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ABSTRACT

This report presents a profile of the populations served by vocational education (VE) programs, comparing their literacy skills, demographics, and socioeconomic characteristics with those of students in other education tracks. Chapter 1 provides an introduction. Chapter 2 compares students enrolled in postsecondary VE programs with students enrolled in institutions granting associate and bachelor's degrees and discusses demographic characteristics, socioeconomic background, and literacy skills. The comparison shows that students enrolled in postsecondary VE programs displayed substantially lower scores on tests of literacy but had parents with lower socioeconomic background. Chapter 3 provides a statistical analysis of the link between secondary and postsecondary VE programs and labor market earnings. It finds that persons who complete a VE track in high school do not have significantly different earnings later in life than those who complete their secondary education without tracking; participants in formal postsecondary VE institutions tended to have earnings significantly higher. Chapter 4 analyzes the potential impact of linking VE programs with academic study programs leading to high school equivalency and finds that those receiving an equivalency certificate had similar literacy skills in comparison with students who received a high school diploma. Chapter 5 reviews the implications of the results for policy reform efforts, many of which define potential economic and educational impact of VE programs on diverse groups participating in the programs. (Contains 48 references.) (YLB)

National Center for Research in
Vocational Education

University of California, Berkeley

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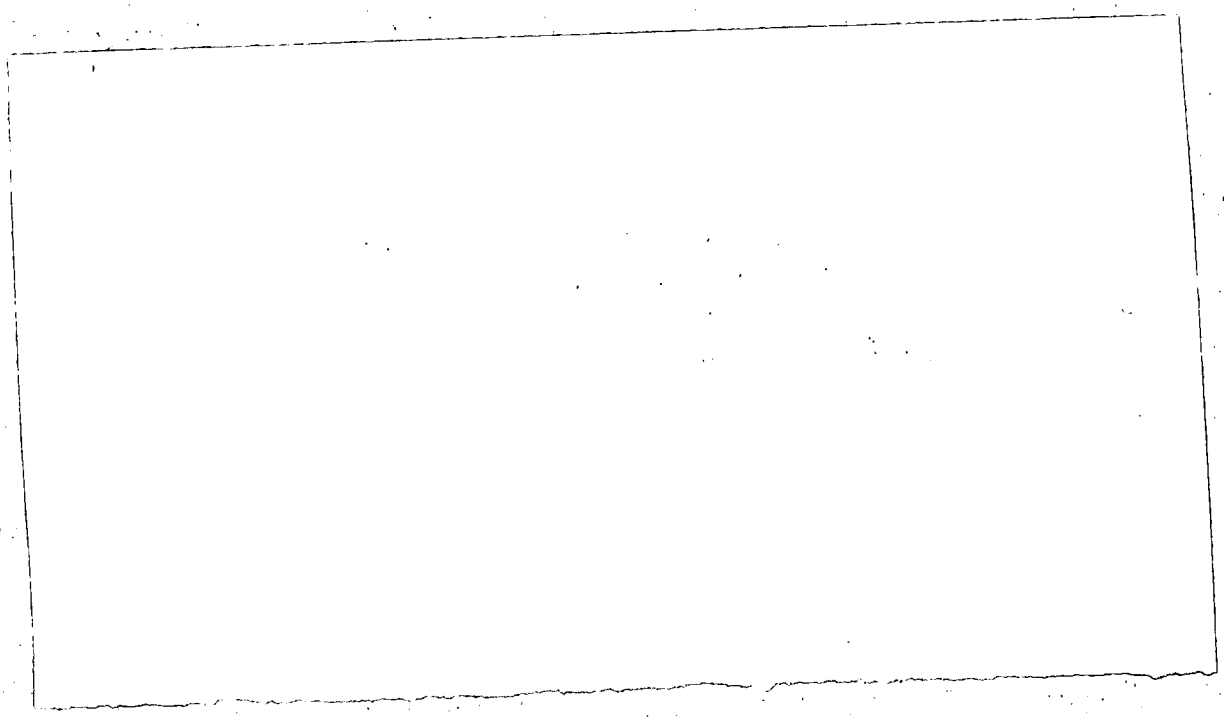

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A PROFILE AND ANALYSIS OF STUDENTS IN VOCATIONAL TRAINING: LITERACY SKILLS, DEMOGRAPHICS, AND SOCIOECONOMIC CHARACTERISTICS

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EXECUTIVE SUMMARY

This study presents a profile of the various populations served by vocational education programs, comparing their literacy skills, demographics, and socioeconomic characteristics with those of students in other education tracks. The study also provides a detailed analysis of the linkages between participation in various vocational education programs and labor market outcomes. In examining these topics, the paper utilizes two major national datasets: the 1992 National Adult Literacy Survey (NALS) and the 1991 Workplace Literacy Assessment Survey (WLAS).

It is found that students enrolled in postsecondary vocational education programs generally display substantially lower scores than other postsecondary students on tests of literacy skills. However, these lower literacy skills are partially explained by the differences in the characteristics of the students who select to enter a vocational education program relative to other postsecondary institutions. Students enrolled in postsecondary vocational education have on average parents with lower socioeconomic background than students registered in other postsecondary institutions. Furthermore, students in bachelor's programs on average stay longer in school than students in vocational education. A multivariate analysis of the determinants of literacy skills suggests that adjusting for socioeconomic status as well as other background characteristics of individuals does reduce substantially the observed gap in literacy skills between students in vocational education and students in other tracks. However, there remains a statistically significant shortfall, even after holding constant an array of individual background variables. The characteristics of the students enrolled in vocational education programs do not, therefore, totally explain their comparatively poorer performance in literacy skills tests. The remaining shortfall may be associated with the characteristics of the programs themselves such as their content and/or the quality of their curriculum. However, it must be strongly emphasized that the cross-sectional evidence presented here is only suggestive and that to provide a reliable answer to this question requires the use of longitudinal data, comparing literacy skills before and after students enter vocational education and other postsecondary programs.

The study's statistical analysis of the link between participation in secondary and postsecondary vocational education programs and labor market outcomes shows, firstly, that, holding other things constant, persons who complete a vocational education track in high school do not have significantly different earnings later in life when compared to those

individuals who complete their secondary education in schools without tracking. In addition, persons who have participated in formal postsecondary vocational/technical education institutions tend to have earnings significantly higher than those of individuals without any postsecondary education. At the same time, the Mincerian rate of return to postsecondary vocational/technical education is lower than for associate and bachelor's degrees. This result may be explained, however, by the differences in the length of the educational process in vocational/technical education institutions, which is much shorter than the longer two-year associate degrees and four-year college degrees. Furthermore, the lower estimated rate of return to vocational/technical training may be explained by self-selection effects, due to the fact that persons who select to enroll in postsecondary vocational education also tend to come from families with lower socioeconomic backgrounds. The comparatively low measured rate of return to vocational/technical education relative to associate and bachelor's degrees may, therefore, be explained by differences in unmeasured characteristics of persons in various postsecondary education programs.

The study concludes with an analysis of the potential impact of linking vocational education programs with academic study programs leading to high school. It is found that, among students who do not pursue postsecondary education, those receiving a GED have similar literacy skills to those of students who have received a high school diploma. Furthermore, among those persons who do not pursue postsecondary education, the Mincerian rate of return to a GED does not appear to be lower than that of a high school diploma. It must be stressed, though, that the strong positive linkage between a GED and both literacy and earnings, when compared to a high school diploma, may be due to a greater selectivity of the GED population when compared to high school graduates. The study compares the literacy and earnings of persons who do not pursue any postsecondary education, that is, whose highest educational attainment is a high school diploma or equivalent. Since a larger proportion of high school graduates pursue postsecondary education when compared to GED holders, and these are usually the persons with greater academic achievement, the sample of persons whose highest educational attainment is just high school constitutes a negatively selected group. Persons who pursue a GED, on the other hand, are usually the most motivated, and have the highest academic achievement, among high school dropouts (they also tend to have a greater number of years of high school compared to dropouts who do not pursue a GED). The positive selectivity of GED holders and the negative selectivity of persons who have a high school diploma as their

highest educational level may account for the apparent equivalence of the two groups in literacy and earnings, as determined in this study. If this is the case, then, it is not the GED as such that provides the literacy and earnings gains documented in this paper, but rather the dynamism and selectivity of GED holders.

CHAPTER 1:
INTRODUCTION

The population served by vocational education programs reflects the diverse American demographic profile. In 1990, there were 4,396,000 persons enrolled in vocational education programs in the United States. Of these, 55.5% were female, 33% resided in central cities, and 14.8% catalogued themselves as forming part of a racial or ethnic minority. Among those persons enrolled in postsecondary vocational/technical education institutions, close to 20% were minority students.[1]

The Carl D. Perkins Vocational and Applied Technology Education Act of 1990 emphasized the necessity of determining efficient and effective practices for addressing the needs of the diverse populations composing the vocational education clientele. Examining this issue has been difficult due to the absence of nationally representative data rich enough to allow an analysis of the participation of minorities in vocational education programs. This report utilizes the recently released 1992 National Adult Literacy Survey (NALS) and the 1991 Workplace Literacy Assessment Survey (WLAS) to present a comparative profile of the various demographic groups served by vocational education. Both the NALS and WLAS include as part of their background questionnaires a rich set of questions on the participation of individuals in vocational education programs as well as on an array of demographic, educational, and socioeconomic variables. Based on the NALS and WLAS data, this report presents a detailed statistical analysis of the various groups participating in vocational education, disaggregated by gender, race, and ethnic status. The study specifies the impact of secondary as well as postsecondary vocational education programs.

Chapter 2 of the report focuses on profiling students who are enrolled in vocational education programs. The purpose of this part of the study is to compare students enrolled in postsecondary vocational education programs with students enrolled in institutions granting associate and bachelor's degrees. This chapter includes a discussion of demographic characteristics, socioeconomic background, and literacy skills (measured by English reading proficiency and quantitative skills tests administered to the NALS sample). It is found that students enrolled in postsecondary vocational education programs display on average substantially lower scores than other postsecondary students on tests of literacy

[1] Based on data gathered by the U.S. Department of Commerce, as published in *Vocational Training News*, June 18, 1992.

skills. However, the data also shows that students enrolled in postsecondary vocational education on average also have parents with lower socioeconomic background than students registered in other postsecondary education institutions. It is also clear that students in bachelor's programs on average have stayed longer in school than students in vocational education. As a consequence, a multivariate analysis of the determinants of literacy skills was carried out to determine whether, holding constant socioeconomic status as well as other individual background variables (including number of years of schooling), students enrolled in postsecondary vocational education still have significantly lower literacy skills than students enrolled in four-year college programs. The results suggest that, although adjusting for socioeconomic status as well as other background characteristics of individuals does reduce substantially the observed gap in literacy skills between students in vocational education and others, there generally remains a statistically significant shortfall. This is especially the case among black students.

