The Report of the National Commission on State Workmen's Compensation Laws, 1972).

It is difficult to distinguish cause and effect in a work injury situation. Studies of industrial accident victims reveal that accidents are closely related to both age and length of service. As Root (1976) pointed out, older employees incur fewer injuries. This conclusion was supported by statistics presented by Ryan (1980), who reported that 40 percent of work injuries occur among persons less than 35 years of age and in their first year of employment. Workers between the ages of 28 and 47 show the highest accident rates.

Educationally, disabled workers generally exhibit a lower average grade attainment, with high concentrations of 8 years or less of schooling. Of course, this factor cannot be understood without reference to the obvious link between education and range of job opportunity; persons with the lowest educational attainment also have the most limited range of work options, including a high incidence of the most dangerous jobs.

The Federal Government has no data available describing the sex or race of industrial accident victims, but according to Wolfe (1979), men and women appear to have equal rates of disability. "Functional limitations" are more likely to occur among black than whites (Berkowitz, Johnson, and Murphy, 1976) because of higher proportion of blacks are in unskilled physically demanding jobs. This finding is consistent with a finding that a higher percentage of blacks receive Supplemental Security Income (SSI) payments because they face poorer job opportunities and are in poorer health (Leonard, 1979).

Marital status has been identified as an important factor in the return to work of the disabled, but the Government has no data on this factor for the work-injured per se. According to Wolfe (1979), however, the disabled are less likely than other people to be married. Those disabled persons who are married, however, are more likely to work than are those who are not married (Berkowitz, Johnson, and Murphy, 1976).

The labor force participation rates of the disabled and of the industrial work-injured indicate mixed factors influencing employment. The 1977 CPS study reported that 32 percent of disabled men and women were not working because they were unable to work or could not find work (Wolfe, 1979). This figure is a conservative estimate of the impact of disability on labor force activity, since it has also been reported that although 72 percent of disabled men held jobs in 1972, only 36 percent had full-time jobs. Disabled persons averaged only 26 hours of work per week (Levitan and Taggart, 1977). It has been estimated that the unemployment rate for disabled men is twice as high as for able-bodied men (Berkowitz, Johnson, and Murphy, 1976).

The work-injured have been characterized as being marginally attached to the labor force. In a followup study of California permanent, partially disabled persons, it was found that after 1 year only 57 percent of the persons who were 51 to 100 percent disabled were in the labor force. Three years later, 39 percent of these people were receiving Social Security benefits (Vroman, 1976). Another 3- to 5-year followup (cited in Lynch, 1979) found that although most persons with back injuries returned to work with their preinjury employer, more than 33 percent of those who returned quit or were terminated within a year.

The fact that the physically disabling injury occurred while at work cannot be overlooked. Temporary, or, in some cases, permanent eligibility to receive a transfer payment creates a disincentive to return to work during the eligibility period (Vroman, 1976; Root, 1979; and Lynd, 1980). Evidence that substantial earnings losses frequently accompany reemployment of the severely injured (Wolfe, 1980) compounds this deterrent.

The characteristics of the work-injured can be summarized as reflecting the general characteristics of employed persons, adjusted for the uneven incidence of accidents across occupations and industries. This adjustment is required because particular groups, including minority members, the young, and the old, are concentrated in the more dangerous jobs.

What, then, is being done on behalf of the work-injured? Are appropriate screening procedures routinely available to identify persons who can, with proper assistance, return to productive employment? Once these people have been identified, are the necessary institutional relationships in place to assure that the required services are, in fact, made available in a timely manner? The next paragraphs give a brief overview of the major programs that are intended to serve the physically disabled.

Services Available to Work-Injured Persons

Two types of programs offer services to handicapped adults. Programs such as Vocational Education, Comprehensive Employment and Training Act prime sponsors, the Job Service, and Vocational Rehabilitation offer services to promote employability. Transfer and cash benefit programs, such as Social Security and Workers' Compensation, offer income and medical benefits to the disabled.

The Vocational Education Act does not specifically mention handicapped adults, and critics claim there is little interagency cooperation. Consequently, vocational training programs for handicapped persons are inadequate. The Comprehensive Employment and Training Act, conversely, provides a general definition of a handicapped target group, but its emphasis is on youth, based on cooperative efforts with vocational education. The CETA law specifically mandates cooperative agreements, but very little is known about the handicapped people this program serves. The Job Service urges special attention to the handicapped, but there are so many "priority" groups that little special service is actually available to persons with physical disabilities. Finally, Vocational Rehabilitation accords specific priority to handicapped persons, but does not specifically mention work-accident victims. Nor does this law mandate cooperative efforts for rehabilitating the target population.

Vocational Education

Vocational education legislation (P.L. 94-482) specifically complies with the 1975 Education for All Handicapped Children Act (P.L. 94-142). Section 110(a) of the 1976 Amendments to the Vocational Education Act of 1963, mandates more services for the handicapped under a National Priority Program. Ten percent of all funds from Federal basic grant, supportive services, and program improvement funds are earmarked for handicapped individuals. All these guidelines apply to institutions offering vocational education: Junior high or middle schools, comprehensive high schools, specialized high schools, technical or vocational schools, and community colleges.

Public Law 94-142, and therefore vocational education agencies, stresses a free and appropriate education for handicapped persons between the ages of 3 and 21. The vocational education legislation makes no mention of services to be offered handicapped persons older than age 21:

> (a) As used in this part, the term "handicapped children" means those children evaluated in accordance with

121a. Section 121a. 530-121a. 534 as being mentally retarded, hard of hearing, speech impaired, visually handicapped, deaf, seriously emotionally disturbed, orthopedically impaired, other health impaired, deaf-blind, multihandicapped, or as having specific learning disabilities who because of those impairments need special education and related services. (P.L. 94-142, section 121a.5)

The Office of Adult and Vocational Education in the U.S. Department of Education monitors State agencies for policy compliance. The 1973 Rehabilitation Act, section 503, requires assurance that vocational education agencies do not discriminate against the handicapped. Of particular importance are the screening criteria used by vocational educators, who often base their recommendations on the following factors:

- Previous grades
- Recommendation of an occupational teacher
- Physical ability
- Good school attendance
- Intelligence test
- Specified academic skills
- Specified test requiring a certain score
- Administrative decision.

A second complicating issue is interagency cooperation, which is vital to assure comprehensive services for the handicapped. The Vocational Education Act of 1976 emphasizes interagency cooperation, but coordination difficulties within the education system, are well documented. So, also, are problems between the education system and external supportive services and employment and training agencies. Since enactment of the 1976 Amendments to the Vocational Education Act, the National Advisory Council on Vocational Education has been required to have a member "experienced in the education and training of handicapped persons" (section 162.[a] [8]). The Council is supposed to "assess the extent to which vocational education, employment and training, (and) vocational rehabilitation. . . represent a consistent integrated and coordinated approach. . ." (section 162. [b] [4A]). Each affiliated State council serves as counterpart to the National Advisory Council with similar representation (section 105.[a] [18]) and the identical purpose--to assess articulation between vocational education, employment and training, and vocational rehabilitation (section 105. [b] [4A]).

