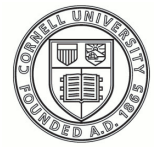

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Trends in the Payoff to Academic and Occupation-Specific Skills: the Short and Medium Run Returns to Academic and Vocational High School Courses for Non-College Bound Students

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Using data from three longitudinal surveys of American high school students, I show that vocational courses helped non-college-bound-students to start their work life more successfully, in terms of steadier employment, higher wages and higher earnings. A comparison of the returns to academic and vocational course work for non-college bound students who graduated in 1972, 1980 and 1992 finds that the short and medium term payoffs to vocational courses rose substantially between 1972 and 1980 and remained high in 1992. Holding past and present school attendance and a host of other variables constant, academic course work in high school had much smaller labor market payoffs than vocational course work. These findings contradict the oft repeated claim that employers now seek workers with a good general education and are happy to teach the occupation specific skills necessary to do the job. Instead, they imply that the payoff to the occupation specific skills developed in schools has risen along with the payoff to generic academic skills. High school students who do not plan to attend college full-time would be well advised to start developing skills in a well paying occupation before they complete high school.

Keywords

high school, student, vocational, college, earnings, academic, pay, skills, occupation

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Abstract

Using data from three longitudinal surveys of American high school students, I show that vocational courses helped non-college-bound-students to start their work life more successfully, in terms of steadier employment, higher wages and higher earnings. A comparison of the returns to academic and vocational course work for non-college bound students who graduated in 1972, 1980 and 1992 finds that the short and medium term payoffs to vocational courses rose substantially between 1972 and 1980 and remained high in 1992. Holding past and present school attendance and a host of other variables constant, academic course work in high school had much smaller labor market payoffs than vocational course work. These findings contradict the oft repeated claim that employers now seek workers with a good general education and are happy to teach the occupation specific skills necessary to do the job. Instead, they imply that the payoff to the occupation specific skills developed in schools has risen along with the payoff to generic academic skills. High school students who do not plan to attend college full-time would be well advised to start developing skills in a well paying occupation before they complete high school.

The early 1980s witnessed a considerable public debate on the success of the US educational system in providing young people, especially those not bound for college, with the skills necessary for success in the modern labor market. The 1984 report by the National Commission on Excellence in Education, "A Nation at Risk", argued that American youth were poorly prepared to meet the opportunities and challenges of the new "learning society". The main recommendation of the National Commission was that all high school students should take at least 4 year long English courses, 3 mathematics courses, 3 science courses, 3 social studies courses, and a semester course in computer science.

> "Whatever the student's educational or work objectives, knowledge of the New Basics is the foundation of success for the after-school years and, therefore, forms the core of the modern curriculum"[1]

These proposals were justified as necessary to "maintain the slim competitive edge we now hold in international competition." Despite the centrality of economics to their case for educational reform, vocational education (courses in business, auto repair, construction trades, etc.) was ignored. Calls were made for more rigorous academic courses, but not for more rigorous vocational courses.

These recommendations apparently reflected the Commission's belief that competitiveness problems were due to workers' lack of basic and general knowledge, summarized in capabilities such as reading, writing, math, science, speaking/listening, and reasoning. Apparently, the Commission, as many others, considered that the new "key" concept of "learning how to learn" was best achieved by developing basic academic skills, not "narrow" vocational training[2].

These analyses and recommendations have influenced policy makers. In the years following the report's publication, many states increased the number of math and science courses required for graduation and sometimes also English and social studies requirements have been raised as well[3]. The percentage of high school students taking the program (4+3+2+2) has increased from 30% of all students in 1982 to 67% in 1990[4](U.S. Department of Education, 1993).

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[1]A Nation at Risk (1984), pg. 70.

[2]See for example Steering Committee (1982). Howell and Wolff (1991) also found that during the 1980s it is possible to observe an increasing demand for interactive and cognitive skills and a declining trend for motor skills.

[3]Between 1980 and 1990, 31 states and the District of Columbia increased their graduation requirements in mathematics; also 24 states and the District of Columbia did the same for science. In addition, nine states that had neither minimum math nor science requirements established at least one of them. Language arts requirements were increased in at least 14 states, and 19 states increased their social studies requirements (Education Commission of the States, 1993).

At the same time, the number of vocational credits taken by high school students declined by 21% between 1982 and 1992 even though the total number of credits completed by high school graduates increased by 10% in the same period[5]. Table 1 summarizes these figures.

Table 1

Average number of Carnegie units earned by high school graduates in the academic. vocational and personal use curricula

	TOTAL	ACADEMIC	VOCATIONA	PERSONAL
1982	21.4	14.2	4.6	2.6
1987	22.8	15.6	4.4	2.7
1990	23.5	16.7	4.1	2.7
1992	23.8	17.3	3.8	2.7

Source: Tuma, J,, "Measuring Enrollment and Participation in secondary vocational education with high school transcript records"

The rising payoff to college has induced more students to aspire to college. This has naturally led to more students choosing a college-prep high school curriculum and this is probably the primary reason for the decline in vocational course taking. While a heavy focus on academic courses will obviously payoff for college-bound students, they represent only half of 19 and 20 year olds. What kind of curriculum is best for the others—those who get or seek full-time work within a year or so of graduating from high school?

Some states have apparently decided to require non-college bound students to focus solely on the New Basics. Access to vocational courses has been reduced in order to make room in student schedules for additional required academic courses. Iowa, for example, has phased vocational education almost completely out of its high schools. High school students are allowed to take occupationally specific courses in community colleges but few do. Advocates of this policy thrust often claim that "front line" workers with a high school education now need basic academic skills most of all; occupational skills can be easily learned on the job. Some educational reformers claim that the skill content of jobs is becoming increasingly generic and academic. The rising return to college is taken as evidence of increasing returns to generic communication and

[4]These figures correspond to the number of Carnegie units in, respectively, English, social science, science, and mathematics that must be done to graduate from high school. The number of students taking the program proposed by A Nation at Risk (4+3+3+3+.5) also experienced a sharp increase, shifting from a 2.9% of all students in 1982 to a 23% in 1990.

[5]Although it seems natural to relate the increasing number of academic courses required or graduation with the declining number of vocational courses taken, the National Assessment of Vocational Education couldn't find direct statistical evidence on this relationship (NAVE, 1994). Probably, another important reason of this trend is the so called U.S. "college culture" that devalues intermediate, applied workforce skills and characterizes vocational courses as a way of relegating people to a future of low-paying, dead-end jobs (Hoachlander, 1994).

mathematics skills not increasing returns to the occupation specific skills (engineering, computer programming, business management, nursing, etc.) or to both types of skills.

Bishop (1995) challenges the theory of a growing academic skills bias in the new workplace, at least on the shop-floor level. He points out that studies comparing workers doing the same job have found that high productivity depends on social abilities (such as dependability and people skills) and cognitive skills specific to the occupation and the job not directly on reading, writing and mathematics skills. Academic skills help workers develop the occupation/job specific skills that are directly productive, but cannot be a substitute for them. Bishop argues that if you know the occupation you want to enter, school based training in that occupation raises your likelihood of getting a job in the field, your productivity in the job, and your likelihood of getting further training from your employer.

The thesis that rewards for generic academic skills have risen more than rewards for occupation specific skills has not been subjected to rigorous testing. As Altonji says:

> "There is much public discussion but almost no evidence on the effects of high school curriculum on postsecondary education and on success in the labor market"[6]

Furthermore, there is some empirical evidence that the payoff to vocational course work for non-college-bound students actually increased for those students graduating in 1980 relative to those graduated in 1972 (see next section of this paper).

Assuming a competitive labor market, if skill requirements have been becoming more "academic", one should expect the returns to academic course work to have risen over the last 20 years. Improvements in the labor market success of those students with broader academic skills might, therefore, be interpreted as evidence of a change in skill requirements.

This paper will focus on three important issues related to the curricula debate. Did the rise in the payoff to academic course work for non-college bound students that was assumed and/or predicted by the Commission actually occur? What happened to the payoff to vocational courses during this same period?. To answer this question, I will measure the labor market effects of vocational and academic courses taken in high school for three different cohorts of high school graduates, the class of 1972, 1980, and 1992.

The second purpose of this paper is to assess how long lasting the effects of high school course work on labor market outcomes are. Do the returns to academic and vocational course work increase or decrease in the years after graduation from high school? Is there a trade-off in vocational education between short and long run returns?.

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[6]Altonji (1994), pg. 409.

Finally, the paper examines whether the optimal course taking strategy is some mix of vocational and academic courses. This issue will be addressed by formally testing whether there are diminishing returns to each type of course work.

The paper proceeds as follows: Section 1 reviews the research on the influence of the high school curriculum on labor market outcomes. In Section 2 I describe the data. Section 3 provides the short run analysis with a preliminary descriptive analysis of the data, the econometric model used and the short run regression results. Section 4 presents the medium run analysis organized as in Section 3. In Section 5, I summarize the main results and make some suggestions about future research.