The question that emerges here is whether this remaining literacy gap is due to the characteristics of postsecondary vocational education programs, which have often been accused of lacking academic focus. Unfortunately, the analysis in this paper cannot establish conclusively whether or not vocational education programs, because of the content and quality of their curriculum, produce lower literacy skills in their students when compared to four-year colleges. To provide an accurate answer to this question requires longitudinal data, comparing literacy skills before and after students enter vocational education and other postsecondary education programs. Nevertheless, the analysis provided here is consistent with a view that attaches significance to both hypotheses: (1) the self-selection that occurs when students of lower socioeconomic background and lower literacy skills acquired in high school enter in larger proportions postsecondary vocational education programs, as well as (2) the specific curriculum and instruction of postsecondary vocational education programs relative to bachelor's degree programs, which may provide students with a lower dose of general reading and quantitative literacy skills. From this perspective, the vocational education system faces a tougher educational challenge compared to other institutions of postsecondary education, who cater to students who may have greater literacy skills to start with. At the same time, one cannot eliminate the possibility that the instruction and curriculum of the vocational education programs themselves fails to provide students with the general literacy skills that bachelor degree programs provide. It is to be emphasized, however, that these statements are based on cross-sectional data that is only suggestive, not conclusive.

Chapter 3 of the report presents an analysis of the labor market performance of individuals with various vocational education credentials. The section provides a statistical analysis of the link between secondary and postsecondary vocational education programs and labor market earnings. The analysis first distinguishes between high schools who segregate students into various tracks (including college-prep, vocational, and general tracks) and those who do not use tracking (all students follow the same program). It is found that, holding other things constant, persons who complete a vocational education track in high school do not have significantly different earnings later in life than those persons who complete their secondary education without tracking.

The analysis in Chapter 3 also studies the association between earnings and various postsecondary educational programs. The research in this section suggests that persons who have participated in formal postsecondary vocational/technical education institutions tend to have earnings significantly higher than those of individuals without any postsecondary education. At the same time, the Mincerian rate of return to postsecondary vocational/technical education is lower than for associate and bachelor's degrees. This result, however, may be explained by the differences in the length of the educational process in vocational/technical education institutions, which is much shorter than the longer two-year associate degrees and four-year college degrees. Furthermore, the lower estimated rate of return to vocational/technical training may be associated with self-selection effects, suggesting that those persons who eventually face greater disadvantage in the labor market are also those who enter vocational/technical postsecondary education programs. From this perspective, the lower measured rate of return to vocational/technical education relative to associate and bachelor's degrees may be explained by differences in unmeasured characteristics of persons in various postsecondary education programs.

Chapter 4 of the report provides an analysis of the potential impact of linking vocational education programs with academic study programs leading to high school equivalency. Among policymakers, there is strong support for this linkage. The National Governors Association, for example, recently proposed that federal funding for training programs be targeted to initiatives that provide students with the skills necessary to pass a General Educational Development (GED) examination for high school equivalency. Some existing publicly funded job training programs already require that high school dropouts first obtain a GED before enrolling in the program. Despite the support among policymakers for increasing the role of the GED in the academic component of vocational

education programs, recent research among academics has raised serious concerns about the economic value of a GED. Economists Stephen Cameron and James Heckman, for instance, have argued that "exam-certified high school equivalents are statistically indistinguishable in their labor market outcomes from high school dropouts. Both dropouts and exam-certified equivalents have comparably poor wages, earnings, hours of work, unemployment experiences, and job tenure. . . . Educational programs that focus on the GED as an end in itself are misguided" (Cameron & Heckman, 1993, pp. 43-44).

This report finds that, among students who do not pursue postsecondary education, those receiving a GED have similar literacy skills to those of students who have received a high school diploma. Furthermore, among those persons who do not pursue postsecondary education, the Mincerian rate of return to a GED does not appear to be lower than that of a high school diploma. We must stress, however, that the strong positive linkage between a GED and both literacy and earnings, when compared to a high school diploma, may be due to a greater selectivity of the GED population when compared to high school graduates. Note that the study compares the literacy and earnings of persons who do not pursue any postsecondary education, whose highest educational attainment is a high school diploma or equivalent. Since a larger proportion of high school graduates pursue postsecondary education when compared to GED holders, and these are usually the persons with greater academic achievement, the sample of persons whose highest educational attainment is just high school constitutes a negatively selected group. Persons who pursue a GED, on the other hand, are usually among the most motivated and with higher academic achievement of high school dropouts (they also tend to have a higher number of years of schooling compared to dropouts who do not pursue a GED). The positive selectivity of GED holders and the negative selectivity of persons who have a high school diploma as their highest educational level may account for the apparent equivalence of the two groups in literacy and earnings, as determined in this study. If this is the case, then, it is not the GED as such that provides the literacy and earnings gains documented in this paper, but, rather, the dynamism and selectivity of GED holders. This has obvious policy implications.

The report concludes in Chapter 5 by summarizing the basic results of the analysis carried out by this project. The conclusions are presented with the goal of establishing the linkage between the research results and the policy implications of the analysis. Recent policy changes and legislation intend to thoroughly reform vocational education programs. The School-To-Work Opportunities Act of 1994, for instance, seeks to integrate vocational concerns with the academic curriculum in secondary schools. Other efforts have been

targeting the expansion of basic skills programs in publicly sponsored job training programs. This last section reviews the implications of the results obtained in this report for these policy reform efforts. Many of the conclusions seek to define the potential economic and educational impact of various vocational education programs on the diverse demographic groups participating in such programs, including women as well as ethnic and racial minorities.

CHAPTER 2:
A COMPARATIVE PROFILE
OF STUDENTS IN VOCATIONAL TRAINING

Vocational education refers to educational programs, services, and activities which are directly related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career requiring other than a baccalaureate or advanced degree.[2] Vocational education may be offered at several levels. First, it may occur at the secondary school level, in high schools offering curricula that focus on vocational education, among other alternatives that include college preparatory programs and general academic programs. Second, vocational education may also occur at the postsecondary level, offered by postsecondary educational institutions (institutes, academies, training schools) with nondegree programs in technical and vocational fields or in training programs offered by the public sector, the private sector, non-governmental organizations, and so on.

This chapter presents a comparative profile and analysis of students enrolled in vocational and technical programs offered by postsecondary educational institutions. Students completing these programs do not receive officially sanctioned college degrees but instead receive awards or diplomas stating that they successfully completed the program. Detailed, nationally representative data on students enrolled in vocational education are not readily available. Most of the Census-based data available does not include information on the vocational education characteristics of persons sampled.[3] The data presented in this chapter was collected by the 1992 National Adult Literacy Survey (NALS). The NALS is a national household survey conducted by the National Center for Education Statistics in conjunction with Educational Testing Service. The NALS sampled 14,900 adults aged 16 and older in the United States. The NALS survey contained a background questionnaire with a broad set of questions on demographics, labor market status, and participation in

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[2] This is the definition followed by the U.S. Department of Education, as stated in the *Digest of Education Statistics*, 1996, p. 510.

[3] The Current Population Survey (CPS) has occasionally added supplements asking questions relating to some aspects of vocational education programs (see Constantine & Neumark, 1994). Aside from specific data bases, based on particular programs, the major alternative source of nationally-representative information on vocational education is based on longitudinal data such as the National Longitudinal Survey or the High School and Beyond Survey; for more details, see Hoachlander, Kaufman, Levesque, and Houser (1992) and Lynch (1989). Information on employer-based training programs is also available from extensive employer surveys such as the EOPP-NCRVE employer survey (see Bishop, 1994) or the Educational Quality of the Workforce National Employers Survey (see Lynch & Black, 1995).

various vocational education programs. It also assessed the literacy skills of the participants in the survey, using a battery of tests on reading skills and quantitative literacy.[4]

The NALS surveyed 1,815 persons who were enrolled in postsecondary education institutions offering associate and bachelor's degrees, and nondegree programs in technical and vocational education. Table 1 presents a summary of the average demographic and socioeconomic characteristics of students enrolled in vocational education, compared to students enrolled in programs leading to associate and bachelor's degrees. In terms of gender decomposition, the vocational education student population was 59% female, a proportion that is similar to that of students enrolled in degree-granting programs. Vocational education students, though, have a greater proportion of persons belonging to racial and ethnic minorities. In addition, students enrolled in vocational education tend to be older than the population in degree-granting programs. The mean age among vocational education students was 32 years for men and 29 years for women, compared to 26 and 27 years, respectively, for the students in associate and bachelor's programs.

Not surprisingly, a larger proportion of the students in postsecondary vocational education programs had received a high school diploma in a vocational track. The percentage of students enrolled in vocational education who have a vocational high school background was 24% for men and 21% for women. By comparison, among associate degree students, the percentage who graduated with a vocational education high school track was 13% and 9%, respectively, for men and women; and for four-year college students, the corresponding percentages were 4% and 6%.

[4] For more details on the NALS, see Kirsch, Jungeblut, Jenkins, and Kolstad (1993).

Table 1

Demographic Characteristics of Persons Enrolled in Postsecondary Educational Institutions

Demographic Category	Students in Vocational Education		Students in Associate Degree Programs		Students in Bachelor's Degree Programs	
	Male	Female	Male	Female	Male	Female
Gender (%):	41%	59%	40%	60%	43%	57%
Racial Composition (%):						
White	61%	51%	69%	56%	70%	67%
Black	14%	31%	19%	30%	16%	19%
Hispanic	19%	14%	11%	12%	9%	10%
Other	6%	4%	1%	2%	5%	4%
Mean Age (Years):	32	29	28	29	25	26
High School Program (%):						
Vocational	24%	21%	13%	9%	4%	6%
College Preparatory	18%	16%	27%	31%	60%	60%
General	35%	32%	45%	41%	28%	24%
No Tracking	23%	31%	15%	19%	8%	10%
Literacy Skills (Test Scores):						
Prose (Reading)	278	272	292	299	310	315
Quantitative	278	260	294	289	310	307
Mother's Education:						
% with Less than High School Education	35%	42%	30%	29%	10%	17%
% with High School Diploma or Equivalent	38%	35%	43%	39%	40%	35%
% with Some College Education	16%	13%	17%	22%	23%	27%
% with College Diploma	11%	10%	10%	10%	27%	21%
Father's Education:						
% with Less than High School Education	36%	50%	35%	37%	11%	21%
% with High School Diploma or Equivalent	32%	28%	27%	32%	29%	27%
% with Some College Education	13%	13%	17%	19%	19%	21%
% with College Diploma	19%	9%	21%	12%	41%	31%

Source: Author's calculations based on National Adult Literacy Survey (NALS) (1992).