There has also been little coordination between vocational education and business and industry. Since 1977, the U.S. Commissioner of Education and the Commissioner of Rehabilitation Services Administration in the Department of Health, Education,

and Welfare (now the Department of Health and Human Services) have issued three Federal mandates to insure that handicapped persons can be served by more than one agency. These mandates required (1) examination of the collaborative efforts between education and vocational rehabilitation agencies; (2) development of formal cooperative agreements among special education, vocational education, and vocational rehabilitation; and (3) response to a need to provide all handicapped persons with comprehensive vocational education services (Albright, Hasazi, Phelps, Hull, 1981).

The vocational training of the handicapped has been widely attacked. Critics have charged that too few handicapped students are being served; a recent survey conducted by the (then) Bureau of Adult Occupational Education, only 2.5 percent of persons receiving vocational education were handicapped. Moreover, critics claim the training programs offered to handicapped students are targeted toward low-paying secondary employment. Therefore, many trained handicapped persons find their opportunities limited to low-paying, unstable employment.

Despite the compliance issues and problems related to the vocational education of the handicapped, a small percentage of handicapped persons are being served. Cooperative agreements with prime sponsors funded through the Comprehensive Employment and Training Act may increase the chances for vocational education agencies to serve the handicapped, because the prime sponsors have a more general target group definition and because they operate under specific cooperative agreements.

The Comprehensive Employment and Training Act

The 1978 Comprehensive Employment and Training Act (P.L. 95-524) Amendments urge greater employment and training efforts and "maximum coordination" of plans, programs, and activities. Specifically named in the act are vocational education, vocational rehabilitation, public assistance, self-employment training, and social service programs (P.L. 95-524, section 676.23). Handicapped persons are automatically eligible for services. Although the definition of handicapped persons differs from the one used in the Vocational Education Act, CETA defines handicapped as " . . . a person who has a physical or mental disability which constitutes a substantial barrier to employment and can benefit from CETA services provided, as determined by the prime sponsor" (P.L. 95-524, section 675.4).

Titles II and IV most directly relate to services to be offered to the handicapped. Title II provides funds for vocational education assistance and coordination. These funds can be used for linkages with education, technical assistance, development of curriculum and materials, as well as staff development. Other funds are available to the Governors of each State

to encourage coordination of services with educational institutions providing training programs for eligible participants (P.L. 95-524, section 677.37). Title IV provides a variety of programs for disadvantaged youths between the ages of 14 to 21, but the maximum age is waived for the handicapped.

Although the CETA law targets vocational rehabilitation agencies for coordination with CETA, this coordination is not supported with funds, as is CETA coordination with vocational education agencies. In a recent study in Missouri, linkages between vocational rehabilitation agencies and CETA were limited; there were no written contracts between the agencies. Only 5 percent of vocational rehabilitation clients were being served by employment and training agencies, even though the vocational rehabilitation agencies allegedly screen their clients to discover who could benefit from CETA services. Despite the interagency link with education, the easing of eligibility requirements, and the targeting of the handicapped individual, little is known about the population served through CETA. According to the 1979 Employment and Training Report of the President, little is known about handicapped enrollees; in fiscal year 1978, approximately 5 percent of title I enrollees were handicapped; 3 percent in title II were handicapped and 4 percent in title VI.

The Job Service

The Job Service, in a cooperative agreement with CETA, acts as a labor exchange by providing assessment and training for special target groups (see Kolberg, 1977). The Job Service is required to make special efforts on behalf of minorities, women, economically disadvantaged persons, handicapped persons, older workers, youths, seasonal farm workers, migrants, welfare recipients, and veterans experiencing significant barriers to employment. Under present goals and objectives, the Job Service is to help any unemployed, underemployed, or employed person find suitable employment. When there are so many priorities, there are, in practice, no priorities. The addition of another target group--the work-injured--would do little to enhance that groups' opportunities.

Vocational Rehabilitation

The 1973 Vocational Rehabilitation Act (P.L. 93-112) gave new and special emphasis to the severely handicapped. The Secretary of the Department of Health, Education, and Welfare received special responsibility to coordinate all programs for handicapped persons. The act describes handicapped to encompass ". . . any individual who (a) has a mental or physical disability which for such individual constitutes or results in

a substantial handicap to employment and (b) can be reasonably expected to benefit in terms of employability from vocational rehabilitation services. . . ."

Since 1973, vocational rehabilitation agencies have focused on the severely disabled, so additional problems have been encountered in rehabilitation efforts. Reemployment efforts might therefore be adjusted to a slack labor market so that the less severely injured clientele can be served. Placement and job development have received little emphasis to date. Screening, effective training, and appropriate placement all stand out as essential elements in successful efforts to return the disabled to the labor market. It has been reported that "less than one in eight severely disabled recipient felt that rehabilitation had contributed to labor market success," and many rehabilitants are currently not self-supporting (Levitan and Taggart, 1977).

State and Federal vocational rehabilitation legislation stresses cooperative arrangements with other governmental agencies providing services to the handicapped. The vocational rehabilitation legislation specifically mentions public assistance programs, public employment offices, and veterans' programs, but does not specifically mention agencies such as vocational education, CETA prime sponsors, or Workers' Compensation.

The work-injury victim has a number of problems obtaining adequate services from a State or Federal vocational rehabilitation agency. One problem arises from the necessity for a State-administered program (Workers' Compensation) to attempt to coordinate with a federally administered program (vocational rehabilitation). Once the workers' compensation unit has referred a person to the vocational rehabilitation agency, the workers' compensation agency has no obligation to check on whether the appropriate service is delivered.

The two agencies have conflicting philosophies and priorities. In only eight of the States surveyed in 1976 did an insurance carrier reimburse the State or Federal vocational rehabilitation agency for services provided. Only 27 of the States had rehabilitation units in their workers' compensation agencies; the agencies chiefly reimburse workers for their disabilities and provide medical services. Thirty workers' compensation units had agreements with external rehabilitation agencies to assist the work-injured to return to employment. Only a small percentage of the work-injured who have been alleged to need rehabilitative services have actually received any skill training. Only in 1980 were the work-injured identified as a possible target population to be included in State

and Federal vocational rehabilitation (Collins, 1980). Although the Vocational Rehabilitation Act specifically includes civil employees and public safety officers injured in their line of duty, it excludes the industrial accident victim.

Transfer Payment and Cash Benefit Programs

Transfer programs and cash benefit programs, such as Workers' Compensation and Social Security, pose another set of difficulties for the disabled worker. There are more than 85 disability programs (private and public) serving disabled persons of working age. These programs provide income, medical services, survivor benefits, and a variety of other services. Social Security Disability Insurance (SSDI) is the largest and most important Federal program dealing with long-term disability; it provides monthly income to disabled workers and their families. Since it began, the cash and medical benefits have increased, the eligibility requirements have been relaxed, and there is a 9-month period during which persons can work without affecting their benefits. There is no income-eligibility criterion for SSDI. Workers' Compensation, a State-sanctioned program, compensates employees for work-incurred disabilities; it provides income maintenance, medical payments, and rehabilitation restoration services.