1. A BRIEF REVIEW OF THE LITERATURE ON THE EFFECTS OF THE HIGH SCHOOL CURRICULUM ON LABOR MARKET OUTCOMES

Early studies of the impact of high school vocational education on labor market success tended to find either small wage differences between former vocational and non- vocational students or even negative differences for vocational concentrators, especially for males (Grasso and Shea, 1981; Gustman and Steinmeier, 1981; Woods and Haney, 1981). Using the first wave of transcript data collected for the NLS-Youth data, Rumberger and Daymont (1982) defined variables for the share of course work during the last three years at high school that was vocational, and the share that was neither academic nor vocational. Their findings were that vocational concentrators were more likely to be employed but male concentrators had 3 percent lower wage rates and females concentrators received no wage premium. Rumberger (1984) found the same results in a later study.

Analyzing NLS-72 data, Meyer (1981) used school reports of the number of courses taken in vocational and non-vocational fields to define a continuous variable: the share of courses that were vocational. He found that there was some payoff for concentration in certain vocational tracks but it was not very high. Females who devoted one-third of their high school course work to clerical training, earned 13 % more during the 7 years following graduation than those who took no vocational courses. For males, specialization in trade and industry were associated to 2.8 % higher earnings.

Analyses that use data from students who graduated from high school in the 1980's tend to find higher returns to vocational course work (Bishop, 1995). Campbell and Basinger (1985), using transcripts to define a dummy variable for being a vocational concentrator, found that both young men and young women who specialized in vocational courses and obtained jobs related to their field of training, tended to earn more (5.6 % higher in 1983 and 2.2 % higher in 1985)

than otherwise comparable youth who pursued an academic curriculum. In a parallel analysis using a different data set, Campbell et al. (1987) found that vocational graduates were 14.9 % more likely to be in the labor force and were paid 9 % more per month than academic graduates. This study showed that vocational education had a positive effect on earnings because vocational concentrators worked longer hours and also showed that, in order to reach these higher earnings, it was very important for the vocational graduate to enter a career related to the vocational education. Finally, they suggested that vocational education returns diminish as time since graduation increases.

Kang and Bishop (1986) used students' reports of courses taken in different vocational and academic areas as a measure of curriculum. They found a positive impact of vocational course work on wage rates and earnings immediately after graduation, but it depended on which vocational courses students took. Males who concentrated on trade and technical or other vocational courses by cutting back on academic courses earned 21-35% more during the year after graduation. For females, an even bigger earnings differential (40%) was associated with specializing in office or distributive education. These authors proposed in a later paper (Kang and Bishop, 1989) that vocational and academic courses should be considered as complements, and they concluded that, although vocational courses showed better payoff for high school graduates not attending college, complete specialization in vocational courses which ignore training in basic skills would not be as effective as one which provided both vocational and basic skills.

The more recent research literature also tends to find positive effects of vocational course work on labor market outcomes. Analysing data from both High School and Beyond and the NLSY, Campbell and Laughlin (1991) confirmed earlier conclusions about the positive relationship between earnings and vocational education when marketable skills were developed and a training-related job obtained.

Some research even suggests a very high long-run return to vocational work. Gray and Huang (1992) found that high school vocational education had positive effects on yearly earnings and that these effects were not related to further attendance of technical or community college after high school. Gray et al., (1993), using data from the NLS-72 and defining the high school courses taken by students with the counselor-coded data, found positive long-term effects (fourteen years after graduation) of high school vocational education on earnings as high as the returns of college degree, both for males and females.

Finally, Crawford et al. (1995) found that vocational programs were correlated with a lowered earning potential, although, as they suggested, their analysis failed to control some very important characteristics that could be introducing important bias on the coefficients.

2. DATA

Three data set are used in this study: the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High School and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88). These data sets are nationally representative databases designed to provide comparable information about the transition of different cohorts of American youths from schools into the adult society. All were organized in a similar way: first, students were surveyed in the spring of their graduation year (1972, 1980 and 1992 respectively) and asked about the number of courses taken in each subject, extracurricular activities, educational expectations and aspirations, and a variety of personal and demographic characteristics. Follow-up surveys were conducted tracking employment, job history, education and other training, earnings, and changes in family status.

The sub-sample of base year high school seniors selected for study were those who had:

1. Graduated from high school between May and December of graduation year; and
2. Not attended school or college full time for more than 6 months during the period of 21 months following graduation[7].

Table 2 reports how many individuals satisfy the selection criteria. Note how the proportion of seniors not enrolling full-time in the post-secondary education rose between 1972 and 1980, probably as a consequence of the 1970s bust in the labor market for college graduates. This proportion then fell dramatically from 1980 to 1992 probably due to the booming labor market for college graduates during the late 1980s (Bishop, 1996).

[7]This period is referred to as the short run. It was defined this way because it was the only period available for the NELS-88 cohort. There is a small difference with NLS-72 where a period of 24 months had to be used. Note that part-time students are included in the sample and control variables are included that control for the number of months the individual attended college full-time and the number of months attending part time. The same sample of individuals was used for analyzing the medium term impacts.

Table 2

Number of observations that satisfy the selection criteria.
Percentages over total number of graduates in each sample

	TOTAL	MALES	FEMALES
NLS-72	9440 (41.7%)	4492 (40%)	4948 (43.4%)
HSB-80	5998 (50%)	2803 (49.5%)	3195 (50.5%)
NELS-88	4839 (33%)	2489 (34.7%)	2350 (31.7%)

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High School and Beyond HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).

In the regression analysis, the number of observations are further reduced by the omission of those with missing data for certain key variables.

Three measures of the respondents' labor market success (annual earnings, the number of months in which the respondent worked during a year and the hourly wage of the last job held during the year) were defined for all of the follow-up years available in each data set.

Separate analyses are conducted for the "short" and the "medium" run. "Short run" labor market outcome variables are available for all three cohorts: 1972 grads, 1980 grads and 1992 grads. The three variables were, the number of months worked from June of graduation year through February of the second year following graduation[8]; the hourly wage of the last job held during that time period; and earnings during the first full calendar year after graduation.

"Medium run" outcomes are available only for 1972 and 1980 graduates. For NLS-72 medium run employment and earnings outcomes were available for the second, third, fourth, fifth, sixth and seventh years following graduation. For HSB-Seniors medium run employment and earnings data are available for the second through fifth years following graduation. Earnings and employment variables are defined for fiscal years in NLS-72 and for calendar years in HSB data. Hourly wage data is available for the third through seventh years after graduation in NLS-72 and for the fourth and sixth year after graduation for HSB-Seniors.

Student were asked about the number of years of courses taken in each of the following fields: mathematics, sciences, social sciences, English, foreign languages, trade and industry, business and sales, technical and other vocational. The continuous measures of vocational and

[8]For NLS-72 the time period runs three additional months. This way of defining employment fails to capture the effects of being part time worker. This must be taken into account when comparisons are being made between models predicting the three different labor market outcomes.

academic course work used in the analyses were derived from these student reports.[9] For NLS-72 and HSB-80 the data on course taking reflects those courses which graduates took the last three years in high school. For NELS-88 the data was collected using the whole high school period (four years).

Table 3

Number of courses taken in selected fields the last three years at high school for the full group of students (all) and for students not attending post-secondary education (sample)

	NLS-72				HSB-80				NELS-88*			
	male		female		male		female		male		female	
	sample	all	sample	all	sample	all	sample	all	sample	all	sample	all
English	3.02	3.04	2.99	3.04	3.03	3.07	3.08	3.12	3.67	3.52	3.85	3.75
Computer	---	---	---	---	--	--	---	---	0.36	0.37	0.41	0.38
Foreign Language	0.48	0.84	0.62	1.01	0.6	0.8	0.77	1.01	0.92	1.38	1.27	1.76
Mathematics	1.68	2.01	1.30	1.61	1.99	2.23	1.85	2.06	2.69	2.86	2.68	2.91
Sciences	1.54	1.83	1.27	1.53	1.63	1.87	1.51	1.72	2.41	2.65	2.42	2.67
Social Sciences	2.66	2.66	2.56	2.57	2.29	2.37	2.29	2.35	3.18	3.02	3.26	3.16
Total Academic	**9.37**	**10.37**	**8.74**	**9.77**	**9.54**	**10.34**	**9.35**	**10.12**	**12.86**	**13.42**	**13.47**	**14.25**
Business and sales	0.76	0.71	2.14	1.74	0.63	0.64	1.39	1.34	0.34	0.31	0.93	0.65
Trade and technical	1.38	1.07	0.10	0.10	1.43	1.22	0.38	0.33	1.15	0.69	0.22	0.13
Other vocational	0.61	0.48	1.34	1.13	0.79	0.69	0.66	0.59	0.79	0.55	0.83	0.53
Total vocational	**2.76**	**2.26**	**3.59**	**2.96**	**2.85**	**2.55**	**2.39**	**2.23**	**2.29**	**1.54**	**1.98**	**1.32**

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High school and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).
* For the NELS-88, means were calculated using the last four years at high school

Table 3 presents the mean number of one-year long courses taken in each subject by each cohort of high school graduates. For females, both non-college and college oriented students decreased the number of vocational courses they took during the 1972 to 1980 period and the 1980 to 1992 period. The distribution of vocational courses also changed. Females who graduated in 1972 mostly took the traditional business vocational courses. The 1980 female graduates took fewer business and other vocational courses but more trade and technical courses. The 1992 graduates took only half as many business courses as the 1972 graduates.