The persons sampled in the NALS were administered a battery of tests measuring their basic literacy skills. Literacy refers to the use of printed and written information to function effectively in society and to develop one's knowledge and potential. The NALS includes several measures of literacy, two of which are examined here.[5] The first one, prose literacy, intends to measure the knowledge and skills needed to understand and use information from various texts used in everyday life such as finding a piece of information in a newspaper article, and interpreting instructions from a warranty. The second, quantitative literacy, purports to measure proficiency in the basic computational skills—addition, subtraction, multiplication, and division—found in printed material encountered in everyday occupational and personal activities (e.g., calculating a check balance; converting prices from cents per ounce to dollars per pound).

A set of questions was designed to measure prose and quantitative literacy and, based on survey respondent responses to these test questions, individuals were assigned scores that ranged from 0 to 500. In order to evaluate levels of proficiency using this scale, the following reference values have been given. For prose literacy . . .

- Individuals who scored below 225 points *(level 1)* could only exhibit the most basic reading comprehension such as identifying where the name of a country was located in a short article.

- People with scores between 225 and 275 points (*level 2*) were generally able to locate two or more features of information in a sports article.

- Scores between 276 and 325 (*level 3*) reflected an ability to read and understand the meaning of several specific sentences in an article.

- Individuals achieving a score of 326 to 375 (*level 4*) were able to state in writing an argument made in a lengthy newspaper article, or contrast views expressed in editorials.

- Finally, a score of over 375 (*level 5*) was given to persons who could use information from a lengthy article to engage in complex interpretative tasks.

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[5] For more details on these measures of literacy, see Kirsch et al. (1993).

In terms of the quantitative literacy scores, the following reference values are given:

- Individuals who scored below 225 points *(level 1)* could only solve the most simple arithmetic computations such as addition, with the numbers to be added clearly specified in the exercise, such as adding up two deposits that had already been entered on a bank deposit slip.

- People with scores between 225 and 275 points (*level 2*) were generally able to carry out simple arithmetic operations involving two or more numbers such as determining differences in price between tickets for two shows.

- Scores between 276 and 325 (*level 3*) reflected an ability not only to add or subtract but also to transfer information accurately from/onto a form (such as calculating miles per gallon using information given on a mileage record chart).

- Individuals achieving a score of 326 to 375 (*level 4*) were able to make more complicated computations, requiring testers to perform two or more sequential operations or a single operation in which the quantities were found in different places. They had, for instance, to use information stated in a news article to calculate the amount of money that should go into raising a child.

- Finally, a score of over 375 (*level 5*) was given to persons who could combine several types of computations such as transforming cents per ounce into dollars per pound and comparing different items on the basis of their price.

The average levels of prose and quantitative literacy for persons in the various educational categories discussed earlier are presented in Table 1. What stands out is that students in vocational education display much lower literacy skills than students in other postsecondary institutions. Among men, persons in vocational education programs exhibit a mean English proficiency (prose literacy) test score equal to 278, while students in associate degree programs have an average score of 292, and four-year college students have an average score of 310. Similar gaps can be observed for women: vocational education students have an average score of 272, compared to 299 for associate degree students and 315 for four-year college students.

Students in vocational education also have substantially lower levels of quantitative literacy, compared to other students in postsecondary education. Among men, the scores for students in vocational, associate, and four-year college programs are 278, 294, and 310, respectively. Among women, the corresponding quantitative literacy scores are 260, 289 and 307, respectively.

These results suggest that the students being served by vocational education programs display substantially lower academic achievement than students in other postsecondary programs. There are several issues associated with this result. First, it is important to emphasize that the gaps in literacy skills among the various postsecondary tracks may be related to a number of determinants of achievement, including socioeconomic background, the educational background of the students, and so on. For instance, consider socioeconomic status. Table 1 presents the average parental educational attainment of the various groups of students in the sample. As can be seen, the educational attainment of both the father and the mother is substantially lower among students in vocational education. Among male students in vocational education, 35% of their mothers did not have a high school diploma or equivalent, compared to 30% of male students in associate degree programs, and only 10% of the male students enrolled in four-year colleges. Among women, 42% of the students in vocational education had a mother without a high school diploma or equivalent, while the equivalent figures for students in associate and four-year colleges were 29% and 17%, respectively. Similar results apply to the educational attainment of fathers.

Since parental education is highly correlated with family income, the data presented in Table 1 strongly suggests that students in vocational education come from families with lower socioeconomic status than students in associate or four-year college degree programs. Given that socioeconomic status is closely associated with achievement in high school, this may partly explain the lower scores obtained by students in vocational education compared to other students. One could conclude that the students who enter vocational education have lower literacy skills than the students entering other postsecondary institutions.

There is a second key issue in interpreting the shortfall of the literacy skills of the students enrolled in vocational education. The NALS data presented in Table 1 is representative of the overall student population enrolled in postsecondary education, which includes recently admitted students as well as older students who have been in school for a

longer period of time. The data does not specify the number of years that students have been enrolled in their postsecondary institutions. The observed gaps in literacy skills presented in Table 1 could in principle be explained by the fact that the number of years required to complete a four-year or an associate degree program is higher than that for students in vocational education. Indeed, some of the students enrolled in college-degree granting institutions sampled by NALS are likely to have been exposed to a longer and richer academic curriculum than vocational education students. In order to confidently suggest that students entering vocational education programs generally display lower academic achievement than other students, one must carry out a multivariate analysis that holds constant the age of the student and the number of years the student has been enrolled in postsecondary education. This task is carried out next.

Explaining the Literacy Skills of Students in Vocational Education

In order to explain more carefully the determinants of the gaps in literacy skills of students enrolled in various postsecondary educational institutions, a simple multiple regression analysis was carried out to examine how both prose and quantitative literacy are related to a number of its determinants. The explanatory variables included in the analysis are as follows:

- **AGE:** Holding other things constant, as the student is older, he or she is more likely to have been in postsecondary school for a longer period of time, thus having higher literacy scores. In addition, older, more experienced persons are more likely to be familiar with the daily reading and quantitative tasks present in the literacy battery administered by the NALS.

- **PREPHS:** This variable is equal to one if the person graduated from a college preparatory track in high school, and zero otherwise. Given that academics are emphasized in the curriculum of college preparatory programs, one expects this variable to be positively related to literacy skills. At the same time, if students are selected into the various tracks, it is more likely that students with high academic achievement would be chosen for (or would choose to be in) college preparatory programs, independently of the curriculum and instruction of the track.

- **VOCATHS:** This variable is equal to one if the person graduated from a vocational education track in high school, and zero otherwise. High school vocational tracks have been criticized for not supplying adequate academic skills to

students. If this is the case, then the impact of this variable on literacy skills is negative. On the other hand, if students are selected into the various tracks, it is likely that students with lower academic achievement are selected into (or decide themselves to enter) vocational high school tracks, thus leading to an observed negative correlation with literacy skills.

- **GENERALHS:** This variable is equal to one if the person graduated from a general education track in high school, and zero otherwise. The expected sign of the coefficient on this variable can be interpreted along lines similar to **VOCATHS**.

- **YEARS:** This variable is equal to the number of years that the person has been a postsecondary student. In general, students in vocational/technical programs have been in postsecondary education for a shorter period of time compared to those pursuing associate degrees or bachelor's degrees.

- **VOCATPSEC:** This variable is equal to one if the person was enrolled in a postsecondary vocational/technical education program, and zero otherwise. If students entering technical/vocational education programs have lower academic proficiency than students in other postsecondary education institutions, then this variable will be negatively associated with literacy skills. At the same time, if postsecondary vocational/technical secondary education programs offer a curriculum that does not support the development of general cognitive skills, as some programs have been criticized for, then the variable will also be negatively associated with literacy skills.

- **ASSOCIATE:** This variable is equal to one if the person was enrolled in an associate degree program, and zero otherwise. The expected sign on the coefficient on this variable can be interpreted in a similar way to **VOCATPS**.

- **HSCHOOLMO, COLLEGEMO:** These variables are equal to one if the person's mother has completed a high school diploma or a college education, respectively, and equal to zero otherwise. Since greater parental education (which is also associated with greater parental socioeconomic status) is positively associated with the academic achievement of children, we expect these variables to be positively associated with literacy skills. However, this assumes that persons sampled by the NALS survey did accurately know the educational attainment of their parents. This may not be the case among many persons. For children raised in female-headed households, with relatively little contact with fathers, respondents

may provide inflated estimates of parental educational attainment, which may cloud any relationship between parental education and literacy skills.

- **HSCHOOLFA, COLLEGEFA:** These variables are equal to one if the person's father has completed a high school diploma, or has a college education, respectively, and equal to zero otherwise. Since greater parental education is positively associated with the academic achievement of their children, we expect these variables to be positively associated with literacy skills. Note, however, the comments relating to **HSCHOOLMO** and **COLLEGEMO**.

Table 2 presents the estimated coefficients of a multiple regression equation explaining prose literacy (English reading proficiency) scores among students enrolled in postsecondary vocational, associate degree and four-year college institutions. Separate equations were estimated for male and female students and for whites, blacks, and Hispanics in the sample. Note that the sample of persons considered in the analysis includes only persons *currently* enrolled in postsecondary education (excluding graduate and professional students), the great majority of whom are not in the labor force. Given the dummy variables included in the regression equations, the reference group consists of persons currently enrolled in bachelor's degree programs.

The estimated coefficients shown in Table 2 indicate that age, participation in a college preparatory high school, and parental education are generally (though not always) positively associated with prose literacy, holding other things constant, with the strength of each variable varying by race and gender. For example, among black and Hispanic men, the mother's educational attainment is strongly positively related to literacy skills, when compared to the father's educational attainment. On the other hand, among white males, the impact of the mother's education is not as strong as that of the father.

The results on the variable VOCATHS show that students in vocational high school tracks do not have scores significantly different from those of other students. Although the estimated coefficients on VOCATHS vary in sign by race and gender (positive for white males and females as well as male Hispanics, negative for black males and females and for female Hispanics), they are not generally statistically significant.

