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Vocational Schooling, Occupational Matching, and Labor Market Earnings in Israel

**Shoshana Neuman
Adrian Ziderman**

ABSTRACT

This paper examines the efficacy (in terms of labor market outcomes) of vocational school education in Israel as compared with that of academic schools. Using data from the 1983 population census, the study shows vocational schooling, which accounts for half of secondary school enrollment in Israel, to be more cost-effective than general school education for those students who do not go on to higher education. In particular, those who complete vocational school and who work in occupations related to a course of study pursued at school earn more (by up to 10 percent annually) than their counterparts who attended general secondary schools or those from vocational schools who are employed in noncourse-related occupations. These results provide strong reinforcement of recent, broadly similar studies for the United States.

I. Introduction

The accumulated evidence from more than two decades of international case study literature argues strongly against vocational

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schooling on cost-benefit grounds. This literature, relating to both Western and Third World countries, compares labor market outcomes of vocational education with general academic schooling, mainly at the secondary level. It has been extensively reviewed by Zymelman (1976), Psacharopoulos (1987), and Tilak (1988). Two recent World Bank studies, for Peru (Moock and Bellew 1988) and for the Ivory Coast (Grootaert 1988), come to similar negative conclusions about vocational schools.

Some recent studies for the United States, however, have reached very different conclusions. This "new wave" of research is focused more closely than earlier studies on the type of jobs held by vocational school completers, on the relationship between vocational courses and subsequent employment,¹ and on more relevant measures of vocational education.² In contrast with the earlier work, these conclude that vocational education can be a labor market advantage in labor force participation, earnings, and unemployment for those high school completers who work in jobs related to the vocational courses followed at school, while vocational completers working outside their training specialty fare no better than workers who pursue general academic tracks. This "new wave" literature on vocational schooling in the United States is reviewed by Bishop (1989). So far, however, these new approaches do not seem to have been utilized in Third World countries and the general negative conclusions of the "vocational schooling fallacy" literature (dating from Foster 1965) remain current and largely unchallenged.

A recent study (Neuman and Ziderman 1989), which compares the earnings of workers who attended vocational with those who attended academic secondary schools in Israel, suggests that Israel may provide an example among nonrich countries of an educational system where vocational (as opposed to academic) schooling appears to be economically effective. The earlier paper, however (as is common with the Third World literature as a whole), lacks discussion of the *content* of these vocational courses of study and its effect on labor market outcomes. Yet, a central objective of vocational schooling (though not necessarily the sole or even major one) is to provide specific marketable skills to the labor force.

In this paper we consider whether vocational school attenders become employed in occupations that utilize vocational skills learned at school and the effect of those skills on labor market earnings. We compare these earnings with those of individuals who study at academic schools. We

1. Important recent studies include those by Daymont and Rumberger (1982) and Campbell et al. (1986, 1987).

2. The pioneering work of Meyer is important here (see Meyer 1981); see also the National Assessment of Vocational Education (1989).

also examine the labor market outcomes of Israeli vocational secondary education in terms of the relationship between subjects studied and occupations entered. The results reported are positive for vocational schooling and provide strong reinforcement for recent, broadly similar U.S. studies.

Israel seems to provide an appropriate framework for studying these issues, given the central role it accords to secondary vocational schools within its educational system. Today, more than 50 percent of secondary school pupils are enrolled in vocational tracks. The vocational school sector is not only sizeable in terms of enrollments and number of schools but is growing relative to academic schools (Figure 1); in this, too, Israel departs from international trends which have shown a secular shift away from vocational schooling in recent decades (Benavot 1983).

Vocational schooling, now under the aegis of the Ministry of Education, constitutes the dominant form of training for the skilled trades in Israel (over 80 percent of skilled workers are trained in these schools). For an amalgam of historical, social, and cultural reasons, enterprise-based forms of training for youth, such as the traditional apprenticeship, have not developed extensively in Israel.³ While the Ministry of Education is responsible for curriculum, terminal examinations, teacher training, and school inspection, very few schools are formally Government schools. Most vocational schools are run by public voluntary organizations (the largest is ORT), a few by local municipalities; all are highly subsidized from Ministry of Education budgets.

II. Data

As in our earlier paper, this study draws upon individual data records from the 1983 Census of Population and Housing 20 percent subsample. Using information on levels and types of terminal schooling we identify two broad groups of individuals: those who terminated education at a vocational secondary school and at an academic secondary school, respectively.⁴ It was not possible to identify the type of secondary school attended by completers who went on to postsecondary education; they are not included in this analysis. In addition, the Census questionnaire was unusual in addressing a specific question concerning the major

3. These issues are discussed more fully in Iram and Balicki (1980) and Ziderman (1989a).

4. Individuals who concluded other forms of vocational training for youth, notably the formal apprenticeship and industrial schools, were also included within the category of vocational school completers; as were those who attended agricultural secondary schools. These groups, however, constitute a small and declining proportion of vocationally educated students.