[9]For NELS-88 the courses taken in computer science were not included in either the vocational or academic total. Transcript data was not available for NLS-72 and for HSB seniors, so self report data was used throughout in order to maintain comparability across cohorts.

Males, by contrast, increased the number of vocational courses they took between 1972 and 1980 (especially for college-bound-students). A reversal follows and there is a big decline in vocational course taking between 1980 and 1992. The distribution shifts as well with the big declines coming in business and sales courses and in trade and tech. The decline of business courses between 1980 and 1992 may be due in part to the inclusion of word processing courses under the computer category.

3. SHORT RUN OUTCOMES

3.1 Preliminary tabular analysis

Let us begin by taking a preliminary look at the relationship between the number of courses taken and three indicators of early labor market success[10]. Table 4 presents for both males and females the mean values of the number of academic courses taken and the three labor market outcomes for sub-samples classified by the self-reported number of full-year courses taken in vocational subjects during the last 3 years of high school (four years for NELS-88).

The number of academic courses tends to decrease as the number of vocational courses increases. For 1972 and 1980 graduates adding four vocational courses tends to reduce academic courses by one. For 1992 graduates a four unit increase in vocational courses is associated with a two unit decrease in academic courses. Clearly vocational concentrators must either have taken more courses overall or fewer non-academic electives.

Non-college bound students graduating in 1980 or 1992 were much more likely to work steadily if they had taken a substantial number of vocational courses. This was not true for 1972 graduates, however. For our sample of non-college bound females, vocational concentrators were no more likely to be working than those who took no vocational courses. For male 1972 graduates there was a relationship but it was quite weak.

[10] The share of months that the individual was employed in the 21 or 24 month period after graduating; the hourly wage in the last job held; and earnings during the first full calendar year after graduation.

Table 4

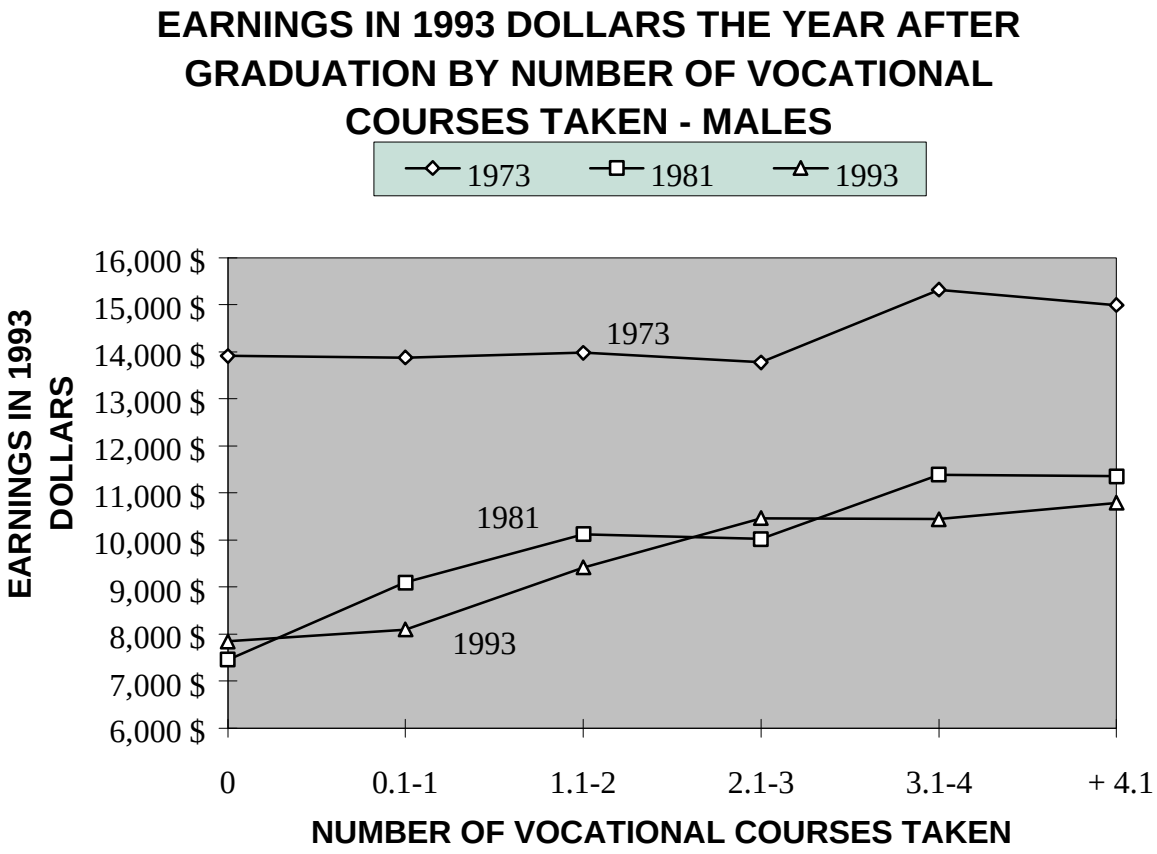
Impact of vocational course work on early labor market outcomes of high school graduates who do not attend college full time

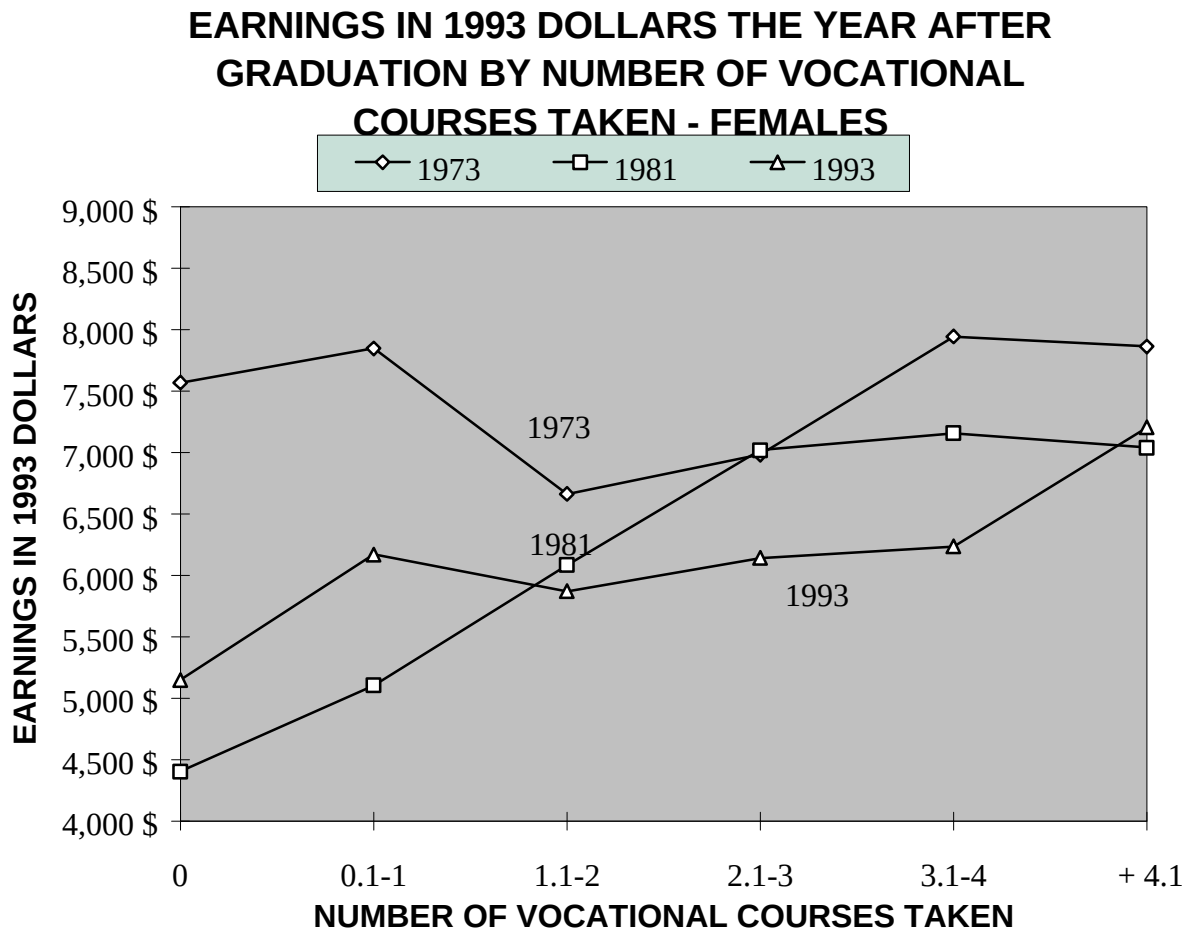
Number of full-year vocational courses	Number of full-year academic courses			Percentage of months worked			Hourly wage in 1993 dollars			Yearly earnings in 1993 dollars 1 year after graduation		
FEMALES	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88
0	8.45	9.91	14.49	61%	40%	66%	8.12	6.95	5.49	7571	4404	5148
0.1-1	10.00	9.63	13.92	60%	46%	71%	8.62	6.81	5.81	7849	5105	6171
1.1-2	9.61	9.24	13.63	56%	49%	70%	8.21	6.84	6.14	6662	6084	5871
2.1-3	9.14	8.97	13.37	57%	56%	76%	8.57	7.20	5.53	6983	7019	6141
3.1-4	8.60	8.95	12.59	60%	57%	73%	8.76	7.04	5.67	7944	7157	6235
+ 4	8.30	9.19	11.84	62%	52%	76%	8.14	6.86	6.03	7865	7042	7205
MALES	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88
0	9.84	9.98	13.93	73%	52%	73%	10.84	7.73	6.01	13914	7459	7843
0.1-1	10.48	9.69	13.83	75%	55%	76%	11.29	8.08	6.53	13880	9095	8098
1.1-2	9.68	9.26	13.31	74%	58%	78%	11.14	8.13	6.21	13978	10124	9415
2.1-3	9.18	9.14	12.60	76%	58%	83%	11.31	8.29	6.46	13776	10018	10465
3.1-4	8.95	9.20	11.99	79%	65%	85%	11.13	8.24	6.58	15319	11391	10439
+ 4	8.42	9.38	11.03	76%	62%	87%	11.16	9.04	6.57	14995	11353	10791

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High school and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).