Table 2

The Determinants of Prose Literacy Among Postsecondary Students

Explanatory Variable	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
INTERCEPT	271.526*	284.901*	250.403*	267.301*	256.438*	274.859*
	(25.785)	(39.15)	(9.001)	(22.821)	(10.260)	(15.332)
AGE	0.577*	0.368*	-0.153	0.213	-0.497	-0.005
	(2.697)	(2.571)	(-0.254)	(0.816)	(-0.666)	(-0.009)
PREPHS	15.092*	8.971*	21.162	8.656	18.339	-1.678*
	(3.049)	(2.462)	(1.724)	(1.370)	(1.365)	(-0.181)
VOCATHS	1.301	1.100	10.021	-18.341	-4.377	-14.562
	(0.189)	(0.192)	(0.570)	(-2.723)*	(-0.270)	(-1.144)
GENERALHS	3.334	-4.699	0.786	-12.340**	16.327	-10.382
	(0.661)	(-1.225)	(0.064)	(-1.971)	(1.346)	(-1.092)
YEARS	5.850*	6.128*	7.871	4.545	6.567	4.3745
	(2.851)	(3.491)	(1.442)	(1.558)	(0.835)	(0.933)
VOCATPSEC	-8.038	-15.818*	-35.720**	-21.002*	-6.452	-18.274
	(-1.516)	(-3.843)	(-2.342)	(-3.098)	(-0.455)	(-1.856)
ASSOCIATE	-7.289	-2.994*	-7.885	4.605	-11.022	-17.683**
	(-1.802)	(-0.956)	(-0.722)	(0.962)	(-0.900)	(-2.096)
HSCHOOLMO	-2.479	3.193	26.492**	-6.683	20.723*	21.394**
	(-0.470)	(0.833)	(2.259)	(-1.205)	(1.892)	(2.443)
COLLEGEMO	8.513	2.408	17.850	-4.458	33.503*	14.869**
	(1.493)	(0.593)	(1.418)	(-0.725)	(2.611)	(1.766)
HSCHOOLFA	2.392	6.878	-8.287	12.262	-5.328	8.293
	(0.460)	(1.852)	(-0.768)	(2.382)**	(-0.381)	(0.877)
COLLEGEFA	9.524	9.958*	-12.626	13.729**	5.060	13.750
	(1.803)	(2.688)	(-1.093)	(2.300)	(0.462)	(1.640)
Adj. R-sq.	0.160	0.145	0.168	0.273	0.245	0.213
N	490	638	113	251	75	109

* Variable is statistically significant at a 99% confidence level.
** Variable is statistically significant at a 95% confidence level.
t statistics are shown in parentheses.

Source: Author's calculations based on NALS (1992).

The estimated coefficients on the variable VOCATPSEC in Table 2 show that students enrolled in postsecondary vocational/technical education have significantly lower prose literacy scores compared to students in bachelor's programs, holding other things constant. This result holds for both men and women as well as for all racial and ethnic groups examined. At the same time, the association between enrollment in vocational education and lower literacy skills, holding other things constant, is stronger among black Americans. For white men, students in vocational education have a score on the prose literacy test which is 8 points lower than that of other students, but for black men, the shortfall is equal to 36 points. Among white women, students in vocational education have prose literacy scores 16 points below those of other students, compared with a shortfall of up to 21 points among black women.

Table 3 presents the results of the multiple regression analysis of *quantitative* literacy scores achieved by students in postsecondary vocational, associate degree, and four-year college institutions. The explanatory variables are the same as those used in the analysis of prose literacy, as presented in Table 1. The ordinary least squares coefficients displayed in Table 3 closely reproduce those in Table 2. With respect to students enrolled in vocational education, Table 3 continues to show that there is a significant shortfall in the academic achievement of these students, measured now in terms of lower quantitative literacy test scores relative to those of students pursuing a bachelor's degree, holding other things constant. The shortfall occurs for both males and females and for all ethnic and racial groups examined. The gap is wider for blacks: for both black men and women, students in vocational/technical education had quantitative literacy test scores that were 24.6 points lower than for students pursuing a bachelor's degree. Among white men and women, students in vocational education had quantitative literacy scores 7.8 and 22.2 points lower than those of four-year college students. For Hispanics, the corresponding figures are 9.2 and 13.9 points.

Table 3

The Determinants of Quantitative Literacy Among Postsecondary Students

Explanatory Variable	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
INTERCEPT	269.055*	283.745*	258.756*	252.557*	249.676*	265.106*
	(23.468)	(34.85)	(9.622)	(21.008)	(8.558)	(13.377)
AGE	0.486**	0.224	-0.285	0.048	-0.576	-0.023
	(2.086)	(1.397)	(-0.490)	(0.179)	(-0.662)	(-0.039)
PREPHS	20.114*	7.425	11.721	16.620*	28.705	-5.403
	(3.733)	(1.821)	(0.988)	(2.563)	(1.830)	(-0.527)
VOCATHS	10.030	6.203	10.040	-5.564	3.367	-15.753
	(1.340)	(0.969)	(0.591)	(-0.805)	(0.178)	(-1.119)
GENERALHS	7.437	-7.384	-8.540	-5.788	26.717	-13.080
	(1.354)	(-1.721)	(-0.725)	(-0.901)	(1.887)	(-1.244)
YEARS	8.401*	6.972*	7.475	4.817	8.904	5.297
	(3.761)	(3.550)	(1.417)	(1.609)	(0.970)	(1.022)
VOCATPSEC	-7.802	-22.156*	-24.644	-24.663*	-9.218	-13.894
	(-1.354)	(-4.811)	(-1.671)	(-3.545)	(-0.557)	(-1.277)
ASSOCIATE	-3.639	-2.895	-12.362	-2.655	-8.397	-20.733**
	(-0.827)	(-0.826)	(-1.171)	(-0.540)	(-0.587)	(-2.223)
HSCHOOLMO	-4.079	0.734	22.784**	-1.178	16.465	26.760*
	(-0.710)	(0.172)	(2.010)	(-0.207)	(1.288)	(2.765)
COLLEGEMO	4.108	0.432	15.193	1.0163	19.464	15.612
	(0.662)	(0.095)	(1.249)	(0.161)	(1.299)	(1.677)
HSCHOOLFA	2.5779	7.376	-11.588	7.730	-13.800	11.274
	(0.456)	(1.775)	(-1.111)	(1.463)	(-0.844)	(1.078)
COLLEGEFA	7.4786	9.679**	-17.129	10.469	1.506	5.654
	(1.301)	(2.336)	(-1.534)	(1.708)	(0.118)	(0.610)
Adj. R-sq.	0.129	0.147	0.121	0.310	0.141	0.157
N	490	638	114	251	75	109

* Variable is statistically significant at a 99% confidence level.
** Variable is statistically significant at a 95% confidence level.
t statistics are shown in parentheses.

Source: Author's calculations based on NALS (1992).

The results in Tables 2 and 3 suggest that to a large extent the massive shortfall in the literacy skills of students currently enrolled in postsecondary vocational and technical education institutions relative to those enrolled in associate and bachelor's degree programs (as depicted by Table 1) is explained by the lower socioeconomic background of the students, the smaller number of years of postsecondary education that they have been enrolled in, and gaps in other background characteristics. Since these background characteristics are brought in by students when they enter postsecondary vocational/ technical training, this suggests that vocational/technical education institutions confront a more complex effort in supplying educational services to their students than do other educational institutions. A larger fraction of students entering postsecondary vocational education institutions come from families with low socioeconomic status, many graduating from high schools that do not supply strong academic content. By contrast, a significantly higher proportion of students entering four-year colleges or even associate degree programs come from families with higher socioeconomic status, having attended college preparatory high school tracks that offer curricula with strong academic content.

The analysis so far suggests that negative selectivity explains to a large extent the alarmingly lower literacy skills of students enrolled in postsecondary vocational/technical education programs, when compared to students in associate and bachelor's degree programs, as was presented in Table 1. Still, even after correcting for socioeconomic status, age, length of postsecondary enrollment, and other variables, students in vocational education programs still display substantially lower levels of literacy than bachelor's students. This could be taken to imply that there is an unmeasured difference in postsecondary vocational education programs and other programs that causes the observed gap. Over the years, various studies have suggested that traditional vocational and technical education programs, whose focus is on supplying specific skills, have provided their students with a curriculum and instruction that does not favor the acquisition or development of cognitive skills (see the survey by Psacharopoulos [1987], for example). This would, of course, explain the results established in Tables 2 and 3. However, although suggestive, this statement is anything but conclusive. Indeed, the cross-sectional analysis in this paper cannot establish conclusively whether or not vocational/technical postsecondary education programs, because of the content and quality of their curriculum, produce lower literacy skills in their students when compared to four-year colleges. To provide an accurate answer to this question requires longitudinal data, comparing literacy skills before and after students enter vocational education and other postsecondary

education programs. The attempt to adjust for differences in the background characteristics of individuals enrolled in various postsecondary programs does suggest that these cannot totally explain the shortfall exhibited by vocational education students. However, suggesting that the gap is due to differences in the curriculum and/or instruction of the various programs remains a matter to be resolved by further research.

CHAPTER 3:
THE LABOR MARKET AND VOCATIONAL EDUCATION

The participation of blacks and Hispanics in vocational education programs greatly exceeds that of whites. Table 4 presents participation in secondary vocational education programs of persons in the labor force, decomposed by race and ethnicity, as determined from the NALS. The proportion of whites in the population in 1992 who completed a high school program with a vocational, technical, or trade focus was 15.3% for men and 12.3% among women. By comparison, the equivalent figures for blacks were 23.9% for men and 19.6% for women. Among male Hispanics, 20.1% attended a high school with a vocational focus while 17.1% of Hispanic women did. Table 4 also shows the much greater participation of both white men and women in college preparatory high school programs.

Table 4
Type of High School Program Completed by Persons in the Labor Force

Persons 16 years of age or older with a high school diploma
Percentage of total

Ethnic/Racial Group	College/Preparatory	Vocational Tech./Trade	General/Other
Male			
Non-Hispanic white	40.7%	15.3%	44.0%
Non-Hispanic black	27.0	23.9	49.1
Hispanic	28.6	20.1	51.3
Female			
Non-Hispanic white	44.1%	12.3%	43.6%
Non-Hispanic black	28.1	19.6	52.3
Hispanic	30.7	17.1	52.2

Source: NALS (1994). Author's tabulations.

To obtain an indication of how attending a high school with a vocational focus is related to labor market earnings, a multivariate statistical analysis was carried out examining how the weekly earnings of workers in the NALS sample were affected by educational attainment, on-the-job experience, literacy skills, and secondary and postsecondary

vocational education programs attended. Following standard labor economics literature, the following empirical human capital model was estimated for the various ethnic and racial groups considered, by gender:

$$\log W_{ij} = b'X_{ij} + U_{ij} \quad (1)$$

where W_{ij} is the weekly wage received by individual i of sex/race/ethnicity j, b is a vector of coefficients to be estimated, X_{ij} is a vector of human capital and demographic characteristics affecting wages, and U_{ij} is a stochastic disturbance.