These cash benefit programs have one shortcoming in common: None aims, as a primary goal, to integrate or reintegrate the disabled person into a productive employment situation. It must be noted, however, that Workers' Compensation does provide physical restoration services, and although persons receiving SSDI are unable to engage in substantial activity, they are required to take advantage of vocational rehabilitation services.

Workers' compensation emphasizes transfer income. Some studies suggest that the labor force participation rate drops as benefits from such programs as Social Security Disability Insurance increase. Others argue that disabled persons have higher medical and health expenditures and therefore need the extra cash and benefits. Numerous studies (Leonard, 1979; Parsons, 1980; Hamermesh, 1980; and Wolfe, 1980) deduce from the effects of reduced labor market opportunities for the disabled that this population has a lower "opportunity cost" of not working, and therefore a higher probability of seeking transfer payments.

A worker who experiences disability has four options: (1) another member of the household can substitute in the labor force, (2) The injured person can invest in training, (3) the employer can attempt to adapt the person's old job to the impaired condition, or (4) the injured person may apply for

transfer benefits (Berkowitz, Johnson, and Murphy, 1976). Disability benefits are society's response to the cost that a disabled person bears (wage loss, reduction in nonmarket production, and utility loss from pain and suffering resulting in a reduction of leisure).

Summary

This section has profiled the disabled population, and, to the extent possible, the smaller work-injured group within this population. The section has also outlined the major legislative and organizational provisions that now exist to help persons who have suffered disabling injuries.

It is apparent that the work-injured are not a random sample of all persons in the work force. They are more likely to be young, recently employed, and black. In part, these factors are tied to the employment opportunities to which different groups in our society have routine access.

Various Federal mandates and earmarked funds exist to provide rehabilitative services to persons who have been injured while at work. The appropriate legislative provisions have been described in the foregoing section.

The next section explores factors that have been identified as likely determinants of a work-injured person's probability of returning to productive employment. The section also analyzes survey data collected from a sample of Workers' Compensation benefit recipients in Missouri between the years 1975 and 1979.

Section 2

Toward a Model of Reemployment Prospects for the Work-Injured

Modeling the reemployment probabilities for work-injured persons differs from generally attempting to understand the forces that mold labor force participation. Variables must be included to reflect the way(s) in which the injury affects the victim's own perception of labor market opportunities, and the impact of injury-related factors on screening behavior by prospective employers must be indentified.

The relevant variables are as follows:

- Demographic factors -- sex, race, age, marital status/other earner(s), number of dependents, and education/training.

- o Labor market factors -- industry/occupation structure, unemployment rate(s), changes in employment level(s), own employment experience, prior earnings level, and full- or part-time experience.

- o Nonearnings sources of income -- workers' compensation, unemployment insurance, AFDC, SSDI, food stamps, and other (e.g., insurance).

- o Injury-related (and general health) factors -- physical incapacity, emotional impairment, certification of disability, employer stigma/fear/misunderstanding, insurance/bonding barriers, and need for retraining.

In specifying a model of reemployment prospects for work-injured persons, planners must decide how much weight to give to the literature on labor market segmentation. The first section mentioned some evidence that certain demographic characteristics are highly correlated with concentration in particular occupations, which, in turn, exhibit an above-average incidence of worksite injuries.

The planners' view of the importance of local labor market structure (i.e., industry/occupation composition) as a determinant of employment prospects for the work-injured will affect the choice of labor market variables and the unit(s) of observation that are chosen. The relevance of prior earnings for work-injured person is of special interest because physical impairment may destroy or diminish the value of previously embodied human capital.

The transfer-eligibility variables do not warrant extended discussion here. The literature has explored the cumulative broadening of the umbrella under which eligibles find income protection. SSDI eligibility is a nonstigmatized alternative to reliance on food stamps, Aid to Families with Dependent Children (AFDC) benefits, or subsidized employment opportunities. A critical matter to be faced in the coming months is where to draw the line between the deserving and the undeserving--and on what criteria will this judgment be based.

The injury-related variables encompass both real and imagined changes that have occurred in a victim's employability as a result of an accident. Physical and emotional aspects of the injury may alter how the victim views employment opportunities. Considerations from the employers' side include stigma, fear, and misunderstanding. In addition, institutionalized barriers to reemployment persist in the form of insurance and bonding bars to specified types of employment for persons who exhibit physical impairments.

The next section explores many of these factors as correlates of reemployment experiences for a sample of workers' compensation payment recipients in Missouri between the years 1975 and 1979. (The authors plan to undertake a more extensive multivariate analysis soon.)

Section 3

Reemployment Experiences of Work-Injured Persons

The following 16 tables present information provided by 183 respondents to a mail survey that was designed to elicit information about these persons' employment and training experiences since they were injured at work and began receiving Missouri workers' compensation benefits at some time between January 1975 and September 1979. The survey was taken in the early months of 1981. As appendix A details, these respondents represent a cross section of mild, moderate, and severe injury categories.

The tables compare various demographic, labor market, and injury-related characteristics to one of three post-injury statuses: (1) working at the time of the survey; (2) having worked at some time since being injured, but not at the time of the survey; and (3) not having worked at any time since being injured.

Table 1 shows that one out of every five respondents had not worked at any time since being injured on the job.

Obviously, the most important point this table reveals is that fewer than 6 out of every 10 injured persons were working at the time the survey was conducted. So few women were included in the sample that no attempt has been made to draw inferences about sex-based differences in reemployment patterns.

We present table 2 with an explicit statement of caution because the number of nonwhite respondents is too small to warrant general conclusions. Nevertheless, as was seen in table 1 with respect to women, there is limited evidence that white men who suffered work injuries are more likely to have been working at the time of the survey than were their female and nonwhite counterparts.

Table 3 displays no substantial difference in the percentage of persons in various age groups who were working when contacted, but older persons are more likely not to have worked at all. This finding contrasts with a significant relationship between age and an expressed desire to work; persons in the youngest and older age groups more often expressed a desire to work than did persons in the mid-range age group.