* For the NELS-88, means were calculated using the last four years at high school

Hourly wage rates appear to be less responsive to course taking patterns than employment. For females the relationship is clearly non-linear with the highest wages obtained by those with modest amounts of vocational course work. For males the relationship is generally positive but strong only for 1980 graduates. Earnings results are presented in Figures 1 and 2.





For males, larger numbers of vocational courses are associated with higher earnings the year after graduation. Note how the slope of the earnings line for the 1972 cohort is much flatter than for the other cohorts. For females, the results are similar to those for males, with the only exception that the 1972 cohort presents a clear U form. In many cases the slope appears to be flatter for high levels of vocational course taking. This suggests that the payoff to vocational course work may be subject to diminishing returns, a possibility that will be tested in the regression analysis to follow.

Table 5 shows for both males and females the mean values of the number of vocational courses taken and the three labor market outcomes for sub-samples classified by the self-reported number of full-year courses taken in academic subjects during the last 3 years of high school (four years for NELS-88).

Table 5

Impact of academic course work on early labor market outcomes of high school graduates who do not attend college full time

Number of full-year academic courses	Number of full-year vocational courses			Percentage of months worked			Hourly wage in 1993 dollars			Yearly earnings in 1993 dollars 1 year after graduation		
FEMALES	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88	NLS-72	HSB-80	NELS-88
0-6	3.85	2.50	1.32	59%	55%	51%	8.15	7.13	7.77	7755	6891	4809
6.1-8	4.06	2.65	2.44	61%	53%	63%	8.30	6.77	5.24	7611	6901	5729
8.1-10	3.54	2.39	2.82	58%	48%	71%	8.54	6.94	5.45	7402	5796	5643
10.1-12	3.13	2.38	2.74	62%	48%	72%	8.33	7.13	5.14	7375	5698	6254
12.1-14	2.64	1.84	2.24	60%	42%	74%	8.85	6.85	5.95	8128	5247	6642
+ 14	1.94	1.70	1.39	64%	48%	76%	8.66	6.64	5.24	8789	4681	6304
MALES												
0-6	3.24	2.547	1.99	74%	58%	77%	11.40	8.33	6.15	14676	10450	9884
6.1-8	3.32	2.989	3.43	77%	60%	81%	11.04	8.28	7.23	14716	11138	10584
8.1-10	2.64	2.938	3.29	76%	60%	82%	11.37	8.33	6.46	14692	10249	9916
10.1-12	2.14	2.672	3.07	76%	57%	83%	11.16	8.54	6.37	13590	9008	10298
12.1-14	1.70	2.435	2.38	74%	53%	83%	10.75	7.84	6.35	13948	8589	10133
+ 14	1.45	2.559	1.37	67%	59%	80%	10.49	8.02	5.99	12539	7966	8657

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High school and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).* For the NELS-88, means were calculated using the last four years at high school

For males, those who took a medium number of academic courses always worked more. For females, in the 1972 and 1992 cohort there is a premium on being academic concentrator but this is not observed for the 1980 cohort. With respect to the hourly wage rates, it is clear that both for males and females a medium-low level of academic courses is associated with higher hourly wages. Finally, for the yearly earnings males who took a low (especially for 1972 and 1992 cohorts) or medium number of academic courses obtained higher earnings. For females it is observed that for the 1972 and 1992 cohorts the best results are obtained by academic concentrators whereas for the 1980 cohort there is a premium on taking few academic courses.

To sum up, vocational courses are associated with improved early labor market outcomes for high school graduates who do not go to college full time. Again conditional on not going to college full time, taking additional academic courses is associated with lower earnings in the short run. The positive association between vocational courses and earnings is strong in 1993, even stronger in 1981 and weak or non-existent in 1973. The return to vocational courses appears to diminish as the number of courses increases. Kang and Bishop (1989) interpreted this non-linearity as reflecting an underlying complementarity between academic and vocational courses. Association does not imply causation. The next section of the paper tries to get at the issue of causality by estimating models that include controls for background characteristics of the student that affect labor market outcomes and are associated with vocational course taking.

3.2 Econometric specification of the model

The goal of the paper is to assess the short and medium run impact on wages and employability of the academic and vocational high school courses. I estimated this impact in the context of a standard linear additive model. The key variables were the sum of vocational courses and the sum of academic courses. In order to test for diminishing returns to each kind of education (non-linear relationship between courses taken and labor market results), quadratic terms for (a) total academic courses minus the sample mean and (b) total vocational courses minus the sample mean were included in the specification.

The model may be defined as follows:

$$Y_i = aTA_i + bTV_i + cTA_i^2 + dTV_i^2 + \underline{\mathbf{cC}} + u_1$$

where

Y_i is a vector of labor market outcomes (employment, wages and earnings) for the i th person

TA_i = sum of academic courses taken deviated from sample mean: $\Sigma_j A_{ij}$-$mean_{over\ i}(\Sigma_j A_{ij})$
where j indexes types of vocational courses

TV_i = sum of vocational courses deviated from sample mean, $\Sigma_k V_{ik}$ -$mean_{over\ i}(\Sigma_k V_{ik})$
where k indexes types of vocational courses

TA_i^2 = the square of the (sum of academic courses minus the mean for the sample)

TV_i^2 = the square of the (sum of vocational courses minus the mean for the sample),

C = the vector of control variables,

and

u_1 = the disturbance term[11].

Note that this way of defining the square terms means that the coefficients, *b* and *c,* on the linear variables TV_i and TA_i provide estimates of the marginal effect of vocational courses and academic courses for individuals who are taking the mean number of such courses.

These data sets offer extensive information about academic and personal background. In most cases the questions that elicited this information did not change over the 20 year period. This allows the regression analysis to use a large set of comparably defined control variables to reduce biases from non-random selection into vocational education. Students who take many vocational courses tend to be less academically able (McCormick et al., 1995), from less advantaged backgrounds (Tuma, 1994) and are often turned off by the core academic curriculum. They also have different values and work attitudes than the average student.

To minimize the bias that results, controls were included for the following variables all measured in 12th grade: test scores; grades in academic courses; whether remedial courses were taken in high school; race; ethnicity; geographic region; size of city/town, family socioeconomic status; number of dependent children; marital status; student participation in clubs or social activities; having some handicap; number of hours spent doing homework; self-reported importance of making a lot of money and of getting a steady job; psychological scales for self-esteem and locus of control; participation in a sport during high school; number of hours worked in senior year; some school characteristics (e.g., school with security problems, Catholic

[11]This model has some weaknesses. Summing all academic courses into one variable and all the vocational courses in another, imposes the restriction that all academic courses have the same impact on labor market outcomes. The variable does distinguish between students who take 8 courses in mathematics and zero in English from those who take zero courses in mathematics and eight in English. A very similar problem appears when using the sum of courses squared instead of a single coefficient for every course squared. The specification chosen imposed the restriction that diminishing returns operated for the sum of academic course work not individually for particular types of academic courses. This restriction allowed me to use a linear specification, instead of the non-linear model it should have been necessary to use. This restriction turned out to be important, because the non-linear model did not yield well-behaved results.

school, private school, school requiring passage of a minimum competency test to graduate); religious background; number of hours watching television; an index of time spent reading for pleasure, an index for student disciplinary problems, and a dummy variable for problems with the law. The last six of these variables were not available in the NLS-72 data set. NELS-88 and HSB-80 data sets had all of them. Controls for college attendance were extensive: current full-time college attendance, current part-time attendance and for each year prior to the current one since graduation full-time and part-time attendance. Appendix 1 provides a detailed description of how each variable is defined. Appendix 2 provides the means and standard deviations for each variable.

3.3 Regression results

The results of regressions analyzing the short run effects of high school academic and vocational courses can be seen in Table 6 for males and in Table 7 for females.