Variables in the vector X_{ij} include, firstly, years of on-the-job experience, represented by the variable EXPER, which is present in the NALS survey, and where declining returns to experience with age is accounted for by means of a quadratic term, with the variable EXPERSQ defined as the square of EXPER.

Years of schooling represents the second major force influencing earnings. High school education is introduced by the variable HIGHSC, which is a dummy variable equal to one if the person received a high school diploma, and zero otherwise. To incorporate variation in the returns to various high school tracks, the dummy variables PREPHS, VOCATHS, and GENERALHS were included, which are equal to one if the person graduated from a high school with a college preparatory track, a vocational track, or a general track, respectively, and zero otherwise. Note that the comparison group in the regression analysis consists of persons who completed their secondary education in high schools with no tracking programs.

To specify how postsecondary education related to earnings, three dummy variables were introduced: VOCATPSEC, which is equal to one if the person attended a vocational or technical postsecondary institution, and zero otherwise; SOMECOLL, which is equal to one if the person completed some amount of college education (including associate degrees and any other college attendance not leading to a college degree), and zero otherwise; finally, COLLEGE is a dummy variable equal to one if the person received a college degree, and zero otherwise.

In addition to high school and postsecondary education, workers may acquire skills through training programs supplied by the government or the private sector. The NALS

questionnaire asked individuals to declare whether they had ever taken part in a program other than in regular school in order to improve their basic skills, that is, basic reading, writing, and arithmetic skills. The answers to this question are included in the analysis through the variable BASICS, which is a dummy variable equal to one if the person had participated in a basic skills program, and zero otherwise.

Most human capital studies have universally used years of schooling as a proxy for academic skills, but this measure can be highly inaccurate since both school quality and the ability of students to absorb material taught in school varies significantly. This paper uses the scores on the prose and quantitative literacy tests administered by NALS as variables influencing earnings. The variable PROSE represents the individual score on the prose literacy test and QUANT is the score on the quantitative literacy test, as described earlier.

The U_{ij}s in equation (1) represent an error term that is usually assumed to be randomly distributed among the population. However, the group of individuals for whom wages are observed, and which is thus used for purposes of estimating equation (1), is not randomly selected from the population since it includes individuals who have nonzero wages and excludes those who are not participating in the labor market. Therefore, there is a possible selectivity bias problem. We follow the two-stage sample selection correction procedure postulated by Heckman (1979). Mainly, we first estimate a binary probit model where the dependent variable is one if the person was an employee, and zero otherwise. The explanatory variables in this equation include a number of variables also present in the wage equation: HIGHSCH, VOCATPSEC, SOMECOLL, COLLEGE, PROSELIT, and QUANTLIT. Other variables in the probit equation, however, are not in the wage equation, and these include the following determinants of labor force participation: disability status, household size, marital status, father's education, and mother's education.

The results of the estimated probit equation are used to calculate inverse Mills' ratios that are then introduced into the original regression equation (1) to adjust for the sample selection bias. In the second stage of the estimation procedure, the variable $MILLS_{ij}$, representing the Mills' ratio for person i of sex/race/ethnicity j, is added to the regression equation of earnings. The estimated coefficients are then unbiased and consistent.

Table 5 presents the results of the estimation procedure just discussed for the earnings equations. Note that the dependent variable is the logarithm of the weekly wage. The estimated coefficients in Table 5 show the quantitative impact of the various forces determining earnings. As expected, years of on-the-job experience is positively connected to earnings, holding other things constant. At the same time, the coefficients on the BASICS variable, as presented in Table 5, indicate that for most groups in the population, persons who completed basic skills programs do not appear to have any significantly higher earnings than those who did not participate in such programs, other things being constant. However, note that for various groups in the population, there is a positive linkage between the variable BASICS and earnings, yet the presence of high standard errors causes the coefficients to be statistically insignificant at conventional levels of confidence (except for the white female equation). Combined with the fact that the NALS does not provide information on the recency and length of these programs, the results in Table 5 cannot be used to suggest the absence of an impact of basic skills programs on earnings.

High school education is clearly connected to higher earnings. Furthermore, note that although participating in a vocational education track in high school is sometimes negatively related to earnings, the results are not statistically significant. It cannot, therefore, be concluded that persons completing a vocational high school track have lower earnings when compared to students who did not follow any tracks at all. The results in Table 5 do not support the view that high school vocational education programs serve to marginalize some students, particularly minorities, into being considered "second-class" by employers, leading to employment in low-earnings occupations.[6] Note, though, that given the cross-sectional nature of the NALS data, the results in Table 5 are only suggestive and cannot be utilized to establish, or deny, a causal connection between particular programmatic treatments and earnings. A longitudinal analysis would be required for those purposes.

[6] Previous studies, based on evaluations of particular high schools, have findings similar to those obtained in this paper through the use of a nationally representative sample; see Oakes, Selvin, Karoly, and Guiton (1992).

Table 5

Analysis of the Impact of Vocational Education on Earnings

Explanatory Variable	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
INTERCEPT	5.0085*	4.8712*	4.6112*	4.4857*	4.8168*	5.0256*
	(58.085)	(36.62)	(30.622)	(19.006)	(38.009)	(19.175)
EXPER	0.0548*	0.0279*	0.0317*	0.0472*	0.0386*	0.0221**
	(14.739)	(6.383)	(3.721)	(6.198)	(4.761)	(2.432)
EXPERSQ	-0.0008*	-0.0004*	-0.0003	-0.0009*	-0.0005**	0.0004*
	(-10.416)	(-4.654)	(-1.868)	(-5.928)	(-3.546)	(-2.636)
HIGHSCH	0.0721**	0.1557*	0.0917	0.1611**	0.0569	-0.0331
	(1.905)	(3.377)	(1.337)	(2.415)	(0.843)	(-0.410)
PREPHS	0.0786*	0.0484	0.0756	0.1928	-0.0281	0.1507
	(2.591)	(1.392)	(1.015)	(3.263)	(-0.361)	(1.654)
VOCATHS	0.0629	-0.0239	-0.0789	0.0662	0.0773	0.0737
	(1.800)	(-0.563)	(-1.120)	(1.075)	(0.959)	(0.821)
GENERALHS	0.0158	-0.0503	-0.0257	0.0911**	0.0098	0.0655
	(0.579)	(-1.573)	(-0.460)	(1.954)	(0.162)	(0.965)
VOCATPSEC	0.1287*	0.1867*	0.1203*	0.2596*	0.2776*	0.0578
	(2.605)	(3.320)	(1.094)	(2.861)	(2.889)	(0.500)
SOMECOLL	0.1958*	0.2997*	0.1388	0.3295*	0.2775*	0.0882
	(4.733)	(5.940)	(1.725)	(4.063)	(3.368)	(0.839)
COLLEGE	0.4543*	0.6025*	0.3491*	0.6758*	0.4400	0.3213*
	(10.286)	(10.942)	(3.610)	(6.720)	(4.291)	(2.509)
BASICS	-0.0585	0.0938**	0.1088	0.0804	0.0208	-0.0368
	(-1.891)**	(2.181)	(1.815)	(1.646)	(0.316)	(-0.499)
PROSELIT	0.0003	0.0006	0.0021*	0.0015**	0.0015*	0.0012
	(0.832)	(1.484)	(3.210)	(2.375)	(2.476)	(1.579)
QUANTLIT	0.0014*	0.0011*	0.0015**	0.0003	0.0011	0.0007
	(4.969)	(3.152)	(2.332)	(0.454)	(1.763)	(0.992)
MILLS	-0.8149*	-0.5762*	-0.5983*	-0.1595	-0.4710*	-0.2808
	(-12.916)	(-7.600)	(-5.883)	(-1.375)	(-3.125)	(-1.696)
Adj. R-sq.	0.236	0.186	0.288	0.263	0.266	0.215
N	4,337	4,330	755	1,084	648	573

Source: Author's calculations based on NALS (1992).

Table 5 suggests that higher earnings are generally associated with attending college preparatory high school programs. However, the estimated coefficients vary by race and gender and do not offer a consistent, statistically significant pattern of results. Table 5 also shows that postsecondary vocational education has generally a positive Mincerian rate of return, when compared to persons without postsecondary education and holding other things constant. White men who attended a postsecondary vocational education institution earned on average 12.9% higher weekly earnings than those who had only a high school education; for blacks, the relative gain from vocational education was 12.1%; and for Hispanics, the higher earnings were 27.8%. For white women, persons who participated in postsecondary vocational education received 18.7% higher earnings; among blacks, the gain was equal to 26%; and among Hispanics, it was 5.8% (which was also statistically insignificant).

Note that despite the positive labor market returns to postsecondary vocational education, as established in Table 5, both an associate degree and a college diploma are associated with greater earnings. This result, however, may be explained by the differences in the length of the educational process in vocational/technical education institutions, which is much shorter than the longer two-year associate degrees and four-year college degrees. Furthermore, the lower estimated rate of return to vocational/technical training may be associated with self-selection effects, suggesting that those persons who eventually face greater disadvantage in the labor market are also those who enter vocational/technical postsecondary education programs. From this perspective, the lower measured rate of return to vocational/technical education relative to associate and bachelor's degrees may be explained by differences in unmeasured characteristics of persons in various postsecondary education programs.

Employer-Supplied Apprenticeships

The analysis presented in this report so far has supplied information on the impact of vocational education programs offered by educational institutions. In addition to these, vocational training programs are provided on-the-job by employers. Such is the case of workplace apprenticeships.

The use of an apprenticeship system to reform vocational education has gathered substantial steam in public policy circles over the last five years (see Hamilton, 1990). There is, however, relatively little evidence on the effectiveness of apprenticeships on economic outcomes in the United States.[7] Examples of the type of apprenticeship proposed in recent years—involving close integration of secondary schooling with the apprenticeship—are not easily found.[8] However, the private sector has used apprenticeship programs for incorporating new employees into the workplace for a long time. We use data provided by the 1991 Workplace Literacy Assessment Survey (WLAS) to examine how apprenticeship programs are related to economic outcomes.

The 1991 WLAS includes data on various education/training programs taken since high school by persons in the sample. The survey was carried out by the Educational Testing Service and the U.S. Department of Labor. It assessed and profiled a national sample of approximately 8,000 persons enrolled in Job Training Partnership Act (JTPA) programs, individuals applying for jobs through the Employment Service (ES) system, and persons filing claims for Unemployment Insurance (UI).