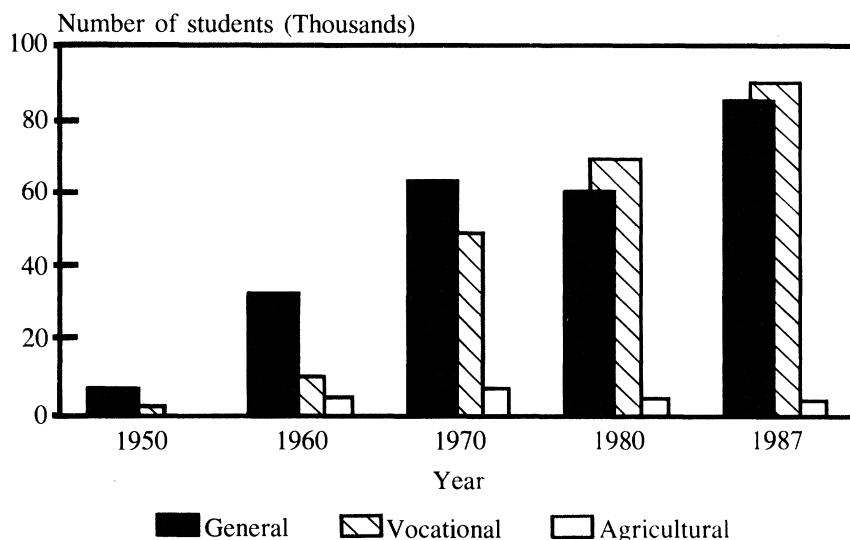


Figure 1
Number of Students in Secondary Schools (Hebrew education)

vocational subject of study to those individuals whose formal education terminated at the agricultural or vocational secondary school. We used this information to probe two central issues relating to vocational schooling: first, the extent to which former vocational school attenders are employed in occupations related to the main subject area they studied at school; and second, whether there are significant differences in the earnings of those employed in jobs related to subject studied at school and those not working in subject-related occupations.

This paper concerns only the subset of individuals who were between the ages of 25 and 49 at the time of the Census. The upper age limit was set in order to exclude individuals who had attended secondary school before 1948, the year of statehood; the lower, to include those who had at least three years of possible labor market experience following their three-year compulsory military service, which begins at age 18. Since our concern is with the Israeli education system, we excluded (on the basis of information on age and year of migration) the large number of immigrants who had attended high school abroad. Finally, we included only male Jewish full-time workers (a worker is considered "full-time" if he worked at least 35 hours in the week prior to the Census). In all, the sample included some 14,000 individuals, nearly 10,000 former vocational school attenders, and some 4,000 individuals who attended general secondary schools.

III. Education-occupation Matchings

For each vocational school attender, we compared subjects studied with current job held (using two-digit occupational codes) to determine whether vocational education received was related to occupation. Two alternative matching procedures were employed, "direct" matchings and "wider" matchings. For direct matchings, a worker is defined as matched if he works in an occupation directly related to the subject studied; for example, the subject "Electricity" and the occupational category "Electricians/Electronic Fitters" constitute a direct match. Wider matchings include closely related occupations, in addition. In the latter case, we take account of the dynamics of career development: thus an individual who had studied Electricity might go on to become a Technical Salesman or open his own electrical business as a Working Proprietor in the Retail Trades. While admittedly judgmental, it is not thought that the procedures adopted will occasion any great dissent.⁵

Table 1 shows the proportion of matched workers, by field of study, according to direct and wider matching regimes.⁶ Overall, 37 percent of vocational school attenders were employed in occupations related to the course of study pursued (47 percent on the basis of the wider matchings). Leaving aside the categories Sewing & Fashion, and Hotel Management, where the number of observations are small, the proportion of matched workers does not differ markedly across subject of study categories (with the exception of Agriculture). Relative frequencies range from 38 to 51

5. Details of the educational-occupational equivalences used in the matchings procedure is provided in the Appendix.

6. The relative importance of courses of study in agricultural and for blue collar occupations (the first five listed in Table 1) are reflective of the courses typically taken by male attenders of vocational schools (who constitute our sample) rather than the overall spread of vocational courses offered. Females, on the other hand, are dominant in courses of study for white collar occupations. This is shown in the overall proportions of vocational school attenders who had taken courses of study leading to the following groups of occupations (Source: Central Bureau of Statistics 1988):

	Male (%)	Female (%)
Agriculture	8.5	6.3
Blue collar	68.9	2.1
White collar	5.5	70.2
Not known	17.0	20.3

Thus, in focusing only on males (as is typical in studies of this type because of the rather different nature of the relevant earnings function for females) the study essentially addresses itself to courses of study relevant to blue collar occupations.