TABLE 6: Curriculum effects on early labor market outcomes of males

	NLS-72	HSB-80	NELS-88
NUMBER OF MONTHS EMPLOYED			
Total number of vocational courses	0.0437	0.2216**	0.2637***
	(0.0671)	(0.1075)	(0.1013)
Total number of vocational courses squared	-0.0021	-0.0255	-0.0199
	(0.0199)	(0.0268)	(0.0301)
Total number of academic courses	-0.0212	-0.0791	0.0375
	(0.0462)	(0.0711)	(0.0621)
Total number of academic courses squared	-0.0138*	0.0271*	-0.0014
	(0.0089)	(0.0146)	(0.0094)
Adj. R^2	0.064	0.112	0.144
F-Test	0.718	5.511***	4.409**
Number of observations	2528	1615	1601
Mean of dependent variable	18.81	12.28	16.81
SD of dependent variable	5.81	7.39	5.83
LOG. HOURLY WAGE RATE			
Total number of vocational courses	-0.0042	0.0161***	0.0129*
	(0.0045)	(0.0055)	(0.0087)
Total number of vocational courses squared	0.0003	-0.0005	-0.0018
	(0.0013)	(0.0013)	(0.0024)
Total number of academic courses	-0.0061**	-0.0036	-0.0085*
	(0.0031)	(0.0036)	(0.0053)
Total number of academic courses squared	-0.0007	-0.00009	0.0006
	(0.0006)	(0.0007)	(0.0008)
Adj. R^2	0.031	0.057	0.041

TABLE 6: Curriculum effects on early labor market outcomes of males

	NLS-72	HSB-80	NELS-88
F-Test	0.131	8.911***	5.481***
Number of observations	2596	1345	1191
Mean of dependent variable	1.19	1.57	1.75
SD of dependent variable	0.39	0.34	0.43
YEARLY EARNINGS			
Total number of vocational courses	3	294***	433***
	(39)	(67)	(115)
Total number of vocational courses squared	19*	-40***	-45*
	(12)	(16)	(33)
Total number of academic courses	-32	-91**	-113*
	(27)	(44)	(69)
Total number of academic courses squared	-7*	-4	-13
	(5)	(9)	(10)
Adj. R^2	0.131	0.145	0.122
F-Test	0.641	23.191***	19.853***
Number of observations	1558	1541	1424
Mean of dependent variable	4729	6503	9239
SD of dependent variable	2682	4492	6237

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test, Standard Error in brackets.

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region; urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control

TABLE 7: Curriculum effects on early labor market outcomes of females

	NLS-72	HSB-80	NELS-88
NUMBER OF MONTHS EMPLOYED			
Total number of vocational courses	0.1986***	0.4005***	0.3405***
	(0.0734)	(0.1028)	(0.1232)
Total number of vocational courses squared	0.0376*	-0.0549**	-0.0337
	(0.0275)	(0.0289)	(0.0383)
Total number of academic courses	0.0074	-0.2751***	0.1264*
	(0.0551)	(0.0584)	(0.0717)

TABLE 7: Curriculum effects on early labor market outcomes of females

	NLS-72	HSB-80	NELS-88
Total number of academic courses squared	-0.0107	-0.0087	-0.0446***
	(0.0112)	(0.0119)	(0.0115)
Adj. R^2	0.148	0.221	0.186
F-Test	4.964**	35.341***	2.601*
Number of observations	2775	2091	1535
Mean of dependent variable	15.66	10.67	15.54
SD of dependent variable	7.18	6.91	6.29
LOG. HOURLY WAGE RATE			
Total number of vocational courses	0.0081**	0.0077*	0.0126
	(0.0035)	(0.0047)	(0.0105)
Total number of vocational courses squared	-0.0018*	-0.0016	-0.0059*
	(0.0013)	(0.0013)	(0.0031)
Total number of academic courses	-0.0006	-0.0045*	-0.0051
	(0.0026)	(0.0027)	(0.0061)
Total number of academic courses squared	0.0004	0.0001	0.0002
	(0.0005)	(0.0005)	(0.0011)
Adj. R^2	0.064	0.042	0.032
F-Test	4.648**	5.361**	2.514*
Number of observations	2715	1754	1124
Mean of dependent variable	0.921	1.41	1.61
SD of dependent variable	0.34	0.29	0.45
YEARLY EARNINGS			
Total number of vocational courses	64**	255***	145*
	(28)	(51)	(103)
Total number of vocational courses squared	0	-33**	2
	(11)	(14)	(32)
Total number of academic courses	1	-145***	-10
	(21)	(29)	(60)
Total number of academic courses squared	0	-4	-21**
	(4)	(6)	(9)
Adj. R^2	0.135	0.202	0.084
F-Test	3.426*	49.751***	1.908*
Number of observations	1397	1878	1303
Mean of dependent variable	2501	4024	6241
SD of dependent variable	1972	3288	4872

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test
Standard Error in brackets

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region;

urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control.

For males, the marginal effect of vocational courses is significantly positive for all three labor market outcomes in both 1981 and 1993 and essentially zero for all outcomes in 1973. The coefficients on the square terms are all negative in 1981 and 1993 implying diminishing returns. At the mean level of academic course taking, marginal effects of academic courses are frequently negative and significantly so for earnings in 1981 and 1993 and for hourly wage in 1973 and 1993. The F statistics test the null hypothesis that, at mean course taking levels, the marginal effect of a vocational course is equal to the marginal effect of one more academic course. The null hypothesis is decisively rejected for all three outcomes in 1981 and 1993. Looking across cohorts, there was clearly a large increase in the short run payoff to substituting vocational courses for academic courses between 1973 and 1981. The payoff to such a switch remains high in 1993: very similar to the payoff in 1981.

For females, the marginal effect of vocational courses is significantly positive for all three outcomes in 1973 and 1981 and for months worked and earnings in 1993. Employment and earnings effects are larger in 1981 than in 1973. Employment and earnings effects are somewhat smaller in 1993 than in 1982, but wage rate effects are bigger. Five of six coefficients on the square terms are negative in 1981 and 1993 implying diminishing returns. At the mean level of academic course taking, marginal effects of academic courses are significantly negative in 1981. In 1993, academic course taking had a significant positive effect on employment of women but no effect on earnings. Here again the F tests decisively reject the hypothesis that academic courses have the same effect on short run outcomes as vocational courses.

Thus for females there was an increase between 1973 and 1981 in the short run payoff to substituting vocational courses for academic courses, but a smaller increase than for men. The impact of substituting vocational for academic courses on employment and hourly wage rates remains very large in 1993. But for earnings the impact of such a switch falls back to the 1973 level (a four course switch raising earnings by 9 percent). Thus in summary the estimates show that the payoff to vocational course work has either increased or maintained its value over

the period considered. The effects of academic course work became more negative from 1973 to 1981 and then became less negative from 1981 to 1993.

4. MEDIUM RUN for 1972 and 1980 GRADUATES

4.1 Preliminary analysis

The analysis of medium run labor market outcomes begins with tabulations of the gross relationship between curriculum and labor market success. The tables report the mean values of the three measures of the labor market outcomes used in this paper (the number of months of employment; annual earnings and the hourly wage in the last job held during the year) for sub samples classified by the self-reported number of full-year courses taken in vocational and academic subjects during the final 3 years of high school. Results for the NLS-72 cohort are shown in Table 8. Results for HSB-80 are in Table 9.

NLS-72

Focusing first on males, vocational course work has no association with months worked and a modest positive association with hourly wage and annual earnings. These associations do not appear to change over time. The number of academic courses taken appears to have a negative relationship with all three outcomes from 1974 through 1977. In 1978 and 1979, however, academic course work appears to be unrelated to any of the outcomes.

For females there is a clear U shaped relationship between vocational course taking and months worked. Women with modest numbers of vocational courses have the lowest probability of employment. Wage rates and earnings appear to have no association with vocational course taking. With respect to academic course taking, women with 14 or more academic courses appear to receive substantially higher wage rates and earnings towards the end of the period. Otherwise there do not appear to be any strong associations between academic course work and the three labor market outcomes.