Table 1

Employment Status by Sex
$x^2 = 2.55$ (.27)

Sex	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
Male	164	96	(59)	29	(18)	39	(23)
Female	18	10	(55)	5	(28)	3	(17)
No Response	1						
TOTAL =	183						

Table 2

Employment Status by Race
$x^2 = 4.98$ (.08)

Race	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
White	164	100	(61)	28	(17)	36	(22)
Black	12	3	(25)	5	(42)	4	(33)
Hispanic	2	--	(--)	1	(50)	1	(50)
Other	1	1	(100)	--	(--)	--	(--)
No Response	4						
TOTAL =	183						

Table 3

Employment Status by Age
$x^2 = 6.40$ (.17)

Age	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
E 36	56	33	(59)	14	(25)	9	(16)
36-50	56	36	(64)	9	(16)	11	(20)
F 50	66	38	(57)	9	(14)	19	(29)
No Response	5						
TOTAL =	183						

Table 4

Employment Status by Marital Status
$x^2 = 4.24$ (.37)

Marital Status	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
Single	28	13	(46)	9	(32)	6	(22)
Married	136	83	(61)	22	(16)	31	(23)
Divorced	12	6	(50)	3	(25)	3	(25)
No Response	7						
TOTAL =	183						

Table 4 does not reveal a significant difference among the three marital status groups; this may be as much a measure of the weakness of two-way comparisons as it is evidence of the absence of a relationship between marital status and postinjury employment status.

Tables 5 and 6 reflect the well-established importance of responsibility for dependents and the presence of another earner in the household as determinants of labor force behavior. Persons who neither support themselves nor bear responsibility for other dependents are least likely to have been working at the time of survey contact. Those who depend only upon their own resources are most likely to have been working.

Table 6 indicates that the injured person is most likely to have been working when contacted in cases when another person in the household has entered the work force since the respondent's injury. This, of course, reveals the simultaneity of the labor market decisions that have been made: The injured persons most likely to be working are those whose spouses (or other earners in the household) have entered the work force since the injury. The next most likely group comprises those who report another adult in the household was employed both before and after the accident. The lowest working percentage occurred among persons who reported no additional earner either before or after the injury.

Table 7 exhibits what may be an extremely important guide to future research: All persons who had worked full time before their injury were working when contacted. (This question was asked in a telephone followup to the mailed questionnaire, which elicited 92 successful interviews.) The rapid growth of caseloads in disability programs may be traceable to an increase in eligibility of those who have worked part time.

These hints are buttressed by the patterns shown in table 8: The longer an injured worker had been employed by a given employer, the more likely the worker is to have been working when contacted. Unfortunately, it is not known whether this pattern is tied to a higher incidence of reemployment by the employer of record at the time the injury occurred.

Another aspect of this employment stability measure is displayed in table 9, which shows that tenure in the specific job being performed at the time of injury is also associated with the probability of working now.

None of the relationships found in these nine tables is surprising; all are consistent with the general literature on labor force participation.

Table 5

Employment Status by Dependents
$x^2 = 7.71$ (.02)

Dependents	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
None	12	5	(5)	5	(15)	2	(5)
Self-supporting	32	21	20	5	(15)	6	(15)
2	53	31	(29)	7	(21)	15	(39)
3	32	20	(19)	6	(18)	6	(15)
4	23	15	(14)	4	(12)	4	(10)
5	16	10	(9)	3	(9)	3	(8)
6	9	4	(4)	3	(9)	2	(5)
7	2	--	(--)	1	(3)	1	(3)
No Response	4						
TOTAL =	183						

Table 6

Employment Status by Additional Household Earnings
$x^2 = 16.40$ (.0025)

Additional Earnings in the Household	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
No now/ no before	79	41	(52)	12	(15)	26	(33)
Yes now/ no before	20	17	(85)	3	(15)	--	(--)
Yes now/ yes before	74	49	(66)	15	(20)	10	(14)
No Response	10						
TOTAL =	183						

Table 7

Employment Status and Pre-Injury Employment, Full or Part Time
$x^2 = 2.15$ (.34)

Preinjury Employment	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
Full Time	50	50	(100)	--	(--)	--	(--)
Part Time	42	3	(7)	19	(45)	20	(48)
No Response	91						
TOTAL =	183						

Table 8

Employment Status and Length of Work Time With Employer
$x^2 = 14.89$ (.06)

Length of Time With Work and Employer	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
E 6 Months	25	10	(40)	10	(40)	5	(20)
6 to 12 Months	13	6	(46)	4	(31)	3	(23)
12 to 24 Months	16	8	(50)	3	(19)	5	(31)
24 to 48 Months	33	19	(57)	4	(12)	10	(31)
F 48 Months	91	65	(72)	12	(13)	14	(15)
No Response	5						
TOTAL =	183						

Table 9

Employment Status and Length of Time at That Job
$x^2 = 16.79$ (.03)

Length of Time at that Job	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
E 6 Months	25	11	(44)	10	(40)	4	(16)
6 to 12 Months	17	7	(41)	6	(35)	4	(24)
12 to 24 Months	14	10	(71)	3	(21)	1	(8)
24 to 48 Months	23	14	(61)	3	(13)	6	(26)
F 48 Months	101	64	(63)	11	(11)	26	(26)
No Response	3						
TOTAL =	183						

Before we turn to the central issue of rehabilitation efforts that were made on behalf of the work-injured, it is important to understand the nature of the injuries that were suffered by the 183 respondents. This information is presented in table 10.

Given what has already been said--four out of every 10 work injured respondents were not working when contacted--table 11 offers depressing news indeed: That is, 90 percent of the respondents had not participated in any skill training as part of their rehabilitation.

Persons who were contacted in the telephone followup to the mailed survey were asked if they wanted training. Table 12 presents the 81 answers given. Approximately half of those responding expressed a desire for training, with the highest percentage of affirmative answers appearing in the "Have worked, but not now" category. This is not surprising, of course, since persons who have been unsuccessful in obtaining steady employment would be expected to be most interested in training possibilities.

Tables 13 and 14 show that the few respondents who did receive training participated for a relatively short period of time and in a field generally unrelated to their previous work.

Of course, training is not the only support or rehabilitive service potentially available to work-injured persons. Table 15 presents the distribution of other services that respondents acknowledged. Forty-two percent of the respondents acknowledged receiving no services. Of those who did get help, most were assisted by their former employers. Again, there is a clear signal here that persons who are shunned by their previous employers are obvious candidates for assistance.

The final table attempts to convey an impression of how the work-injured respondents have spent their time since the accident occurred. Each cell of table 16 is self-contained; neither rows nor columns sum to 100 percent because each person's time was converted to a percentage distribution across the three activity categories, and then these were summed and averaged.