Table 1

Numbers and Average Monthly Earnings of Matched and Nonmatched Workers by Subject of Study (full-time male salaried workers, attenders of vocational schools—Israeli Census 1983)

Area of Study	All Vocational School Attenders		Direct Training-Occupation Matchings			Wider Training-Occupation Matchings		
	Number of Workers	Average Monthly Earnings ^a	Percent of Workers in Matched Occupations ^b	Average Monthly Earnings of Matched Workers ^a	Average Monthly Earnings of Nonmatched Workers ^a	Percent of Workers in Matched Occupations ^b	Average Monthly Earnings of Matched Workers ^a	Average Monthly Earnings of Nonmatched Workers ^a
Agriculture	1,002	37,898 (28,782)	6.09 (61)	29,324 (11,861)	38,448 (29,453)	14.47 (145)	45,849 (28,814)	36,571 (28,408)
Electricity	1,357	37,602 (27,694)	42.08 (571)	37,768 (18,918)	37,482 (32,639)	51.14 (694)	41,217 (34,151)	33,824 (17,694)
Electronics	691	43,759 (29,633)	49.06 (339)	51,215 (35,915)	36,579 (19,461)	60.35 (417)	50,212 (34,142)	33,938 (16,814)
Metal work	4,337	36,834 (28,530)	37.91 (1,644)	36,944 (26,525)	36,767 (29,693)	45.35 (1,967)	39,996 (37,134)	34,210 (18,170)
Auto mechanics	1,967	36,341 (22,450)	42.76 (841)	37,122 (23,655)	35,757 (21,497)	56.58 (1,113)	38,556 (25,517)	33,451 (17,258)
Bookkeeping, secretarial & clerical	331	38,007 (22,045)	51.06 (169)	37,990 (19,139)	38,025 (24,777)	58.31 (193)	40,945 (22,257)	33,899 (21,148)
Sewing & fashion	20	30,213 (16,522)	20.00 (4)	17,827 (3,175)	33,516 (17,126)	20.00 (4)	17,827 (3,175)	33,516 (17,126)
Hotel management	93	29,433 (10,893)	40.86 (38)	31,009 (10,112)	28,344 (11,364)	40.86 (38)	31,009 (10,112)	28,344 (11,364)
Total	9,798	37,396 (27,129)	37.4 (3,667)	38,274 (25,638)	36,870 (27,973)	46.7 (4,571)	40,892 (33,104)	34,338 (20,037)

a. Standard deviations in parentheses.

b. Absolute numbers in parentheses.

percent for direct matchings and between 45 and 60 percent for wider matchings; ranking by subject differs somewhat for the two matching processes.⁷

The table also reports average monthly earnings for matched and nonmatched workers, by subject. Average earnings of matched workers exceed those of nonmatched workers for most subject of study categories. No weight should be given to the size of the earnings differential in particular cases, however, since the comparative earnings figures are "gross" ones, with no control for other factors that may differentially influence earnings; the regression analysis that follows presents "net" results.

IV. Earnings Functions: Vocational School Attenders

Earnings functions are estimated for the subsample of 9,788 individuals who had attended vocational secondary school. The objective of the regression analysis is to examine whether there are significant differences between vocational school attenders who work in field-of-study related occupations and those who do not, holding constant other variables that may affect earnings.

The specification of the earnings functions is of the traditional Mincer type. The log of monthly earnings is run against a series of human capital variables, including years of schooling, labor force experience, type of school certification obtained, and a dummy variable (*VOC.M*) relating to vocational school attenders that were employed in matched occupations, i.e., occupations related to the vocational course of study taken at school.

The main focus of the regressions is the coefficient on the *VOC.M* variable, holding constant the other explanatory variables relating to other dimensions of education received, to various personal background characteristics, and to aspects of labor market involvement. A positive and significant coefficient on the *VOC.M* variable would indicate that attenders of vocational secondary schools who were employed in occupations related to course of study pursued, earned more, on average, than their counterparts who did not work in matched occupations.

7. There is also considerable stability of the matched proportion, by age. For the five-year age groups between ages 25–49, the percentage of matchings were:

	25–29	30–34	35–39	40–45	45–49	All Age Groups
Direct matchings	38.2	39.5	36.6	33.6	33.0	37.4
Wider matchings	44.4	48.9	47.5	45.0	48.4	46.7

The full set of variables employed in the regressions are as follows:

Schooling variables

YRS.SCH: Years of schooling (ranging from 8 to 12 years)

A dummy variable *VOC.M* representing matched vocational school attenders, with nonmatched in the constant term.

Subject of study, represented by a series of dummy variables (with Agriculture as the reference group): *ELECTRIC* (Electricity), *ELECTRON* (Electronics), *METAL* (Metal work), *AUTO* (Auto mechanics), *CLERIC* (Clerical and bookkeeping), *SEW* (Sewing and fashion), and *HOTEL* (Hotel management). Occupation dummies are not included, because of a high correlation between vocational subject studied and occupation.