Table 8

Impact of vocational and academic course work on the medium labor market outcomes of high school graduates who do not attend college full time for the 1972 cohort

Number of full-year vocational courses	Percentage of months worked						Hourly wage in 1973 dollars					Yearly earnings in 1973 dollars					
FEMALES	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1975**	**1976**	**1977**	**1978**	**1979**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
0	59%	61%	62%	71%	74%	71%	3.24	3.15	3.60	3.74	3.66	2476	2956	3169	3413	3294	3536
0.1-1	57%	63%	63%	62%	65%	68%	3.29	3.46	3.61	3.51	3.53	2782	3539	3364	3605	3729	3515
1.1-2	56%	59%	59%	59%	63%	64%	3.50	3.40	3.36	3.35	3.30	2255	2727	2688	3032	3439	3441
2.1-3	59%	64%	62%	67%	67%	69%	3.44	3.49	3.41	3.28	3.47	2668	3446	3411	3397	3604	3642
3.1-4	59%	65%	64%	65%	64%	66%	3.22	3.48	3.38	3.54	3.66	2903	3120	3288	3196	3241	3433
+ 4	60%	63%	63%	70%	72%	71%	3.17	3.27	3.34	3.41	3.39	2692	3145	3225	3494	3694	3583
MALES	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1975**	**1976**	**1977**	**1978**	**1979**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
0	75%	83%	83%	88%	90%	90%	4.26	4.49	4.38	4.61	4.81	4859	5786	6169	6879	7541	7574
0.1-1	78%	85%	85%	86%	86%	87%	4.31	4.35	4.61	4.77	5.14	5036	5996	6270	6970	7547	8026
1.1-2	72%	82%	82%	87%	87%	89%	4.19	4.41	4.74	4.60	5.04	4692	5671	6023	7046	7523	7961
2.1-3	77%	84%	85%	87%	89%	92%	4.46	4.42	4.49	4.61	4.90	4981	5926	6493	7017	7353	7953
3.1-4	78%	83%	84%	86%	89%	90%	4.29	4.53	4.85	5.12	5.17	5342	5955	6398	7191	7963	8367
+ 4	76%	85%	85%	88%	90%	90%	4.37	4.55	4.67	4.97	5.03	5189	6287	6637	7395	7836	8079
Number of full-year academic courses	Percentage of months worked						Hourly wage in 1973 dollars					Yearly earnings in 1973 dollars					
FEMALES	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1975**	**1976**	**1977**	**1978**	**1979**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
0-6	56%	60%	59%	64%	66%	67%	3.273	3.31	3.53	3.64	3.62	2419	3220	3241	3420	3633	3774
6.1-8	59%	59%	64%	67%	70%	69%	3.269	3.45	3.31	3.38	3.34	2673	3097	3150	3358	3439	3263
8.1-10	58%	62%	61%	67%	66%	68%	3.291	3.38	3.33	3.35	3.43	2675	3175	3187	3471	3603	3674
10.1-12	62%	67%	66%	71%	69%	68%	3.159	3.24	3.34	3.38	3.51	2798	3243	3301	3322	3420	3642
12.1-14	59%	63%	62%	66%	69%	71%	3.477	3.31	3.60	3.62	3.64	2806	3055	3404	2892	3293	3393
+ 14	65%	61%	58%	58%	70%	71%	3.503	3.54	4.77	4.43	4.50	2930	3113	3075	3465	3924	4161
MALES	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1975**	**1976**	**1977**	**1978**	**1979**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
0-6	73%	83%	87%	85%	87%	87%	4.559	4.73	4.71	4.86	5.11	5023	6198	6806	7129	7763	7854
6.1-8	78%	82%	84%	87%	89%	90%	4.397	4.43	4.58	4.72	5.02	5056	6036	6476	7251	7860	8113
8.1-10	77%	85%	85%	88%	90%	90%	4.383	4.42	4.70	4.86	5.09	5092	6120	6413	7065	7485	7961
10.1-12	76%	85%	83%	87%	89%	88%	4.236	4.44	4.62	4.73	4.91	5132	5860	6095	7173	7593	8021
12.1-14	76%	85%	84%	88%	88%	90%	4.019	4.48	4.54	4.66	4.80	4740	5497	6126	6803	7491	7852
+ 14	69%	76%	79%	85%	86%	89%	3.741	4.25	4.33	4.85	5.06	4217	5194	5603	6358	7107	7803

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High school and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).

* For the NELS-88, means were calculated using the last four years at high school

Table 9

Impact of vocational and academic course work on the medium labor market outcomes of high school graduates who do not attend college full time for the 1980 cohort

Number of full-year vocational courses	Percentage of months worked				Hourly wage in 1984 dollars		Yearly earnings in 1982 dollars			
FEMALES	1982	1983	1984	1985	1984	1986	1982	1983	1984	1985
0	56%	71%	66%	80%	5.20	5.72	3985	4195	5536	6666
0.1-1	57%	69%	69%	84%	5.20	5.63	4516	4909	5774	7029
1.1-2	56%	67%	66%	80%	5.41	5.42	4858	5000	6010	7483
2.1-3	66%	76%	69%	82%	5.23	5.55	5781	5989	7019	8171
3.1-4	63%	76%	68%	86%	5.29	6.05	5892	6391	7084	7967
+ 4	61%	75%	68%	83%	5.93	5.94	6304	6800	7415	8252
MALES	1982	1983	1984	1985	1984	1986	1982	1983	1984	1985
0	61%	75%	70%	88%	6.04	6.49	6361	6945	9301	11315
0.1-1	66%	77%	71%	87%	6.06	6.62	6885	7557	9965	11561
1.1-2	67%	78%	71%	88%	6.16	6.93	7092	7883	10092	11680
2.1-3	67%	78%	73%	91%	6.18	7.06	7638	8230	10690	12209
3.1-4	70%	81%	73%	89%	6.24	6.90	7951	8489	10847	12425
+ 4	73%	82%	74%	88%	6.67	7.17	8511	9060	11070	12785
Number of full-year academic courses	Percentage of months worked				Hourly wage in 1984 dollars		Yearly earnings in 1982 dollars			
FEMALES	1982	1983	1984	1985	1984	1986	1982	1983	1984	1985
0-6	55%	68%	69%	84%	5.39	5.55	4785	5128	6188	6875
6.1-8	63%	73%	67%	82%	5.26	5.44	5556	5828	6597	7511
8.1-10	59%	72%	69%	81%	5.39	5.72	5397	5657	6035	7172
10.1-12	61%	72%	65%	83%	5.61	5.71	4894	5238	6424	7912
12.1-14	57%	71%	69%	82%	4.84	6.13	4913	5314	7157	8642
+ 14	60%	71%	65%	83%	5.41	5.73	4221	4368	6585	8837
MALES	1982	1983	1984	1985	1984	1986	1982	1983	1984	1985
0-6	69%	77%	74%	89%	6.50	6.70	7825	8395	10845	12302
6.1-8	71%	81%	71%	89%	6.47	6.74	8269	8918	10672	12666
8.1-10	69%	80%	73%	88%	5.96	6.92	7533	8240	10630	11992
10.1-12	65%	75%	72%	88%	6.24	6.93	6953	7350	10173	11672
12.1-14	66%	81%	71%	88%	6.34	6.76	6192	7148	9472	11206
+ 14	59%	75%	68%	90%	5.62	7.65	5675	6665	8425	10743

Data selected from the National Longitudinal Study of the High School Class of 1972 (NLS-72); the High school and Beyond (HS&B-80); and the National Education Longitudinal Study 1988-1992 (NELS-88).

* For the NELS-88, means were calculated using the last four years at high school

HSB-80

The relationship between vocational courses and the labor market success was much stronger for the Class of 1980 than the Class of 1972. For the non-college bound males, those who took four vocational courses earned $1096 to $1535 more than those who took none. Extra academic courses, by contrast, were associated with lower earnings.

For non-college women those who took four vocational courses earned $1291 to $2167 more than those who took none. Employment probabilities and wage rates also tended to be higher. Extra academic courses, by contrast, had a negative relationship with earnings in 1982 and 1983 and no relationship in 1984. Only in 1985 did the relationship become positive.

These associations do not imply causality, however. While the sample is limited to those who did not attend college for more than 6 months in the first 21 months after graduation, some of the sample attended college in 1983, 1984 and 1985. This would tend to lower the earnings of some graduates (eg. academic track students) and bias the results. Student ability and family background are also not controlled. Therefore, multivariate models need to be estimated that control for these potentially confounding influences.

4.2 Regression Results

The results of multivariate regression analysis are presented next. With one exception, the medium run models used the same specification as the short run models. The exception was the inclusion of additional dummy (or months attending) variables for full-time and part-time college attendance for each year since high school graduation. Sub samples were defined as they were for the short run. The analysis was replicated for the two data sets with available information (NLS-72 and HSB-80), treating men and women separately. The results of the regressions analyzing the medium run effects of high school academic and vocational courses can be seen in Table 10 for NLS-72 males and in Table 12 for NLS-72 females. Table 11 presents the results for HSB-80 males and Table 13 for HSB-80 females. The results for males are discussed first.