Earnings information was acquired from two sources. First, 91 respondents who returned a completed questionnaire were contacted by telephone and asked for pre and postinjury earnings information. And second, Social Security numbers for all respondents to the mailed questionnaire were submitted to the Missouri Divison of Employment Security to secure four calender quarters of earnings (October 1979 to September 1980) from the

Table 10

Employment Status By Type of Injury
$x^2 = 3.62$ (.16)

Type of Injury	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Row %	Number	Row %	Number	Row %
Amputation--Hand, Arm	8	5	(5)	3	(9)	--	(--)
Amputation--Foot, Leg	5	1	(1)	2	(6)	2	(5)
Burns--Hand, Arm	3	3	(3)	--	(--)	--	(--)
Burns to Body	15	9	(8)	2	(6)	4	(12)
Crushed, Fractured Heel	8	6	(6)	1	(3)	1	(2)
Crushed Hand, Arm	21	13	(12)	4	(12)	4	(10)
Fracture--Hand, Wrist	15	11	(10)	2	(6)	2	(5)
Fracture--Leg, Ankle	27	13	(12)	8	(24)	6	(14)
Fracture--Pelvis	6	5	(5)	--	(--)	1	(2)
Multiple Fractures	23	12	(11)	4	(12)	7	(17)
Gunshot Wound	2	2	(2)	--	(--)	--	(--)
Head Injury	4	--	(--)	1	(3)	3	(7)
Lacerated Tendon or Nerve--Hand, Arm	24	18	(17)	3	(9)	3	(7)
Lacerated Tendon or Nerve--Leg, Foot	2	2	(2)	--	(--)	--	(--)
Back Injury	6	2	(2)	--	(3)	3	(7)
Spinal Cord Injury: Paraplegia, Quadriplegia	6	2	(2)	1	(3)	3	(7)
Other	7	4	(4)	1	(3)	2	(5)
No Response	1						
TOTAL =	183						

This table was reduced to two groups to arrive at the chi square. Group 1 = upper extremity and group 2 = lower extremity (including more general spinal cord injuries).

Table 11

Employment State and Skill Training
$x^2 = 1.8$ (.40)

Type of Training	Total	Working Now		Since Injury: Have Worked But Not Now		Since Injury: Have Not Worked	
	No.	Number (ex. None)	Column % (ex. None)	Number (ex. None)	Column % (ex. None)	Number (ex. None)	Column % (ex. None)
None	164	92	( )	33	( )	39	( )
In School, Classroom, or Laboratory	6	4	(29)	--	(--)	2	(67)
On-the-job Training	9	7	(60)	1	(100)	1	(33)
Other	3	3	(21)	--	(--)	--	(--)
No Response							
TOTAL =	183	106		34		42	

Table 12

Employment Status and Desire For a Training Program
$x^2 = 5.87$ (.05)

Desire for Training	Total	Working Now		Since Injury: Have Worked But Not Now		Since Injury: Have Not Worked	
	No.	Number	Column %	Number	Column %	Number	Column %
Yes	39	19	(40)	12	(75)	8	(44)
No	42	28	(60)	4	(25)	10	(56)
No Response	102	59		18		24	
TOTAL =	183	106		34		42	

Table 13

Employment Status and Length of Training
x^2 = .87 (.65)

Length of Training	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Column %	Number	Column %	Number	Column %
E 6 Months	5	4	(31)	--	(--)	1	(50)
6 E 12 Months	4	4	(31)	--	(--)	--	(--)
F 12 Months	6	5	(39)	--	(--)	1	(50)
No Response	168						
TOTAL =	183	13		--		2	

Table 14

Training Related To Previous Work
x^2 = none

Relationship To Previous Work	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number	Column %	Number	Column %	Number	Column %
Not Related	13	11	(79)	--	(--)	2	(100)
Related	3	3	(21)	--	(--)	--	(--)
No Response	167						
TOTAL =	183	14		--		2	

Table 15

Employment Status and Services
x^2 = 29.77 (.02)

Assistance to Get Back to Work	Total	Since Injury: Working Now		Have Worked But Not Now		Have Not Worked	
	No.	Number (ex. None)	Column % (ex. None)	Number (ex. None)	Column % (ex. None)	Number (ex. None)	Column % (ex. None)
None	77	39	( )	18	( )	20	( )
Sent to Employers for Job Interviews	9	5	(7)	2	(13)	2	(9)
Career Counseling	12	4	(6)	2	(13)	6	(27)
Work Evaluation	1	1	(2)	--	(--)	--	(--)
Aptitude Testing	1	1	(2)	--	(--)	--	(--)
Interest Testing	1	--	(--)	--	(--)	1	(5)
Private Counseling	5	1	(2)	--	(--)	4	(18)
Assistance from Previous Employer	36	28	(41)	7	(44)	1	(5)
Other	40	27	(39)	5	(31)	8	(36)
No Response	1						
TOTAL =	183	106		34		42	

Table 16

Employment Status By Average Percent of Time Spent in Each Type of Activity Since Injury

Activity	Since Injury		
	Working Now (Number = 106) $\bar{x}$ percent	Have Worked But Not Now (Number = 34) $\bar{x}$ percent	Have Not Worked (Number = 42) $\bar{x}$ percent
Working	79	39	--
Not Working, but Looking	5	16	15
Not Working, or Looking	18	19	45

Note: The distribution of time among the three activity categories was computed for each person, and then the average (mean) of these percentages was computed within each of the three categories. Therefore, the column totals do not sum to 100 percent.

employer quarterly earnings and contributions file maintained for unemployment insurance purposes.

For the respondents who participated in the telephone interview and reported that they had worked full time both before and after the injury, a variable ratio of self-reported postinjury earnings to preinjury earnings was created. Of the 40 respondents who provided the necessary information, 5 respondents reported lower postinjury earnings (ranging from 63 percent to 92 percent of the previous level), while 10 respondents reported an increase of up to 10 percent over their previous earnings level; 24 respondents reported increases of 13 percent to 98 percent over their preinjury earnings; and one person reported an increase of 167 percent. It is important to remember that this is self-reported information limited to persons who had worked full time prior to being injured, who were working full time when contacted in the survey, and who participated in the telephone interview. In other words, this is not a cross section of the respondent sample.

A somewhat different perspective on earnings is achieved by looking at the earnings data acquired for 57 respondents from the Missouri Division of Employment Security. These are annual earnings data for all persons who appeared in the covered earnings file for the period October 1979 to September 1980. The mean annual earnings level for these respondents was $9,404, with a standard deviation of $7,569. The range covered figures from $70 to $27,611. Twenty-nine of the 57 respondents earned less than $8,000 during this 12-month period. Again, interpretive caution is urged. These data reflect only the injured people's own earnings, not the data for other earners who may be present in some of the households. No distinction is made between full-time, full-year employment as opposed to part-time or part-year work.

Cumulatively, the data reported in this section describe a population of work-injured persons, all of whom had made a commitment to working for pay and who have experienced varying degrees of difficulty in reestablishing themselves in stable and productive work situations. The limited earnings data that are available suggest that persons who were and are working full time are likely to have suffered little, if any, reduction in own earnings, but the annual earnings levels are far below general labor force averages. We have no information about the loss of income suffered by persons who are not now working. (See appendix B for informal comments by the respondents about their current situation.)

Of greatest importance from a congressional or executive agency standpoint is the clear evidence that work-injured persons make little use of skill-training opportunities, despite their full or partial loss of physical productive capability. Additional statistical analysis of the survey data proceeds, but it is possible now to offer a number of specific recommendations for Federal actions to be taken.

Section 4

Recommendations

This report has emphasized the industrial accident victim, but the recommendations the authors make have policy implications that affect many persons other than those injured on the job. The lack of cooperation between rehabilitation units in workers' compensation divisions and the State or Federal rehabilitation agency point to a general lack of cooperation among social service and human development programs serving the population of handicapped or disabled adults. Few of the accident victims in our sample who received vocational rehabilitation either from workers' compensation or the State agency were exposed to vocational skill training, retraining, or placement opportunities. Yet these people, although presenting a unique and complex array of problems, have substantial attachment to the labor force.