A series of dummy variables, *P.CERT*, *S. CERT*, and *BAG*, relating to the highest level of school certification attained—completed primary or intermediate level, completed secondary schooling, and gained *Bagrut* (matriculation), respectively. The category, “no certificate obtained” enters the constant term.

Personal background variable

ETHNIC: a dummy indicating ethnic origin (Oriental = 1, Western = 0).

Work related variables

EXP: years of work experience (defined as Age-*SCH*-6)

WEEKS: log of number of weeks worked in the past year

HOURS: log of hours worked in the past week⁸

A series of dummy variables relating to sector in which employed: Industry (*IND*), Electricity (*ELECT*), Commerce (*COMM*), Finance (*FIN*), Transport (*TRANS*), Public Services (*PUB*), Private services (*PRIV*), Construction (*CONST*), with Agriculture in the constant term.

Results are presented in Table 2, on the basis of direct and wider matchings, respectively. Before considering the *VOC.M* variable, we review some of the other central results. Whereas the experience terms yield expected results (earnings are positively related to years of experience but decline for additional higher years of experience), the lack of significance on the years of schooling term is to be explained in part by the introduction of the certification terms. The positive coefficient on the interaction term, however, *EXP*YRS.SCH* (which is not in the tradi-

8. The reason for taking the natural logarithm of the weeks and hours variables is that they are highly skewed to the left (most workers working 45 hours a week and 52 weeks a year). By taking the log, the distribution becomes more symmetric.

Table 2

*Regressions of Monthly Earnings (*ln*) (full-time, male, salaried workers, attenders of vocational schools—Israeli Census 1983; n = 9,798)*

Independent Variables	Direct Matchings		Wider Matchings	
	Coefficient	t-statistic	Coefficient	t-statistic
<i>YRS.SCH</i>	0.024	1.51	0.022	1.38
<i>EXP</i>	0.025	2.13	0.025	2.06
<i>EXP</i> ²	-0.0007	5.07	-0.0007	4.98
<i>EXP*YRS.SCH</i>	0.002	2.37	0.002	2.36
Certification				
<i>P.CERT</i>	0.011	0.44	0.013	0.38
<i>S.CERT</i>	0.073	3.10	0.067	2.84
<i>BAG</i>	0.112	3.46	0.103	3.23
<i>WEEKS</i> (<i>ln</i>)	0.302	13.16	0.298	13.05
<i>HOURS</i> (<i>ln</i>)	0.374	9.66	0.367	0.53
<i>ETHNIC</i>	-0.137	11.84	-0.134	11.66
Economic Sector				
<i>IND</i>	0.101	3.08	0.095	2.90
<i>ELECT</i>	0.284	6.48	0.285	6.54
<i>COMM</i>	0.110	0.30	0.008	0.23
<i>FIN</i>	0.133	3.31	0.139	3.49
<i>TRANS</i>	0.084	2.36	0.092	2.58
<i>PUB</i>	0.019	0.55	0.033	0.95
<i>PRIV</i>	-0.047	1.16	-0.054	1.34
<i>CONST</i>	-0.005	0.14	0.00002	0.00
Subject of Study				
<i>ELECTRIC</i>	0.055	2.36	0.033	1.43
<i>ELECTRON</i>	0.184	6.62	0.158	5.67
<i>METAL</i>	0.057	2.88	0.040	2.01
<i>AUTO</i>	0.042	3.27	0.043	1.97
<i>CLERIC</i>	0.044	1.25	0.016	0.46
<i>SEW</i>	-0.053	0.42	-0.054	0.43
<i>HOTEL</i>	-0.024	0.41	-0.038	0.65
<i>VOC.M</i>	0.055	4.54	0.114	9.80
Intercept	6.771	25.72	6.838	26.07
R ²	0.155		0.161	

tional Mincer specification⁹) shows the presence of increasing returns to schooling as experience advances (and vice versa).

Of more central importance, however, are the coefficients on the *VOC.M* term. The coefficients show that matched workers do achieve higher earnings than their nonmatched counterparts;¹⁰ it is also seen that subject of study exerts a differential effect on earnings.¹¹ How do the earnings of each subgroup of vocationally educated individuals compare with those who go through the academic secondary school stream? We probe these issues in the next section.

V. Vocational Versus General School Outcomes

We turn to the broader sample of former secondary school attenders, comprising those from both vocational and academic secondary school backgrounds. Two dummy variables, relating to type of secondary school attended, are now defined: *VOC.M* (=1, if the worker is a vocational school attender working in a matched occupation, and =0, if otherwise), and *VOC.U* (=1 if he is an unmatched vocational school attender, and =0 is otherwise). The reference group is thus workers who had attended general academic secondary schools. The regression model specification is otherwise parallel to those reported in Table 2, except that a set of occupational dummies replace the subject-of-study dummies (the Census did not collect information on the latter for academic secondary school attenders). The occupational dummy variables are: Scientific and academic (*ACAD*), Other professional and technical (*TECH*), Administrators and Managers (*MANAG*), Sales (*SALES*), Services (*SERV*),

9. For a justification for including this interaction term, see Dougherty and Jimenez (1987).

10. The large *VOC.M* coefficient in the wider matchings regression (compared to that in the direct matchings) might occasion surprise. The Table 2 regressions, however, do not include controls for occupation; many individuals that are matched under the wider matchings definitions are managers, who tend to command relatively high salaries. Rerunning Table 2 regressions but substituting occupational dummies for the subject-of-study dummies give the following results for the *VOC.M* coefficient: direct matchings 0.094 (7.26), wider matchings 0.097 (7.96).