Table 10

Curriculum effects on medium labor market outcomes of males

NLS-72

NUMBER OF MONTHS EMPLOYED	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses	-0.0241	-0.0235	-0.0251	-0.0228	-0.0035	0.0111
	(0.0451)	(0.0346)	(0.0332)	(0.0333)	(0.0307)	(0.0292)
Total number of vocational courses squared	0.004	0.0105	0.0055	0.0061	0.0158*	0.0197
	(0.013)	(0.0107)	(0.0103)	(0.0104)	(0.0096)	(0.0091)
Total number of academic courses	-0.024	-0.0175	-0.0246	0.0032	0.0052	0.0068
	(0.031)	(0.0239)	(0.0231)	(0.0232)	(0.0215)	(0.0204)
Total number of academic courses squared	-0.012**	-0.0078*	0.0003	0.0021	0.0016	0.0026
	(0.006)	(0.0046)	(0.0044)	(0.0045)	(0.0041)	(0.0039)
Adj. R^2	0.031	0.061	0.078	0.071	0.081	0.053
F-Test	0.001	0.023	0.001	0.466	0.061	0.015
Number of observations	2591	2853	2899	2656	2664	2668
Mean of dependent variable	9.37	10.04	10.11	10.53	10.68	10.79
SD of dependent variable	3.96	3.19	3.08	2.95	2.73	2.61
LOG. HOURLY WAGE RATE		**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses		-0.0047	0.0038	0.0065*	0.0086*	0.0048
		(0.0046)	(0.0044)	(0.0045)	(0.0046)	(0.0047)
Total number of vocational courses squared		0.0004	-0.0008	-0.0017	-0.0018	-0.0014
		(0.0013)	(0.0013)	(0.0014)	(0.0014)	(0.0014)
Total number of academic courses		-0.0098***	-0.0023	-0.0014	0.0011	-0.0003
		(0.0032)	(0.0031)	(0.0032)	(0.0033)	(0.0033)
Total number of academic courses squared		-0.0009*	-0.0001	0.0001	0.0006	0.0005
		(0.0006)	(0.0005)	(0.0006)	(0.0006)	(0.0006)
Adj. R^2		0.041	0.046	0.046	0.051	0.073
F-Test		0.952	1.48	2.37*	1.99*	0.898
Number of observations		2435	2467	2418	2444	2399
Mean of dependent variable		1.36	1.46	1.56	1.67	1.81
SD of dependent variable		0.39	0.38	0.39	0.39	0.39
YEARLY EARNINGS	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses	27	7	12	-19	9	63
	(41)	(40)	(46)	(54)	(61)	(71)
Total number of vocational courses squared	-5	10	4	21	28*	7
	(12)	(12)	(14)	(16)	(18)	(22)
Total number of academic courses	-38*	-53**	-86***	-15	-34	7
	(28)	(27)	(31)	(37)	(42)	(50)
Total number of academic courses squared	-4	-3	1	0	11*	4
	(5)	(5)	(6)	(7)	(8)	(9)
Adj. R^2	0.052	0.073	0.074	0.102	0.964	0.084
F-Test	1.88*	1.74*	3.38*	0.004	0.377	0.462
Number of observations	2406	2656	2656	2450	2443	2462
Mean of dependent variable	5626	7161	8105	9740	11216	13100
SD of dependent variable	3522	3549	4138	4622	5209	6137

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test, Standard Error in brackets

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region; urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control.

Males who graduated in 1972

Males who graduated from high school in 1972 do not appear to have benefited from choosing a vocational curriculum rather than an academic curriculum. The F tests in Table 11 consistently reject the hypothesis that vocational courses have different effects on employment than academic courses. For wage rates and earnings, the hypothesis is rejected in half of the years analyzed at the 10 percent level and in all years at the 5 percent level. Point estimates are small as well. The largest estimated earning impact, the 1979 coefficient, implies that exchanging four vocational courses for four academic courses increased annual earnings by only $356 or about 4.3 percent.

Table 11

Curriculum effects on medium labor market outcomes of males

HSB-80

NUMBER OF MONTHS EMPLOYED	**1982**	**1983**	**1984**	**1985**
Total number of vocational courses	0.1277**	0.0736*	0.0146	-0.0545
	(0.0668)	(0.0573)	(0.0445)	(0.0436)
Total number of vocational courses squared	-0.0125	0.0006	-0.0097	0.0071
	(0.0165)	(0.0141)	(0.0111)	(0.0114)
Total number of academic courses	-0.1086***	-0.0944***	0.0139	0.0073
	(0.0435)	(0.0373)	(0.0296)	(0.0284)
Total number of academic courses squared	0.0091	0.0133*	-0.0053	0.0051
	(0.0086)	(0.0074)	(0.0059)	(0.0057)
Adj. R^2	0.045	0.041	0.036	0.051
F-Test	8.812***	6.057***	0.0002	1.462
Number of observations	1762	1762	1392	1382
Mean of dependent variable	8.41	9.71	8.71	10.73
SD of dependent variable	4.76	4.08	2.79	2.69
LOG. HOURLY WAGE RATE		**1984**		**1986**
Total number of vocational courses		0.0115*		0.0084
		(0.0071)		(0.0072)
Total number of vocational courses squared		-0.0015		-0.0025*
		(0.0017)		(0.0018)
Total number of academic courses		-0.0015		0.0069*
		(0.0046)		(0.0047)
Total number of academic courses squared		0.0001		-0.0006
		(0.0009)		(0.0009)
Adj. R^2		0.046		0.091
F-Test		2.435*		0.031
Number of observations		1173		1265
Mean of dependent variable		1.72		1.88
SD of dependent variable		0.41		0.43
YEARLY EARNINGS	**1982**	**1983**	**1984**	**1985**
Total number of vocational courses	242***	196**	114	89
	83	90	99	111
Total number of vocational courses squared	-18	-20	-17	-16
	20	22	26	28
Total number of academic courses	-95*	-79*	-60	-77
	54	59	64	73
Total number of academic courses squared	-8	-2	-13	-14
	10	11	13	14
Adj. R^2	0.125	0.142	0.173	0.161
F-Test	11.604***	6.335***	2.222*	1.611
Number of observations	1625	1687	1384	1428
Mean of dependent variable	7791	8643	11534	13650
SD of dependent variable	5747	6339	6153	7081

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test, Standard Error in brackets

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region; urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control.

Males who graduated in 1980

By contrast, males who graduated from high school in 1980 appear to have benefited from substituting vocational courses for academic courses. Vocational courses had significantly more positive effects on earnings than academic courses in all years. The estimated effects of being a vocational concentrator (taking four rather than zero vocational courses and reducing academic courses equivalently) ranges from about $1500 in 1981 to $1100 in 1983 and $670 in 1985. Wage rate and employment effects also diminish with time in the labor market. Point estimates for the square terms on vocational course work are generally negative but not significantly different from zero.

Table 12

Curriculum effects on medium labor market outcomes of females

NLS-72

NUMBER OF MONTHS EMPLOYED	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses	0.1043**	0.0877**	0.0931**	0.1022**	0.0881*	0.0777*
	(0.0465)	(0.0438)	(0.0441)	(0.0479)	(0.0475)	(0.0474)
Total number of vocational courses squared	0.0318*	0.0058	-0.0023	0.0231*	0.0276*	0.0101
	(0.0175)	(0.0163)	(0.0163)	(0.0175)	(0.0174)	(0.0174)
Total number of academic courses	0.0031	-0.0029	-0.0106	-0.0155	-0.0075	-0.0236
	(0.0348)	(0.0333)	(0.0331)	(0.0361)	(0.0355)	(0.0356)
Total number of academic courses squared	-0.0062	-0.0036	-0.0019	-0.0025	0.0048	0.0104*
	(0.0071)	(0.0069)	(0.0069)	(0.0074)	(0.0074)	(0.0074)
Adj. R^2	0.085	0.068	0.061	0.041	0.040	0.035
F-Test	3.474*	3.083*	4.021**	4.404**	2.955*	3.340*
Number of observations	2857	3212	3266	2954	2966	2975
Mean of dependent variable	7.52	7.82	7.73	8.14	8.16	8.06
SD of dependent variable	4.61	4.66	4.69	4.83	4.79	4.79
LOG. HOURLY WAGE RATE		**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses		-0.0002	0.0069*	0.0051*	0.0051*	0.0039
		(0.0038)	(0.0037)	(0.0036)	(0.0038)	(0.0039)
Total number of vocational courses squared		-0.0017	-0.0022*	-0.0014	-0.0009	-0.0011
		(0.0014)	(0.0014)	(0.0013)	(0.0013)	(0.0014)
Total number of academic courses		-0.0022	-0.0017	0.0031	-0.00001	-0.0007
		(0.0029)	(0.0028)	(0.0027)	(0.0028)	(0.0029)
Total number of academic courses squared		-0.00002	0.0011*	0.0011**	0.0012**	0.0011*
		(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)
Adj. R^2		0.052	0.065	0.056	0.047	0.061
F-Test		0.199	3.758**	0.223	1.27	1.013
Number of observations		2123	2137	2256	2271	2268
Mean of dependent variable		1.11	1.21	1.28	1.37	1.47
SD of dependent variable		0.33	0.33	0.32	0.34	0.36
YEARLY EARNINGS	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
Total number of vocational courses	102***	23	85***	79**	116***	141***
	(27)	(30)	(34)	(40)	(45)	(54)
Total number of vocational courses squared	3	-4	-17*	5	-4	-24
	(10)	(11)	(12)	(14)	(16)	(19)
Total number of academic courses	2	-19	-25	-28	3	-12
	(20)	(23)	(26)	(30)	(34)	(40)
Total number of academic courses squared	1	1	2	6	8	18**
	(4)	(4)	(5)	(6)	(7)	(8)
Adj. R^2	0.077	0.075	0.065	0.052	0.051	0.042
F-Test	9.684***	1.359	7.597***	5.075**	4.505**	5.802***
Number of observations	2516	2810	2860	2738	2743	2749
Mean of dependent variable	3130	3933	4270	4795	5357	6023
SD of dependent variable	2586	3013	3414	3951	4454	5277

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test, Standard Error in brackets

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region; urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control

Females who graduated in 1972

Females who graduated from high school in 1972 with a vocational concentration worked more and earned more than those who pursued a purely academic curriculum. In the earnings regressions the coefficients on academic courses were all negative or close to zero. Vocational courses, by contrast, had large and significant effects on earnings in every year except 1975. The positive effects of vocational courses do not appear to diminish with time since high school graduation. A substitution of four vocational courses for an equivalent number of academic courses raises annual earnings by $400 in 1974, by $440 in 1976, by $428 in 1977 and by $612 in 1979. The coefficients on the squared number of vocational courses were generally negative but not significantly so in the wage rate and earnings models. In the employment model, however, the coefficients on the square terms are generally significantly positive suggesting increasing returns.