Table 6 shows the decomposition of the various education/training programs completed since high school graduation by persons in the labor force sampled by the WLAS. As can be seen, apprenticeships accounted for a relatively small component of the education/training program menu available to the persons sampled. Participation in apprenticeships was much greater among men, for all racial and ethnic groups. Among non-Hispanic white men, 7.4% had participated in an apprenticeship program, while for non-Hispanic white women, it was only 2.1%. Similarly, among non-Hispanic black men,

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[7] For a discussion of the issues surrounding apprenticeships in the American labor market, see Bailey and Merritt (1992).

[8] A discussion of innovative high school programs linking school and work is provided by Goldberger, Kazis, and O'Flanagan (1994), and by Pauly, Kopp, and Haimson (1994).

7.5% had completed an apprenticeship but only 1.5% of black women had. Among Hispanics, the numbers were 4.8% for men and 1.5% for women.

Table 6
Type of Education/Training Program Completed Since High School by Persons in the Labor Force

Persons 16 years of age or older who have completed their education

Ethnic/Racial Group	Vocational, Provided by Educational Institution	Apprenticeship Program	Employer Work-Site Program	Vocational, Provided by Military	Total
Male					
Non-Hispanic white	28.2%	7.4%	24.5%	16.7	76.8%
Non-Hispanic black	36.7	7.5	19.0	12.2	75.4
Hispanic	29.0	4.8	17.5	5.6	56.9
Female					
Non-Hispanic white	34.4%	2.1%	22.0%	1.3	59.8%
Non-Hispanic black	39.1	1.6	21.0	3.8	65.5
Hispanic	22.3	1.5	12.7	1.5	38.0

Source: Workplace Literacy Assessment Survey (WLAS) (1991). Author's tabulations.

To examine the impact of apprenticeships on labor market outcomes, a multivariate statistical analysis was carried out examining how the hourly earnings of workers in the WLAS sample were affected by educational attainment, on-the-job experience, health indicators, literacy skills, and vocational education programs attended (and time of participation in these programs). It is found that, among men, workplace apprenticeships are strongly related to earnings. For non-Hispanic black and white men, for instance, participating in an apprenticeship program would be associated with increased earnings on

average of about 20%, holding other things constant. For Hispanic men, the association would be even stronger, being connected to a 35% increase in earnings. Among women, on the other hand, the empirical results do not find any statistically significant connection between participation in an apprenticeship and earnings. These results apply to all racial and ethnic groups considered.

The lack of impact of apprenticeships on the earnings of women may be explained by the clustering or tracking of women into lower-paying occupations such as nursing or clerical occupations. In fact, some women's advocacy groups—such as Wider Opportunities for Women (WOW)—have noted precisely this issue. In 1992, a report released by the American Association of University Women stated that "despite reforms designed to encourage girls to enter nontraditional fields, sex bias in vocational education is keeping females from rewarding careers" (Vocational Training News, 1992). Since the segregation of women into lower-paying occupations appears to solidify in secondary schooling, our findings raise serious concerns about how current School-to-Work initiatives may be molded to deal with their potential bias against women.

CHAPTER 4:
ACADEMIC ENRICHMENT, THE GED, AND VOCATIONAL EDUCATION

There is currently considerable support among policymakers and many academics for integrating academic enrichment programs such as General Equivalency Diploma (GED) courses into vocational education programs. For example, in their detailed analysis of training programs, Sar Levitan and Frank Gallo (1988) recommend that government training programs complement their skill offerings with programs of study for a GED: "Achievement of a high school equivalency diploma should be the goal for enrolles who have not completed their secondary education" (p. 175). Some academics, however, have raised serious concerns about the economic value of a GED, although the matter is a controversial one, with some research also suggesting positive effects of obtaining a GED on labor market outcomes (see Cave & Bos, 1994; Iowa Department of Education, 1992; and Passmore, 1987).

This is a key issue for ethnic and racial minorities with elevated high school dropout rates. For them, obtaining high school certification through a GED would constitute a key benefit of vocational education programs, if indeed the GED is beneficial. Presently, close to 50% of black high school dropouts and 30% of Hispanic dropouts would like to, and plan to, get a GED.[9]

Is the value of a GED insignificant, as seems to be suggested by some of the recent economic research on this topic? Analysis of this issue has been limited due to the lack of data allowing comparison of GED recipients with high school graduates. Previous studies all rely either on a selected sample of the population (such as a cohort of GED recipients in a particular state) or the utilization of the National Longitudinal Survey of Youth (used by Cameron & Heckman [1993, 1994] as well as Murnane, Willett, & Boudett [1995, 1997]), which is restricted to a sample of persons who were aged 13 to 20 in 1978. By using the NALS, this paper presents the first nationally representative analysis of the consequences of the GED.

Our analysis focuses on linking labor market outcomes to a GED, looking at the labor market status and wages of GED recipients and comparing them to those of high school dropouts without a GED and to persons who have a high school diploma as their

[9] These figures are for 8th- to 10th-grade dropouts surveyed by the U.S. Department of Education (1992).

highest educational qualification. Note that the paper focuses on comparing persons who have decided not to pursue postsecondary education, an issue to be discussed in greater detail later on. The paper also studies how the literacy skills of persons with a GED compares with those exhibited by other groups in the population. The analysis is disaggregated by gender, race, and ethnicity.

Comparing the Labor Market Outcomes of High School and High School Equivalency

There are two ways of achieving certification for high school completion: (1) through formal schooling ending in graduation from high school or (2) for those who drop out of high school, by passing a standardized equivalency certification exam. To compare the relative effectiveness of these two alternatives, this section examines the characteristics of those persons in the NALS sample who have a GED, those who are high school dropouts and have no GED (for simplicity referred to, from now on, as high school dropouts), and those receiving high school diplomas through academic schooling (high school graduates). The comparison is made on the basis of two labor market outcomes: (1) the rate at which individuals participate in the labor force (either employed or looking for work), and (2) the weekly wages received by those who are employed. The population examined is restricted to persons 25 years of age or older, who have presumably completed their college education. This section provides a discussion of the simple correlation between labor market outcomes and GED recipiency. Later sections proceed to a more detailed description of the connection, including a discussion of the results of a multivariate analysis of the role played by the GED on wages.

Table 7 presents the labor force participation rates of male and female GED recipients relative to those of persons in other educational categories, including high school dropouts, high school graduates, persons with some college education (but no degree), and those who have a college diploma. Among men, high school dropouts had the lowest labor force participation rate, equal to 58.3%. By contrast, the participation rate among those who received a GED was 83.4%. This was approximately equal to the 83.2% participation rate among high school graduates.

Among women, Table 7 shows that the labor force participation rate of high school dropouts was also the lowest in the sample, equal to 36.2%. For GED recipients, though, labor force participation was drastically higher, equal to 63.5%. As in the case of men, high school graduates had a labor force participation rate similar to that prevailing among GED recipients, this time equal to 58.6%.

Table 7

The Comparative Labor Force Participation of GED Recipients

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Labor Force Participation Rate (in Percentage)
Men	High School Dropout	58.3%
	Earned GED	83.4
	High School Graduate	83.2
	Some College	84.9
	College Graduate	87.0
Women	High School Dropout	36.2%
	Earned GED	63.5
	High School Graduate	58.6
	Some College	69.6
	College Graduate	77.4

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

The connection between GED recipiency and labor force participation exhibited in Table 1 holds for all the major racial and ethnic groups in the population. Among the black population, for example, the labor force participation rate for female high school dropouts is 43.6% but among GED recipients it is 65.3%. For Hispanics, the jump in female labor force participation relating to GED recipiency goes from 39.3% to 68.8%. And among white females, the increased participation rate associated with a GED is from 33.2% to 60.6%. As in Table 7, the greater labor force participation rate associated with a GED according to race and ethnicity also holds among men.

The correlation between a GED and weekly wages is examined next. Because we find that the association between GED recipiency and wages is more complex than the one obtained for labor force participation rates, the analysis is disaggregated by race and ethnicity as well as gender. Table 8 presents the weekly wages received on average by non-Hispanic whites in the various educational categories considered in our discussion. Tables 9 and 10 present the same information for non-Hispanic blacks and Hispanics, respectively.

Table 8 shows that, among non-Hispanic white men, the lowest weekly wage rate was received by high school dropouts, who exhibited an average of $534 per week in the NALS sample. Among men who had received a GED, the weekly wage rate was equal to $630, substantially above the one received by dropouts. The average wage rate received by GED recipients was even higher than the wage rate of males whose highest educational attainment was a high school diploma—$540 in the NALS sample. Among college graduates, the average wage rate for non-Hispanic white men was $1,089, reflecting the high return to a college education in 1992.

Table 8
The Weekly Wages of GED Recipients, Non-Hispanic Whites

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Weekly Wage Rate in 1992 ($)
Men	High School Dropout	$534
	Earned GED	630
	High School Graduate	540
	Some College	670
	College Graduate	1,089
Women	High School Dropout	250
	Earned GED	288
	High School Graduate	303
	Some College	395
	College Graduate	608

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

The relationship between GED recipiency and weekly wages for non-Hispanic white women is also shown in Table 8. Female dropouts had the lowest average wage of all persons in the whole NALS sample, equal to $250 a week. A GED, however, was associated with a substantial improvement in wages: among GED recipients, the prevailing wage rate was $288. The wage of white female GED recipients was still lower than the one prevailing among persons whose highest educational attainment was a high school diploma, which was $303. As was the case for men, college graduates had remarkably higher wage rates, equal to $608 weekly.

The educational wage structure established in Table 8 for non-Hispanic whites applies also to non-Hispanic blacks. Table 9 depicts the wages of the various groups of persons 25 years of age or older considered in this paper. Among men, the lowest wage rate was exhibited by high school dropouts. The average weekly wage among high school dropouts was $338 while it was $362 among persons who had earned a GED. Persons whose highest educational attainment was a high school diploma had wages substantially above these, equal to $407.

Table 9

The Weekly Wages of GED Recipients, Non-Hispanic Blacks

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Weekly Wage Rate in 1992 ($)
Men	High School Dropout	$338
	Earned GED	362
	High School Graduate	407
	Some College	481
	College Graduate	767
Women	High School Dropout	244
	Earned GED	296
	High School Graduate	304
	Some College	375
	College Graduate	616

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

For non-Hispanic black women, we again find substantially higher wages among holders of a GED, when compared to high school dropouts. Among those with a GED, the average wage rate was $296; while for dropouts, the wage rate was $244. For non-Hispanic black women with a high school diploma, average wages were equal to $304, again significantly lower than for black women with a college degree, who made $616 a week.