11. We reran the regressions reported in the previous footnote, for each subject course for which there were sufficient observations. The *VOC.M* coefficients were found to be positive and significant for all of the regressions (except for Agriculture), thus confirming overall that the differential earnings effect is present for the course of study subsamples. For the direct matchings regressions, the *VOC.M* coefficients were as follows (the *t* statistic is shown in parentheses): Electricity 0.109 (2.71), Electronics 0.140 (2.11), Metalwork 0.073 (3.59), Auto mechanics 0.095 (3.07) and Clerical 1.068 (3.34). Results for the wider matchings are: Electricity 1.09 (2.94), Electronics 0.099 (1.67), Metalwork 0.076 (4.00), Auto mechanics 0.099 (3.34), and Clerical 0.673 (3.28).

Skilled (*SKILL*), and Unskilled (*UNSKILL*), with Agricultural workers entering the constant term.

The reported coefficients on the *VOC.M* and *VOC.U* variables in the regressions in Table 3 are significantly positive and nonsignificant, respectively. The implication of these results is clear. They indicate that while there is no difference in earnings between academic school attenders and those vocational school attenders who work in occupations unrelated to vocational courses studied at school, the earnings of former vocational school students employed in matched occupations exceed those of workers who attended academic schools (by over 8 percent in the regression relating to wider matchings and by 9.6 percent for direct matchings).¹²

The overall regression results in Table 3 lead to an important refinement of the conclusions presented in our earlier paper. We now see that type of school attended, whether vocational or academic secondary, *does* have an impact on labor market income. It is only when vocational school attenders are employed in jobs unrelated to courses of study pursued at school that earnings are broadly similar to those of workers who studied at academic secondary schools. For those vocational school attenders who work in study-related occupations, average earnings are significantly higher than those of workers who studied at academic secondary schools.¹³

VI. Costs and Benefits of Vocational Schooling

The regression analyses show that, given the higher earnings accruing to vocational school attenders working in matched occupations (i.e., occupations related to course of study), overall, terminal voca-

12. The actual percentage effect of the *VOC.M* dummy variable on earnings is somewhat higher than the dummy variable coefficient multiplied by 100 (see Halvorsen and Palmquist 1980).

13. An anonymous referee has argued that the higher earnings found in training-related occupations may really be just an effect of placement in a high-wage occupation—whether or not one was specifically trained for it in school. This question has been explored by Hotchkiss (1989); using U.S. data, Hotchkiss finds that adding dummy variables representing occupations nullifies the apparent effect of other dummy variables representing whether a person is in a training-related job. This result is different from those reported in Table 3, where the job-match dummies *do* remain significant despite the presence of occupation dummies. Two main differences between our work and that of Hotchkiss may account for the differing results. First, our matching procedure is far more detailed than that of Hotchkiss who distinguishes only between two areas of vocational study—clerical, and trade and industry—while we have eight. Thus, for example, a worker who studied electricity but worked as a plumber would be considered matched in the Hotchkiss analysis, but not in

tional secondary education yields higher monetary benefits than general academic education. The question of the efficacy of vocational schooling, however, relates not just to the relative benefits of vocational and academic schooling, but rather to benefits in relation to respective costs.

While in the comparative international context vocational schooling costs generally exceed the costs of academic schooling,¹⁴ no sound data are available on the relative costs of vocational and general secondary schooling in Israel. Official estimates of national expenditure on secondary education, however, are available by type of schooling;¹⁵ from these we may derive rough estimates of relative costs in terms of national expenditures *per pupil* on vocational and academic secondary schools, respectively. For the financial year 1982–83, which most closely relates to the year of the Census, per-pupil vocational and academic schooling costs respectively were 61,107 and 33,667 Israeli Shekel: this gives a ratio of per-pupil vocational to academic schooling costs of 1.815 (i.e., vocational schools were over 80 percent more expensive per student than academic schools).¹⁶

Are these higher vocational school unit costs sufficiently sizable to offset the earnings benefits of vocational education (as indicated by those working in matched occupations)? In order to test this, we compared benefits and costs in terms of an investment appraisal; we subjected our overall results to a series of sensitivity tests, by experimenting with alternative values of the parameters in the following equation:

$$NPV = \sum_{t=1}^n [m v Y_{At}(1 + g)^t - c C_{At}] (1 + i)^{-t},$$

where

- Y_A measures average income of academic school completers, in year t ;
- v is the proportional earnings advantage of vocational school completers working in matched occupations;

ours. Second, Hotchkiss considers wages in the first job within two years after high school completion, while our analysis relates to the whole lifecycle—in our view the more appropriate focus.