Table 13

Curriculum effects on medium labor market outcomes of females

HSB-80

NUMBER OF MONTHS EMPLOYED	**1982**	**1983**	**1984**	**1985**
Total number of vocational courses	0.1694***	0.1582***	-0.0052	0.0631
	(0.0701)	(0.0655)	(0.0522)	(0.0579)
Total number of vocational courses squared	-0.0202	-0.0003	0.0074	-0.0029
	(0.0197)	(0.0184)	(0.0143)	(0.0158)
Total number of academic courses	-0.0296	0.0029	-0.0413*	0.0457*
	(0.0399)	(0.0373)	(0.0302)	(0.0333)
Total number of academic courses squared	-0.0104	-0.0017	-0.0027	-0.0027
	(0.0081)	(0.0076)	(0.0061)	(0.0066)
Adj. R^2	0.113	0.071	0.064	0.042
F-Test	6.548***	4.574**	0.391	0.076
Number of observations	2264	2265	1631	1635
Mean of dependent variable	7.21	8.79	8.13	9.99
SD of dependent variable	4.91	4.57	3.02	3.38
LOG. HOURLY WAGE RATE		**1984**		**1986**
Total number of vocational courses		0.0083		0.0109**
		(0.0069)		(0.0069)
Total number of vocational courses squared		-0.0017		-0.0011
		(0.0019)		(0.0019)
Total number of academic courses		-0.0083**		0.0011
		(0.0039)		(0.0039)
Total number of academic courses squared		0.0005		-0.0002
		(0.0007)		(0.0007)
Adj. R^2		0.081		0.095
F-Test		4.756**		1.728*
Number of observations		1496		1566
Mean of dependent variable		1.57		1.69
SD of dependent variable		0.39		0.39
YEARLY EARNINGS	**1982**	**1983**	**1984**	**1985**
Total number of vocational courses	295***	344***	394***	389***
	(71)	(79)	(88)	(105)
Total number of vocational courses squared	-13	-9	-46**	-68***
	(20)	(22)	(24)	(29)
Total number of academic courses	-6	-6	2	58
	(41)	(45)	(51)	(61)
Total number of academic courses squared	-13*	-5	4	5
	(8)	(9)	(10)	(12)
Adj. R^2	0.155	0.147	0.171	0.134
F-Test	14.424***	15.744***	16.151***	8.007***
Number of observations	2051	2152	1796	1823
Mean of dependent variable	5202	5743	7031	8531
SD of dependent variable	4784	5402	5501	6617

* Significant at 0,19 on a two-tail test, ** Significant at 0,05 on a two-tail test,** * Significant at 0,01 on a two-tail test, Standard Error in brackets

Controls were included for the following: test scores; grades in academic courses; part-time enrollment in college; some previous college education; race; ethnicity; geographic region; urbanity; family socioeconomic status; number of dependent children; marital status; number of hours spent doing homework; student participation in clubs or social activities; religious background; number of hours spent reading for pleasure; having some handicap; importance of making a lot of money and getting a steady job; number of hours watching television; practice of a sport during school period; some school characteristics; number of hours worked in senior year; and psychological scales for self-esteem and locus of control.

Females who graduated in 1980

The estimated effects of vocational course work on women's labor market outcomes are substantially larger for those who graduated in 1980. The hypothesis that vocational and academic courses had the same effects is rejected in all of the earnings models, all of the wage rate models and in two of the four employment models. The equations predict that exchanging four vocational courses for four academic courses increased earnings by $1232 in 1982, by $1396 in 1983 and $1324 in 1985. Here again the dollar impact of pursuing a vocational curriculum in high school on a women's earnings did not diminish with time since graduation. Since mean earnings rise rapidly in the first few years out of high school, percentage impacts decline with time out of high school.

Coefficients on the square of vocational courses are negative in all of the wage rate and earnings models and significantly so in the 1984 and 1985 earnings models. In the employment model, the square term on vocational courses is negative in 3 of 4 cases but never significantly so.

To sum up, taking vocational courses in high school appears to have positive medium term effects on earnings that are almost as large as the short run effects. The medium run earnings impact of being a vocational concentrator was larger for the cohort graduating in 1980 than those graduating in 1972. For males, there is a mild trend for the dollar magnitude of the vocational earnings premium to diminish with time out of high school. For women, however, the earnings differential was stable. Clearly, these results provide little support for the claim that vocational courses, beneficial as they may be in the short run, do not offer the skills necessary for long term success.

5. SUMMARY AND IMPLICATIONS

This paper had two goals: first, to determine whether the payoff to generic academic skills has been rising more rapidly during the past two decades than the payoff to occupation specific skills learned in school; and secondly, to determine whether payoffs to academic or vocational skills change dramatically with time since graduating from high school. These issues were addressed by assessing the relative impact of high school academic and vocational course work on the early labor market success of the non-college-bound students for three different cohorts of high school graduates--those graduating in 1972, 1980 and 1992..

With respect to the first question, tabulations of initial labor market outcomes by the total number of vocational courses, showed that non-college bound vocational concentrators were more likely to be employed, were paid a higher wage and earned more than non-college bound students who pursued a purely academic curriculum. These effects were substantially larger for the 1980 and 1992 graduates than for 1972 graduates. The medium term (2 to 7 years after graduation) effects of vocational courses were also substantially higher for 1980 graduates than 1972 graduates.

When multivariate models are used to address these questions, the answers do not change. Including a large set of control variables substantially reduces the selection bias problem, so the estimated returns to vocational courses should be reasonably good estimates of value added. Vocational courses did not improve the labor market outcomes of non-college bound males who graduated in 1972, but they did generate large benefits for those who graduated in 1980 and 1992. All cohorts of non-college bound females benefited from substituting vocational courses for academic courses, but the payoff to vocational skills increased sharply from 1972 to 1980 and remained high for the 1992 graduates.

With respect to the second question, the dollar impact of vocational courses on the earnings of females appears to be pretty stable in the post high school years. For the males who graduated in 1972, the effect of vocational courses remained close to zero throughout the 7 year follow up period. For males in the class of 1980, the large initial dollar impact of substituting vocational for academic courses fell to half its initial level toward the end of the 5 year follow up period.

These results challenge the view that traditional occupational training in high schools has no effect on the earnings of its recipients (Ryan and Büchtemann, 1996. The results also pretty decisively reject the hypothesis that the skill demands of employers that hire recent high school graduates have become increasingly generic and academic and decreasingly occupation specific. In fact the evidence implies quite the reverse: the payoff to vocational course work has

risen more rapidly than the payoff to academic course work. This could have resulted from high school vocational education becoming more effective at teaching occupational skills during the 1970s or from an increase in the payoff to occupation specific skills between 1973 and 1985.

Whatever the explanation, the empirical findings argue against closing down high school vocational education. High school juniors who do not want to go to college or who are uncertain about college should be advised to pick an occupational category and develop skills in that field before leaving high school. High school programs should be articulated with post-secondary programs so students who choose the vocational option do not permanently foreclose college. While the return to high school vocational education is substantial, the return to post secondary study is larger still. Consequently, high school students should always be encouraged to plan on getting further education after high school.

Partisans of the growing academic skill bias thesis argue that firms are better providers of occupation specific training than schools. If that were the case, why do so many firms encourage their employees to obtain occupational training at local schools or colleges by paying tuition costs. Where firms are more time efficient trainers than schools, that efficiency derives largely from the tutorial character of the one-on-one teaching. One-on-one teaching is extremely expensive, however, and is consequently likely to be rare. Wishing firms would provide more such training does not make it happen. As providers of occupational skill training, schools have many advantages: economies of scale and specialization that generate low unit costs, greater trainee control over what is studied and when, credibility as providers of credentials and access to public subsidies.

The second major policy implication of the results concerns the integration of academic and vocational education as envisioned in the Carl D. Perkins Vocational and Applied Technology Education Act. One way to interpret the results obtained may be that vocational education needs to expand its scope from a primary focus on specific preparation for a definite job to a larger industry perspective. This change should de-emphasize the curriculum organization around skills suited to a particular occupation and develop a broad knowledge in the context of the industry in which the student may be later working.

Further research is needed. The model used in this paper can be improved. First of all, the model should be able to capture the influence of every single course on labor market outcomes. This way it could be possible to exactly assess which kind of skills are more rewarded in the labor market[12]. Secondly, it would be very important to include “school”

[12]This comment does not imply that the primary goal of high school is to provide students with “labor market” skills. It could be agreed that other goals, specially socialization, are even more important.

variables, measuring the quality of the education provided in order to control for this probably important source of bias. Finally, transcripts should be used to calculate the exact courses taken.

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