This situation indicates a problem of cooperation between the agencies that offer vocational education, vocational rehabilitation, and employment and training services. The small number of handicapped adults in vocational education and in CETA may stem from a lack of role clarification about what services each agency performs on behalf of the handicapped. Our recommendations therefore emphasize coordination and clarification of roles among agencies available to serve the work-injured adult:

1. We recommend congressional review to assure--

   -- Consistent definitions, in order to specifically identify handicapped adults;

   -- Specific language naming the agencies expected to coordinate; and

   -- Designation of priorities for each agency, to promote equity and efficiency in delivery of client services.

2. We also recommend programmatic reviews to determine--

-- Sources of duplication or omission, so appropriate administrative responsibility on behalf of the disabled can be assigned; and

-- A comprehensive method of "networking" to promote outreach and interagency cross-training.

The following subsections elaborate on these recommendations.

Consistent Definitions of the Handicapped in Order to Specifically Name Handicapped Adults in the Legislation

The Vocational Education Act (P.L. 94-482) largely addresses the needs of handicapped persons who are in school and who are up to and including 21 years of age. This language is necessary to comply with the Education for All Handicapped Children Act (P.L. 94-142). The Vocational Education Act does not specifically mention handicapped adults; the act makes only a general reference to handicapped persons and mentions that postsecondary institutions are eligible to receive vocational education funds under the law. This language only implies that handicapped adults can benefit from vocational education. At the State level, vocational education is known for its emphasis on area vocational-technical schools and secondary-level vocational education programs. Some vocational educators, while serving handicapped youths through these facilities, may not be responsive to broader community needs for retraining and developing the skills of handicapped adults. Unlike young people, out-of-school handicapped adults are not readily accessible; they require outreach efforts. Specifying handicapped adults in the law would emphasize their need for skill-training services. Establishment of consistent definitions among agencies serving the handicapped would contribute to identifying persons who can benefit most from direct service and determining what services are needed.

The agency that now evaluates handicapped adults is the State or Federal vocational rehabilitation agency. The vocational rehabilitation definition, as well as CETA's, is broad whereas the vocational education language identifies specific impairments. If the vocational education agency adopts the broader definition and supports coordination with the vocational rehabilitation agency and CETA to develop a consistent definition, all will have a better understanding of the types of handicapped persons to be served.

Identification of Agencies and Their Roles

This recommendation is offered in an attempt to eliminate vague terminology about which agencies are to coordinate under specified circumstances for what purposes. Currently, the Vocational Education Act simply refers to a "wide range of agencies" that are to be involved in coordinated activities. The Vocational Rehabilitation Act refers to coordination with "manpower programs." This ambiguity permits individual administrators to define their management practices virtually any way they wish.

Clarification of agency roles in coordinated activities would serve the twofold purpose of better informing program administrators about congressional expectations and of providing limited management guidance with respect to the specific roles that each agency is to play.

Agency Priorities to Promote Equity and Efficiency

Equity and efficiency in services to the handicapped by all agencies are affected by two factors. First, there is a need for more effective identification of handicapped persons who need the array of vocational training experiences. It is idealistic to maintain that all handicapped adults could benefit from, or want, formal or informal vocational skill training. It is often difficult and expensive to rehabilitate handicapped adults. Agencies must classify individuals as too disabled to work, in need of training or retraining to become employable, or immediately placeable. This classification requires a highly technical identification and recommendation process that should go beyond the medical, psychological, and "vocational potential" assessments now performed primarily by vocational rehabilitation units for identification of appropriate clientele. Professionals familiar with labor market signals, forecasting, and available agency service must review these technical measures, as well as the appropriate education and work environment, training, and adaptive needs of clients. Clients' time and agency efforts often are wasted by ineffective evaluations or career assessments of the handicapped who are being served, however inappropriately, in a vocational setting.

A second factor affecting equity and efficiency of services is the need for clarification of each agency's role in the development of the handicapped's employability. The services each agency can perform and the services each agency should be responsible for need to be specified to provide a more streamlined and comprehensive mix of services for the handicapped and to minimize duplication of services. For instance, agencies

now have their own screening and identification process, which promotes duplication. A simple chart illustrates how the process could be streamlined.

A key feature in this flow of services is the identification and referral assignment stage. This multifunded agency cooperative effort pulls together the knowledge needed for such technical and vital decisions. Each handicapped person would be matched to the proper services provided by the appropriate agency. The identification and referral assignment would be administered by an impartial agency familiar with all the services available to the handicapped. To promote cooperation rather than competition, it is recommended that this effort be multifunded. And not only must priorities be established for appropriate screening of population and clarification of organizational roles, but a single agency must act as case manager for all agencies providing services to a particular client.

A Comprehensive Method of Networking

"Networking" consists of a thorough system of inservice or "cross-training" and access to information among all agencies that help the handicapped.

The most expedient way to implement change, improve efficiency, avoid duplication of services, and make the system work for the client is to provide inservice training programs "cross-training"--for personnel from all three agencies: vocational education, vocational rehabilitation, and workers' compensation. Inservice training provides an opportunity to exchange information, to promote consistency, cooperation and better communication, and to define each agency's responsibility. Despite obvious overlaps among the three agencies serving injured workers, staff persons from these agencies rarely have opportunities to coordinate services, discuss problem cases, and find alternatives for hard-to-serve clients.

If inservice training is to act as an effective communication forum and provide the desired results (better services for handicapped as well as disabled workers) inservice training sessions should be held quarterly. Administrative support for such training must be assured; effective training will take place only if attendance is mandated for all three agencies.