14. See Tsang (1989) for a comprehensive review of the evidence.

15. See *Central Bureau of Statistics* (recent years).

16. Details of these cost estimates can be obtained from the authors on request. The cost ratio of 1.815 represents very much higher relative costs for vocational schools than were given in an earlier paper by the authors (Neuman and Ziderman 1989); in that paper the authors overestimated the absolute level of unit costs, and understated the relative vocational-academic school unit cost ratio; we are thankful to Shmuel Amir of the Hebrew University, Jerusalem for this correction.

Table 3

*Regressions of Monthly Earnings (*ln*) (full-time, male, salaried workers, general and vocational school attenders—Israeli Census 1983; n = 13,879)*

Independent Variables	Nonmatched Regression		Direct Matchings		Wider Matchings	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
<i>YRS.SCH</i>	0.020	1.53	0.017	1.34	0.017	1.29
<i>EXP</i>	0.036	3.69	0.034	3.52	0.034	3.49
<i>EXP</i> ²	-0.0008	7.40	-0.0008	7.32	-0.0008	7.31
<i>EXP*YRS.SCH</i>	0.001	1.62	0.001	1.79	0.001	1.82
<i>WEEKS</i> (<i>ln</i>)	0.314	16.66	0.312	16.58	0.312	16.57
<i>HOURS</i> (<i>ln</i>)	0.301	9.25	0.312	9.60	0.313	9.64
<i>ETHNIC</i>	-0.130	13.49	-0.131	13.59	-0.129	13.43
Economic Sector						
<i>IND</i>	0.075	2.51	0.072	2.40	0.069	2.30
<i>ELECT</i>	0.267	6.73	0.260	6.55	0.261	6.59
<i>COMM</i>	-0.026	0.82	-0.028	0.86	-0.027	0.84
<i>FIN</i>	0.131	3.88	0.128	3.82	0.130	3.88
<i>TRANS</i>	0.072	2.26	0.073	2.29	0.074	2.32
<i>PUB</i>	-0.029	0.92	-0.029	0.94	-0.026	0.83
<i>PRIV</i>	-0.055	1.53	-0.072	1.99	-0.017	1.96
<i>CONST</i>	-0.003	0.08	0.004	0.13	0.003	0.08

Occupation						
<i>ACAD</i>	0.253	3.30	0.283	3.70	0.279	3.65
<i>TECH</i>	0.369	8.18	0.360	7.99	0.361	8.01
<i>MANAG</i>	0.496	11.03	0.525	11.65	0.480	10.68
<i>CLER</i>	0.194	4.43	0.215	4.90	0.211	4.82
<i>SALES</i>	0.195	4.22	0.224	4.87	0.199	4.35
<i>SERV</i>	0.186	4.04	0.212	4.60	0.208	4.53
<i>UNSKILL</i>	0.102	1.98	0.134	2.60	0.134	2.61
<i>SKILL</i>	0.180	4.20	0.173	4.03	0.174	4.07
Certification						
<i>P.CERT</i>	0.0005	0.02	-0.001	0.07	-0.001	0.05
<i>S.CERT</i>	0.071	3.55	0.063	3.18	0.064	3.22
<i>BAG</i>	0.122	5.01	0.113	4.66	0.116	4.81
<i>VOC</i>	0.026	2.42	—	—	—	—
<i>VOC.M</i>	—	—	0.096	6.84	0.081	6.27
<i>VOC.U</i>	—	—	-0.003	0.27	0.013	1.05
Intercept	6.949	31.46	6.940	31.49	6.959	31.57
R ²	0.169	—	0.173	—	0.173	—

- m is the proportion of vocational school completers employed in matched occupations;
- g is the secular growth of real incomes.
- c relates to excess vocational schooling costs over academic school costs and is measured by the ration $(C_V - C_A)/C_A$, where C_V and C_A measure annual costs per student in vocational and academic schools, respectively;
- i is the discount rate; and
- n is the time horizon of the appraisal.

Results are presented in Table 4, assuming a 35-year postschooling time horizon. Our central findings, with positive *NPVs*, are shown in the boxes in the table. For direct matchings these relate to $v = 0.096$ and $m = 0.37$ (based on the matched percentages given in Table 1), and for wider matchings to $v = 0.081$ and $w = 0.47$. In both cases $c = 0.815$, $g = 0.02^{17}$ and $i = 0.08$; three years of secondary schooling is assumed¹⁸ and the values for v are assumed to apply also to the three-year period of compulsory army service from age 18.