For the Hispanic population, the structure of results are similar to those among non-Hispanic blacks. Table 10 shows that a GED is linked to higher wages among Hispanic men, but the return is not particularly high. The wage rate among high school dropouts was $336, while for GED recipients it was $348. By comparison, Hispanic men with high school diplomas as their highest educational attainment had a substantially greater wage, equal to $498. Among women, GED recipients had again slightly higher wages than high school dropouts. The wage rate among dropouts was $231, among GED recipients it was $247, and among high school graduates it was $335.

Table 10
The Weekly Wages of GED Recipients, Hispanics

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Weekly Wage Rate in 1992 ($)
Men	High School Dropout	$336
	Earned GED	348
	High School Graduate	498
	Some College	543
	College Graduate	1,266
Women	High School Dropout	231
	Earned GED	247
	High School Graduate	335
	Some College	398
	College Graduate	519

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

It is clear from Tables 8 through 10 that, for all ethnic and racial groups, persons holding a GED do significantly better than high school dropouts in the labor market. One question that emerges, however, is whether the GED provides educational value in the form of greater academic proficiency, or whether the economic gains from a GED are related to the value of the high school equivalency purely as a credential, without it being really associated with greater worker skills or productivity. The next section examines this issue.

Does a GED Have Educational Value?

The question of whether passing the GED test battery really implies that the person has some additional knowledge or skill compared to high school dropouts who do not take the GED is one that plagues GED recipients. Some scholars have suggested that passing the GED does not provide any significant academic value, pointing out to the limited candidate preparation for the tests (a survey carried out in 1980 suggested that the average preparation time was only 20 hours), and the high passing rate (which is 80% on a first-time basis) (see Cameron & Heckman, 1993, 1994).

The NALS data set allows us to establish the literacy skills of male and female GED recipients as well as those of high school dropouts, high school graduates, and other educational groups. This section examines whether GED recipients have greater literacy skills than high school dropouts.

The average levels of prose and quantitative literacy for persons in the various educational categories discussed in this paper are presented in Tables 11 through 13, arranged by race/ethnicity and gender. Table 11 begins by presenting the data for non-Hispanic whites in the sample (standard deviations are reported in parentheses). Note that the scores achieved by persons with a GED were substantially higher than those for high school dropouts. For both men and women, the data presented in Table 11 show that those with a GED scored 50 points higher than dropouts, upgrading their prose and quantitative literacy skills from level 1 to levels 2 or 3.

Table 11

Comparative Literacy Skills of GED Recipients, Non-Hispanic Whites

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Prose Literacy	Quantitative Literacy
Men	High School Dropout	218.9 (55.6)	224.4 (62.1)
	Earned GED	272.1 (33.1)	280.5 (38.5)
	High School Graduate	273.2 (42.2)	282.7 (44.9)
	Some College	297.1 (39.2)	308.6 (40.6)
	College Graduate	334.6 (38.0)	340.1 (39.7)
Women	High School Dropout	226.3 (49.9)	216.6 (60.2)
	Earned GED	280.5 (41.3)	277.8 (43.2)
	High School Graduate	278.2 (39.7)	273.4 (43.9)
	Some College	300.9 (37.8)	297.5 (40.2)
	College Graduate	334.4 (36.9)	325.5 (41.0)

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

As a matter of fact, Table 11 indicates that, among non-Hispanic whites in the NALS, the literacy skills of GED recipients were approximately equal to those exhibited by persons whose highest educational attainment was a high school diploma. In terms of prose literacy, for example, men with a GED had an average score of 272.1 points while those with a high school diploma had an average score of 273.2 points. Among women, the literacy skills of GED recipients were even slightly higher than those exhibited by high school graduates, 280.5 versus 278.2 for prose, and 277.8 versus 273.4 for quantitative literacy.

Table 12 shows the literacy skills of the non-Hispanic black population in the NALS, according to educational category and by gender. The literacy skills levels of non-Hispanic blacks lie below those achieved by non-Hispanic whites, a pattern that may be attached to differences in the quality of schooling.[10] In terms of the earlier discussion, though, the results established for non-Hispanic whites are reproduced here: GED recipients performed substantially above the level achieved by high school dropouts in both the prose and quantitative literacy measures. As before, the superiority of persons with a GED was around 50 points, which moved them from level 1 to level 2 relative to high

[10] For an examination of this issue, see Rivera-Batiz (1991, 1992).

school dropouts. In addition, the scores of GED recipients were approximately equal to, and sometimes even higher than, those displayed by high school graduates. Among black men, for example, the average prose literacy score for GED recipients was 248.2 points, while among high school graduates it was 231.4 points. Among black women, the average prose literacy score earned by GED recipients was 241.3 points while it was 242 for persons whose highest education attainment was a high school diploma. Similar patterns are observed for quantitative literacy skills.

Table 12
Comparative Literacy Skills of GED Recipients, Non-Hispanic Blacks

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Prose Literacy	Quantitative Literacy
Men	High School Dropout	181.4 (56.2)	167.3 (62.1)
	Earned GED	248.2 (36.3)	239.7 (38.9)
	High School Graduate	231.4 (43.4)	227.6 (44.8)
	Some College	256.6 (47.2)	254.7 (47.2)
	College Graduate	289.7 (43.1)	285.9 (39.4)
Women	High School Dropout	195.2 (50.5)	174.0 (58.7)
	Earned GED	241.3 (37.2)	230.2 (42.0)
	High School Graduate	242.0 (36.4)	228.4 (41.0)
	Some College	265.1 (37.7)	252.9 (40.1)
	College Graduate	292.6 (38.2)	276.2 (41.1)

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

Table 13 presents the literacy skills achieved by the various Hispanic educational groups in the United States. The remarkable observation is that, again, GED recipients greatly outperform high school dropouts. The gap for the Hispanic population is even greater than for non-Hispanics in the population. Perhaps because of the association of a GED with improved English language proficiency, the prose skills of male Hispanic GED recipients were 71.3 points higher than among high school dropouts and those of female Hispanic GED recipients were 74.2 points higher. The lack of a significant difference in the literacy skill levels of GED recipients and persons whose highest educational attainment was a high school diploma also holds for the Hispanic population. Among women, for

example, the average prose literacy score of those with a GED was 235.2 points while the corresponding score for high school graduates was 240.1 points.

Table 13
Comparative Literacy Skills of GED Recipients, Hispanics

Persons 25 years of age or older, 1992

Gender Group	Highest Educational Attainment	Prose Literacy	Quantitative Literacy
Men	High School Dropout	151.0 (64.1)	149.6 (69.6)
	Earned GED	222.3 (67.4)	230.9 (71.5)
	High School Graduate	232.3 (57.9)	237.6 (61.3)
	Some College	259.0 (58.9)	267.5 (57.9)
	College Graduate	303.1 (48.3)	308.3 (43.8)
Women	High School Dropout	165.1 (62.1)	149.0 (70.4)
	Earned GED	244.1 (51.4)	232.0 (47.2)
	High School Graduate	245.1 (52.4)	236.2 (55.4)
	Some College	269.2 (59.3)	259.7 (55.5)
	College Graduate	285.9 (57.5)	279.5 (52.5)

Source: NALS, Public Use Data Tape (1992). Author's Tabulations.

The results presented in this section indicate that GED recipients exhibit significantly greater literacy skills than high school dropouts. In fact, it is hard to differentiate the scores of GED recipients from those of persons whose highest educational attainment was a high school diploma. Although suggesting that the acquisition of a high school equivalency provides significant academic value added, compared to that of high school dropouts, one must be careful in interpreting these results. Although the NALS data provides a nationally representative data set that can be used to examine the economic and literacy consequences of a GED, it is a cross-sectional data set, which places some limits on the interpretation of the results just established. The surprisingly strong positive linkage between a GED and both literacy and earnings, comparable to a high school diploma, may be due to a greater selectivity of the GED population when compared to high school graduates. Note that this study compares the literacy and earnings of persons who do not pursue any postsecondary education, whose highest educational attainment is a high school diploma or equivalent. Since a larger proportion of high school graduates pursue

postsecondary education when compared to GED holders, and these are usually the persons with greater academic achievement, the sample of persons whose highest educational attainment is just high school constitutes a negatively selected group. Persons who pursue a GED, on the other hand, are usually among the most-motivated and with higher academic achievement of high school dropouts (they also tend to have a higher number of years of schooling compared to dropouts who do not pursue a GED). The positive selectivity of GED holders and the negative selectivity of persons who have a high school diploma as their highest educational level may account for the apparent equivalence of the two groups in literacy and earnings, as determined in this study. If this is the case, then, it is not the GED as such that provides the literacy and earnings gains documented in this paper, but, rather, the dynamism and selectivity of GED holders. This has obvious policy implications. It also may explain the difference between the cross-sectional results established in this paper and those of the longitudinal analyses provided by Cameron and Heckman (1993) and Murnane et al. (1995, 1997). By providing information on literacy skills before and after acquiring a GED, longitudinal analysis is better suited for an analysis that corrects for the selectivity differential of GED holders and persons whose highest educational attainment is a high school diploma.

A Multivariate Analysis of the Impact of the GED on Wages

Previous sections compared directly the wages of GED recipients with those of high school dropouts and other groups. Such a simple correlation can be misleading. Wages are related to a whole array of other variables whose interaction with educational attainment may make the relationship between wages and GED recipiency quite complex.

Age, for instance, may be a critical factor to adjust for. The growth of the GED as a source of high school certification boomed in the 1970s and 1980s. As a result, the GED population is younger compared to the population holding high school diplomas. However, the wages received by males graduating from high school—or their equivalents—have declined in real terms over the last twenty years (see Blackburn, Bloom, & Freeman, 1990; Levy & Murnane, 1992). As a consequence, the male GED cohort may be observed to have lower wages relative to high school graduates purely because of its younger composition. Compounding this influence on wages are also differences between GED and non-GED populations in years of job experience, extent of part-time employment, physical disabilities, and a number of other variables.

In order to specify the particular role played by educational attainment (especially that of a GED versus other educational categories), a multivariate regression analysis was carried out estimating human capital earnings functions that specify how wages are influenced by a set of explanatory variables that includes the educational categories examined above, on-the-job experience, age of the person, race and ethnicity, and literacy skills (see the discussion relating to equation (1) earlier for more details on this). The analysis was carried out separately by gender.

Table 14 depicts the sample means for the first set of earnings equations estimated in this paper. The discussion begins by looking at the results for men. Later, the discussion turns to the results for women.