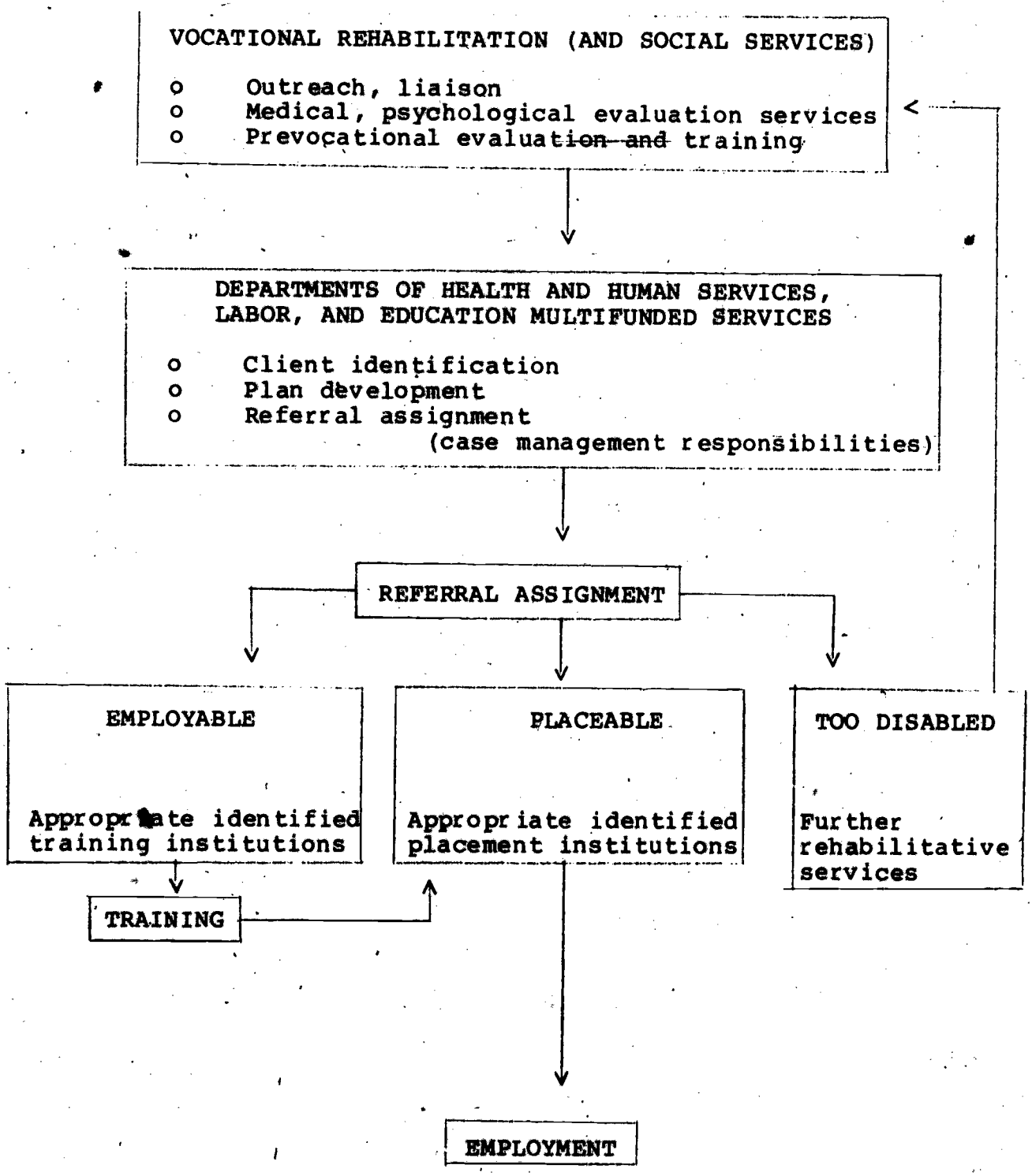
Uniform legislative mandates should specify network coordination efforts among vocational education agencies, CETA prime sponsors, the Job Service, vocational rehabilitation agencies, and State workers' compensation units. Information about injured workers that require services must be shared. Each agency must have access to medical, psychological, and

vocational information. At present, this coordination is not implemented at the client level. If the legislation specifies the types of coordination, who is responsible for what, and how often staff members should meet to exchange basic information, work-injured persons will have access to workable plan for re-entry into the labor market. When computerized recordkeeping is not available, there is likely to be a need for new procedures to assure timely tracking of client status.

This approach would end rhetorical endorsement of cooperation and linkages, and give substance to measures to improve cooperation and to achieve a network. Without a specific step-by-step guide written into the laws and administrative regulations, no change will occur, and the vague language will continue.

A major goal on behalf of the work-injured is to provide services and training that will insure a return to gainful employment. Without question, vocational education programs offer a potential opportunity for the disabled work injured to receive new training, retraining, and placement assistance. Yet seldom do injured workers take advantage of this opportunity. There are several reasons for this limited use. The recommendations offered here will help the disabled work-injured person only if the major linkages described are established or solidified. Interagency networking systems already exist or are being established in many States to help other target groups. Unless the work-injured are identified by the State vocational rehabilitation agency, this population may not be able to take advantage, or may be ignorant, of the range of services offered. To date, only half the States have even paper cooperative agreements between their workers' compensation and vocational rehabilitation agencies.

Vocational education agencies cannot force the proposed linkages, but there are several ways to promote coordination at the State level. One is to fund a liaison position through either the Vocational Education Act or the Comprehensive Employment and Training Act to coordinate with vocational rehabilitation and workers' compensation units. Without such a dedicated position, no one person will be accountable for the actual coordination of services. A dedicated position would avoid duplication of services and help people who would otherwise fall out of the service network and probably drop out of the labor market.


VOCATIONAL REHABILITATION (AND SOCIAL SERVICES)
o Outreach, liaison
o Medical, psychological evaluation services
o Prevocational evaluation and training
DEPARTMENTS OF HEALTH AND HUMAN SERVICES, LABOR, AND EDUCATION MULTIFUNDED SERVICES
o Client identification
o Plan development
o Referral assignment
(case management responsibilities)
REFERRAL ASSIGNMENT
EMPLOYABLE
Appropriate identified training institutions
PLACEABLE
Appropriate identified placement institutions
TOO DISABLED
Further rehabilitative services
TRAINING
EMPLOYMENT

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APPENDIX A

TECHNICAL ASPECTS OF THE SAMPLE SURVEY OF WORKERS' COMPENSATION BENEFIT RECIPIENTS IN MISSOURI 1975-1979

The Population

The population studied was drawn from Missouri's industrial accident victims classified as permanent partial workers' compensation claimants between January 1975 and September 1979. Included among permanent, partially disabling injuries are those deemed serious enough to warrant physical-vocational rehabilitation. According to Missouri's Workers' Compensation Law and Regulations (1980), "'permanent partial disability' means a disability that is permanent in nature and partial in degree" (387.190,6.); loss of some physical capacity, hearing, sight, or both is included. About 250 "industrial work-injured" persons referred to physical rehabilitation in Missouri during the period under examination; the permanent, partially disabled population of the State is approximately 4,000.

Missouri's Workers' Compensation Law and Regulations (1980) further state that "the Division's supervision of physical rehabilitation cases is limited to those of workers who are seriously injured. . . ." Serious injury is not precisely defined, "but the usual meaning of 'serious' as grave or viewed with apprehension should be given. Among others the Division considers the following as serious injuries: quadriplegia, paraplegia, amputations of hand, foot or leg; atrophy due to nerve injury or non-use; back injuries not amenable to recognized medical and surgical procedures" (50-4010) (19-20). Thus it can be seen that the population sampled for this study included those with the greatest apparent need for assistance to return to work. Of the approximately 250 new claimants referred to physical rehabilitation each year in Missouri, approximately 50 are referred to the State or Federal office of vocational rehabilitation to obtain further help to enable them to return to the labor market.

Sampling Techniques

Random selection from Missouri's permanent, partially disabled accident victims who received physical or vocational rehabilitation, or both, for the period 1975-79 was made. Approximately 100 workers' compensation closed cases from each year were selected, controlling for the following factors: severity of injury, age, and type of work. Persons selected sustained more severe injuries than simple fractures or cuts.