The table shows alternative *NPV* results, based on different combinations of alternative income growth rates, a higher discount rate, lower value for the m parameters, four years of secondary schooling and zero value for v during army service. Only in some of the *worst* assumption cases are the *NPVs* negative and then only marginally so.¹⁹ We may conclude that terminal vocational schooling in Israel compares favorably with terminal academic schooling, in cost-benefit terms.

VII. Discussion

This paper has compared, for the case of Israel, vocational secondary schools with academic schools in terms of their efficacy in enhancing labor market earnings. Using data from the 1983 Census of Population and Housing relating to nonpost-secondary school attenders, the study shows vocational schooling to be more cost-effective than general academic education. In particular, those vocational school attenders who work in occupations related to course of study pursued at school earn more (by up to 10 percent monthly) than both their peers who stud-

17. The historical trend in real wages increases since the early 1970s has been higher, at close to 3 percent.

18. Under the 1968 Reform of the Israeli educational system, secondary high schools offer a three-year program, compared with four years previously.

19. The *NPV* "loss" seldom represent more than a few weeks earnings, usually considerably less.

Table 4
Incremental Net Present Value of Vocational Schooling over Academic Secondary Schooling (Israeli Shekel, per student)

Direct Matchings ($v = 0.096$)		Wider Matchings ($v = 0.081$)	
Matched in Occupation (m)		Matched in Occupation (m)	
27 percent	37 percent	37 percent	47 percent
3 year Schooling	3 year Schooling (Army Service)	4 year Schooling	3 year Schooling (Army Service)
Schooling	Schooling	Schooling	Schooling

<i>Discount Rate (i): 8 percent</i>
Income growth rate (g):
1 percent
2 percent
3 percent

<i>Discount Rate (i): 10 percent</i>
Income growth rate (g):
1 percent
2 percent
3 percent

ied at academic secondary schools and those who attended vocational schools but found employment in noncourse-related occupations. These results are highly supportive of recent research on vocational schooling for the United States. For example, Campbell et al. (1987) report earnings gains of 8 percent for U.S. vocational school completers working in training-related jobs, over workers who had followed a general high school curriculum; vocational school graduates not working in matched fields fared no better than those who had studied on general tracks.

Overall, given the present division of secondary education between academic and vocational schooling, this study has indicated the efficacy of vocational secondary schooling in Israel. This conclusion is buttressed when account is taken of the differing individual background factors that characterize the students attending Israeli academic and vocational secondary schools, respectively.

Most studies of outcomes of vocational and academic schooling do not control explicitly for background differences between the two subpopulations, due to a lack of the requisite data. The results of such studies may not be faulted by this omission, however, because in most developing countries only a small (and highly select) fraction of children attend secondary schools, implying a restricted variance in student samples at the secondary level (Fuller 1987). In the present case, however, where over 80 percent of secondary school age teenagers are enrolled in secondary schools, competition for entry into academic schools leads to a process of rationing of academic school places on the basis of student academic ability; social class and parental background also play a role. Thus, vocational secondary school pupils differ from their academic school counterparts in a number of ways, which, in turn, affect earnings. They tend to be of lesser academic ability and to come from a lower socioeconomic background; they are more likely to be of Oriental origin and their parents are less educationally qualified. Data limitations prevented us from controlling for most of these factors. Yet, in the absence of secondary schooling, it is to be expected that these factors would result in a level of earnings for those who attended a vocational school that was lower than that of their academic school peers: attendance at a secondary school results in a closing of this earnings gap between the two groups. In this case, our results underestimate the true "value added" of vocational schooling.²⁰

20. This argument, however, should not be pressed too far. Unlike the case of vocational schools, most academic high school completers go on to pursue postsecondary study. Since our sample is restricted to academic school attenders who do not continue studying, it relates to the less academically able students at academic schools—a form of negative selection. Yet this group is likely to be closer in background and ability to vocational school attenders generally.

We have noted that the present balance of secondary schooling in Israel between vocational and academic schooling offers a satisfactory return on societal investment in terminal secondary schooling. It remains the case, however, that well over half of all those who attend the more costly vocational schools do not work in occupations matching the courses of study pursued at school, nor do the latter benefit from an earnings advantage over their academic school counterparts. Does this suggest that there should be a redistribution of secondary school places in favor of academic schools? This would be so only, and this is doubtful, if vocational school students generally were suitable for the more demanding academic secondary education stream.

Our positive conclusions with regard to vocational schooling need to be tempered with a caveat. While vocational schooling overall may be cost-effective in comparison with other forms of secondary schooling, it is *not* so in relation to alternative training modes for youth in the skilled trades. In a recent study, one of the authors compared vocational schools with alternative nonformal training modes in Israel—notably the traditional apprenticeship and factory-based vocational schools (Ziderman 1989b). In this context, vocational schools were found not to be cost-effective: they constitute the most expensive skill training mode without offering any earnings (or productivity) advantage to vocational school attenders over those from alternative training institutions. It was concluded that greater efficiency in the national training effort could be attained by a shift in the training effort away from vocational schooling in the direction of more closely job-related training modes outside the formal education system. Yet, accounting for only some 7 percent of 15–17 years old (compared with over 40 percent attending vocational schools), these training institutions are marginal today in Israel, not only in terms of numbers.