Table 14
GED Earnings Equations, Age Range 24 to 65: Sample Means

	Mean	
Variable	**Male**	**Female**
Weekly Wage	$691	$397
Ln Weekly Wage	6.26	5.71
LESSHS (Proportion with Less than High School Certificate)	0.15	0.13
GED (Proportion with GED)	0.04	0.04
HSGRAD (Proportion who Completed High School)	0.28	0.29
SOMECOLL (Proportion with Some College Education)	0.26	0.31
COLLEGE (Proportion with a College Degree)	0.13	0.12
MORECOLL (Proportion with More than a College Degree)	0.14	0.11
AGE (Persons 25 to 64 Years of Age)	40.3	40.6
AGESQ (AGE*AGE)	1,733	1,755
BLACK (Proportion Self-Identified as Black)	0.087	0.11
HISPANIC (Proportion Self-Identified as Hispanic)	0.092	0.08
READING Literacy (Average Score)	285	292
QUANTITative Literacy	292	287

Source: NALS (1993). Public Use sample.

Table 15 shows the estimated coefficients for the human capital equation for the logarithm of weekly wages for men. The first column presents the estimated coefficients with no literacy variables included. The second equation shows the coefficients for the earnings equation augmented with literacy variables.

Table 15
Log Weekly Earnings Equations, Males 25 to 64

	Simple Wage Equation	Augmented Wage Equation
INTERCEPT	4.0122 (28.6)	3.3307 (23.4)
GED	0.2868 (5.9)	0.1032 (2.2)
HSGRAD	0.2939 (10.7)	0.1204 (4.2)
SOMECOLL	0.4748 (17.1)	0.2086 (6.7)
COLLEGE	0.7628 (23.2)	0.4154 (11.0)
MORECOLL	0.9911 (30.6)	0.6041 (15.6)
AGE	0.0813 (11.9)	0.0744 (11.2)
AGESQ	-0.0008 (-10.5)	-0.0007 (-9.5)
BLACK	-0.2625 (-8.6)	-008438 (-2.6)
HISPANIC	-0.1744 (-5.7)	-0.0250 (0.8)
READING	—	0.0002 (0.4)
QUANTIT	—	0.0032 (8.1)
R-SQ	0.27	0.31
N	5,463	5,463

Inside parentheses: t for H_0: Parameter = 0.

Source: NALS (1993). Public Use sample.

Table 15 shows that, holding other variables constant, males with a GED had higher wages than workers with less than a high school education. A GED (with other things constant, such as age and race/ethnicity) is associated with a 28.7% increase in wages relative to those received by high school dropouts. Compared to persons whose highest educational attainment is a high school diploma, though, the rate of return to

education of a GED, as measured in Table 15, is slightly lower since among high school graduates the earnings are 29.4% higher than for high school dropouts. Note also from this equation the much higher economic returns to college education (compared to high school certificates), the negative and significant coefficients on the black and Hispanic dummy variables, and the positive but declining rates of return to job seniority.

In terms of literacy skills, the augmented wage equation in Table 15 suggests that quantitative literacy represents the key variable associated with higher earnings among men. Reading proficiency, on the other hand, is statistically insignificant in the equations. Note also that, once the literacy variables have been added, the black and Hispanic dummy variables lose their importance, both in absolute value and in terms of statistical significance (see Neal & Johnson, 1996). Still, the GED is shown to supply a substantial positive economic return, only slightly lower than that for a high school diploma.

Table 16 shows the estimated human capital equation coefficients for the logarithm of weekly wages for women. The estimated coefficients indicate that women with a GED had higher wages than high school dropouts, holding other things constant. Holding a GED (with other things constant, such as age and race/ethnicity) is linked to 24.6% higher wages relative to those received by high school dropouts. Compared to women whose highest educational attainment is a high school diploma, the rate of return to education of a GED for women, as measured in Table 16, is approximately equal to the rate of return to a high school education.

In terms of literacy skills, the augmented wage equation in Table 16 suggests that quantitative literacy represents the key variable associated with higher earnings among women. As in the case of men, reading proficiency is statistically insignificant. Still, the GED is shown to supply a substantial positive economic return, again approximately equal to that for a high school diploma.

Table 16

Log Weekly Earnings Equations, Females 25 to 64

	Simple Wage Equation	Augmented Wage Equation
INTERCEPT	4.4932 (27.8)	3.7350 (21.9)
GED	0.2463 (4.4)	0.1089 (1.9)
HSGRAD	0.2490 (7.8)	0.1063 (3.2)
SOMECOLL	0.4900 (15.4)	0.2816 (7.9)
COLLEGE	0.8301 (21.6)	0.5624 (12.7)
MORECOLL	1.0253 (25.9)	0.7189 (15.4)
AGE	0.0353 (4.5)	0.0352 (4.6)
AGESQ	-0.0004 (-4.2)	-0.0004 (-4.1)
BLACK	0.0662 (2.1)	0.2061 (6.3)
HISPANIC	0.0562 (1.5)	0.2198 (5.8)
READING	—	0.0005 (1.1)
QUANTIT	—	0.0025 (5.4)
R-SQ	0.16	0.19
N	5,513	5,513

Inside parentheses: t for H_0: Parameter = 0.

Source: NALS (1993). Public Use sample.

We conclude this section by noting again that, although persons with a GED receive earnings similar to those received by persons whose highest educational attainment, this does not necessarily mean that the GED can provide labor market returns equivalent to a high school diploma. As noted earlier, the persons for whom the GED earnings have been computed so far are likely to be positively selected relative to persons for whom a high school diploma is the highest educational attainment. This would then account for the surprisingly strong connection between a GED and earnings. However, for the average person seeking a GED (not necessarily positively selected), the qualification may not provide rates of return equivalent to a high school diploma.

CHAPTER 5:
SUMMARY AND CONCLUSIONS

Nationally representative data on the effects of vocational education are not readily available. Most of the census-based information does not include data on the vocational education characteristics of persons sampled. This paper uses two recently released surveys in examining the impact of vocational education on racial and ethnic minorities in the United States. These are the 1992 National Adult Literacy Survey (NALS), the data of which was released in 1994, and the 1991 Workplace Literacy Assessment Survey (WLAS), which was released in 1992. The following are the results:

Secondary Vocational Education

1. The clientele of high school vocational education programs includes a significantly greater proportion of minorities (blacks and Hispanics) than whites. The proportion of whites in the population in 1992 who attended a high school program with a vocational, technical, or trade focus was 15.3% for men and 12.3% among women. By comparison, the equivalent figures for blacks were 23.9% for men and 19.6% for women. Among male Hispanics, 20.1% attended a high school with a vocational focus while 17.1% of female Hispanics did. There is also much greater participation of both white men and women in college preparatory high school programs.

2. It is found that, holding other things constant, persons who complete a vocational education track in high school do not have significantly different earnings later in life than those persons who complete their secondary education without tracking.

Postsecondary Vocational Education

3. It is found that students enrolled in postsecondary vocational education programs display on average substantially lower scores than other postsecondary students on tests of literacy skills. However, the data also shows that students enrolled in postsecondary vocational education on average also have parents with lower socioeconomic background than students registered in other postsecondary education institutions. It is also clear that students in bachelor's degree programs on average have stayed longer in school than students in vocational education.

4. A multivariate analysis of the determinants of literacy skills suggest that, although adjusting for socioeconomic status as well as other background characteristics of individuals does reduce substantially the observed gap in literacy skills between students in vocational education and others, there generally remains a statistically significant shortfall. This is especially the case among black students. Is this remaining literacy gap due to the curriculum of postsecondary vocational education programs, which has often been accused of lacking academic focus? Unfortunately, the analysis in this paper cannot establish conclusively whether or not vocational education programs, because of the content and quality of their curriculum, produce lower literacy skills in their students when compared to four-year colleges. To provide an accurate answer to this question requires longitudinal data, comparing literacy skills before and after students enter vocational education and other postsecondary education programs.

5. Persons who have participated in formal postsecondary vocational/technical education institutions tend to have earnings significantly higher than those of individuals without any postsecondary education. At the same time, the Mincerian rate of return to postsecondary vocational/technical education is lower than for associate and bachelor's degrees. This result, however, may be explained by the differences in the length of the educational process in vocational/technical education institutions, which is much shorter than the longer two-year associate degrees and four-year college degrees. Furthermore, the lower estimated rate of return to vocational/technical training may be associated with self-selection effects, suggesting that those persons who eventually face greater disadvantage in the labor market are also those who enter vocational/technical postsecondary education programs. From this perspective, the lower measured rate of return to vocational/technical education relative to associate and bachelor's degrees may be explained by differences in unmeasured characteristics of persons in various postsecondary education programs.

Apprenticeships

6. Apprenticeships accounted for a relatively small component of the education/training program menu available to the persons studied in this report. Participation in apprenticeships was much greater among men, for all racial and ethnic groups. Among non-Hispanic white men, 7.4% had participated in an

apprenticeship program while for non-Hispanic white women it was only 2.1%. Similarly, among non-Hispanic black men, 7.5% had taken an apprenticeship but only 1.5% of black women had. Among Hispanics, the numbers were 4.8% for men and 1.5% for women.

7. For men, workplace apprenticeships are strongly related to earnings. For non-Hispanic black and white men, for instance, participating in an apprenticeship program would be connected to an increase in earnings of about 20%, holding other things constant. For Hispanic men the association is even stronger, being linked to 35% higher earnings. Among women, on the other hand, we do not find any statistically significant connection between participation in an apprenticeship and earnings. These results apply to all racial and ethnic groups considered.

Basic Skills Programs and Academic Enrichment of Vocational Education

8. This report finds that, among students who do not pursue postsecondary education, those receiving a GED have similar literacy skills to those of students who have received a high school diploma. Furthermore, among those persons who do not pursue postsecondary education, the Mincerian rate of return to a GED does not appear to be lower than that of a high school diploma. We must stress, however, that the surprisingly strong positive linkage between a GED and both literacy and earnings, when compared to a high school diploma, may be due to a greater selectivity of the GED population when compared to high school graduates. Note that the study compares the literacy and earnings of persons who do not pursue any postsecondary education, whose highest educational attainment is a high school diploma or equivalent. Since a larger proportion of high school graduates pursue postsecondary education when compared to GED holders, and these are usually the persons with greater academic achievement, the sample of persons whose highest educational attainment is just a high school diploma constitutes a negatively selected group. Persons who pursue a GED, on the other hand, are usually among the most motivated and with higher academic achievement of high school dropouts (they also tend to have a higher number of years of schooling compared to dropouts who do not pursue a GED). The positive selectivity of GED holders and the negative selectivity of persons who have a high school diploma as their highest educational level may account for the apparent equivalence of the two groups in literacy and earnings, as determined in this study. If this is the case, then, it is not the GED as

such that provides the literacy and earnings gains documented in this paper, but, rather, the dynamism and selectivity of GED holders. This has obvious policy implications.

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