To obtain a distribution of injuries, each worker's compensation code was assigned a "mild," "moderate," or "severe" designation based on a professional judgment of the injury. An attempt was made to sample heavily from the moderate category (see appendix B).

The sample excluded persons with hearing or visual injuries, as well as those with occupational diseases. The sample included a mix of injuries approved for rehabilitation services from workers' compensation, plus persons referred to the State vocational rehabilitation agency.

Demographic and pre- and postinjury data were obtained for the sampled participants by using a combination of four techniques: We consulted data on file in the Missouri Division of Workers' Compensation office, we used a mail questionnaire, we followed up with a telephone survey, and we consulted quarterly earnings data from the Missouri Division of Employment Security.

On January 17, 1981, a pilot questionnaire was mailed to 25 former claimants of workers' compensation, and on January 27, 15 reminder letters were sent to the nonrespondents. Then a refined questionnaire was mailed to those drawn from the 1975-79 period. On March 12, 1981, a reminder postcard was mailed to the nonrespondents. From a total population of 498, including the pilot phase, 184 usable questionnaires were returned (37 percent).

QUESTIONNAIRE CODE ASSIGNMENT

All persons in the sample were assigned an injury code number when they entered the Workers' Compensation Division's system. Those numbers were placed in numerical order by year and then assigned a questionnaire code.

Year	Severity of Injury	Questionnaire Code Number		Sample Number	Pilot Sample	Total By Year
1979	Severe	79-201	S	10		
1979	Moderate	79-301	MO	65	5	90
1979	Mild	79-401	MI	10		
1978	Severe	78-501	S	11		
1978	Moderate	78-601	MO	72	1	93
1978	Mild	78-701	MI	9		
1977	Severe	77-801	S	14		
1977	Moderate	77-901	MO	68	10	103
1977	Mild	77-1001	MI	11		
1976	Severe	76-1101	S	13		
1976	Moderate	76-1201	MO	78	4	105
1976	Mild	76-1301	MI	10		
1975	Severe	75-1401	S	13		
1975	Moderate	75-1501	MO	79	5	107
1975	Mild	75-1601	MI	10		
				473	+ 25	= 498

PILOT MAIL-OUT

Twenty-five persons were selected for the pilot study. Code numbers were assigned for each year starting at 01. (example: 79-01.) The following is a break-out by year.

1979 - 5

1978 - 1

1977 - 10

1976 - 4

1975 - 5

25

APPENDIX B

SELECTED RESPONDENTS' INFORMAL COMMENTS

1. "If there is any additional information that could be helpful in any way, do not hesitate to call. I might add that I received invaluable help from the Counseling Services at a rehabilitation center at Columbia in addition to my extensive physical rehabilitation."

2. "My comment is: A [person with] a work-related injury should be compensated [with] more money during his disability. Because these days of high food, heating, and other prices the amount received is starvation! Thank you. P.S. My injury caused a 14-1/2 month lost wages--see what I mean."

3. "Yes there is one thing I'd like to say. [A]fter I went back to work for this company, the boss kind of gave me a hard time. And I worked for him about six months after the accident, and then he told me his insurance went sky high and told me to find another job, so I found another job 4 months later."

4. "I had very little help from any organization after the 40 weeks of workman's compensation were up. Tried Social Security, Welfare, Salvation Army, and could get no help. If my father [had] not have left me some money when he died I would have starved. I am still having trouble with my leg, but it is getting better."

5. "Workman Comp. after a person has worked over 10 to 15 years. The company should be made to keep person or persons employed, not kicked out and put to pasture. The injury doesn't heal properly and arthritis set[s] in your joints and they don't pay enough for injury."

6. "Before the accident I was planning on going to L.V.N. school (nursing) as soon as my last child was in school. I was just working to help out until I could get in school. I had already gotten my G.E.D. (High school diploma) and checked into nursing school. Since the accident I am unable to be on my feet for long periods of time. I have considerable pain if I do much walking at all. I was advised that I could not do any type of work that required me to be on my feet for any length of time. I would like to find a good job that would be interesting and would pay fairly good so I

could be more independent. Our income has changed considerably because my husband is a building contractor and, as you know, building has been very slow because of the economy."

7. "I feel that when you are injured on the job that the law is set up too much to protect the employer. The employee has to go to the doctor the company provides, at the time I was injured workman's comp. only provided $95 a week. Have you ever tried living on that? It's not easy! The disability rating is too low. Missouri needs to revamp its workman's comp. to help the employee. He is the one who has lost the blood! It's a shame for them to have to lose their house or car also. Remember the workers pay taxes also. If you would like to call I would be happy to talk to you. Maybe this law can be brought up to date."

8. "My employer told me any time I felt like it I could return to work 1 hr. or as many hrs. that I felt like I could put in. He was very fair and still is. Thank you."

9. "My hand was hurt on July 25, 1975. I was off work for 2 months. Went back to work and had 4 months light duty. I went back to the same job until it was discontinued, then began working in quality control. The plant I work for was very cooperative and considerate."

10. "I only referred to my latest on-the-job injury. I have been injured seriously on the job 3 different times. One of these injuries has left me with a very bad back and partial disability. One of these injuries has impaired my left hand."

11. "Answer to number 3--This injury occurred in May 1976. For 3 years I did not work. Then took a job in a fast food service place. Same type of work. Then because of back injury had to leave this job. My employer at this time has no insurance of any kind. This happened in November 1980. So far I have not worked, but would like to do something. My only income is Social Security."

12. "I'd like to comment on the cooperation, sincerity, competence and efficiency of the vocational rehabilitation agency. They rate excellent scores. I wish I could say the same of the other agencies I've had to deal with since my injury."

"Did not know skill training was available."

I was sent a form for retraining but never heard anything from the division."

I was offered job training, but I didn't think it was necessary. But I am now interested in [maybe] taking a class."

Mr: You want to know how I am doing after my injury. I had to go into business for myself. My wife never did have to work but she does now. I can't write very good at all. I eat pain pills day and night. I get up, walk the floor at four; I hurt so much I couldn't sleep. As [for] rehabilitation, the man I talked to never done anything for anybody that I talked to. I have a bad left hand and a bad right leg. I have headaches so bad at times that I go get shots to put me to sleep. And I still try to work when I can. And this state has able-bodied people on total Social Security that are drunk half the time. At the time I got hurt I had had a headache for two days and nights, but I still had to work. If I sound bitter, I am. This country helps people that comes from other countries and don't help the ones that are here. God help this country for it sure is headed downhill."

"I had to demand I wanted to return to work and to see if I could do porter and labor work after my injury. As it worked out, they are the only 2 jobs I can do and handle. The work is slack in summer months. I have been laid off 3 to 4 months each year since my injury. I have been with my employer for 34 years and am now the oldest employee there. Therefore I am a steady worker."

"I am still in school and will receive my Master's Degree in Rehabiliation counseling in May."

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