The national consensus in Israel on the importance of providing a *schooling* framework to undertake the role of the social and cultural integration of Israel's heterogeneous, largely immigrant population acts as a major constraint on the development of those training alternatives that are the norm for youth in other countries. The desire to meet manpower needs for development plays an important role in explaining the growth and size of vocational schooling in Israel (Glasman 1983). Vocational schools were also accorded a central role in integrating into the dominant framework of society the large numbers of youths stemming from North Africa, the Middle East, and Yemen who have low academic ability and socioeconomic status; by and large the traditional, academic schools were not regarded as providing an appropriate educational framework for most of these immigrant youngsters (Ziderman 1989a). Thus, vocational secondary schools became the dominant provider of skilled workers for

the skilled trades, issues of economic efficiency notwithstanding. Very little is done to develop the nonformal job-related training modes as mainstream training institutions; under the aegis of the Ministry of Labor and Social Affairs they concentrate on meeting the needs of disadvantaged and marginal youth. The cost effectiveness of vocational secondary schools in relation to academic ones, then, must be seen against this backcloth, very much in a "second best" context, once the full range of educational and training programs for youth are taken into account.

The positive findings for vocational schooling presented in this study, supportive of recent research for the United States, illustrate the importance of adopting a broader scope than is taken in the typical evaluation study of vocational schooling in Third World countries. Too often such studies concentrate on earnings and other labor market success indicators to the exclusion of the intervening variable relating to the type of occupation followed and its relevance to prior vocational studies.²¹ In this paper we have seen that such considerations may be central to a proper understanding of the labor market outcomes of vocational schooling. Future studies will need to pay more attention to issues of curriculum (including the type and scope of vocational studies), as well as to the nature of the occupation followed and its relationship with prior courses of vocational study.

21. There are some notable exceptions, including an early Brazilian case study by de Moura Castro (1975); a forthcoming case study of vocational schools in Hong Kong, also based on Census data and employing a very similar methodology (in terms of matched occupations) to that employed in the present paper, reached positive results for vocational schooling (see Chung 1990).

Appendix*Matching of Vocational Education Course with Occupation*

Subject of Study	Number of Course Completers	Matching Occupations			(Additional to Direct Matching Occupations)	Number of Matched Individuals		
		Direct Matchings		Number of Matched Individuals				
		Matched Occupations						
Agriculture	1,002	Farm proprietors (working their own farms)	10	Other managers	84			
		Farm managers	25					
		Skilled workers in agriculture	24					
		Farm hands	2					
		Percent directly matched	6.1%	Percent more widely matched		14.5%		

Appendix*Matching of Vocational Education Course with Occupation*

Subject of Study	Number of Course Completers	Matching Occupations			
		Direct Matchings		Wider Matchings	
		Matched Occupations	Number of Matched Individuals	Matched Occupations	(Additional to Direct Matching Occupations)
Electricity	1,357	Engineering technicians and practical engineers	95	Other managers	76
		Electrician and electronic fitters	476	Working proprietors in retail trades	10
		Percent directly matched	42.1%	Technical salesmen	37
Electronics	691	Engineering technicians and practical engineers	203	Percent more widely matched	51.1%
		System analysts and computer programmers	7	Other managers	54
				Working proprietors in retail trades	3

			21
Electricians and electronic fitters	119	Technical salesmen	
Fitters of precision instruments	10		
Percent directly matched	49.1%	Percent more widely matched	60.4%
Engineering technicians and practical engineers	140	Other managers	214
Raw metal processors	37	Technical salesmen	
Tinsmiths, welders, blacksmiths, and workers in finished metal products	1,185		
Assemblers, installers, and repairers of machines and transport vehicles	222		
Pipe fitters and plumbers	60	Percent more widely matched	45.4%
Percent directly matched	37.9%		
Engineering technicians and practical engineers	64	Other managers	87
Mechanical equipment operators	4	Technical salesmen	69
Metal work	4,337		
Auto mechanics	1,967		

Appendix*Matching of Vocational Education Course with Occupation*

Subject of Study	Number of Course Completers	Matching Occupations			Wider Matchings (Additional to Direct Matching Occupations)	
		Direct Matchings		Number of Matched Individuals		
		Matched Occupations	Number of Matched Individuals			
		Assemblers, installers, and repairers of ma- chines and transport vehicles	477		Tinsmiths, welders, blacksmiths, and workers in finished metal products	
		Operators of digging, building and road con- struction equipment	61			
		Drivers	235			
		Percent directly matched	42.7%	Percent more widely matched	56.6%	

Clerical and bookkeeping	331	Supervising clerks	8	Other managers	24	
		Bookkeepers	102			
		Secretaries, typists, and keypunch operators	9			
		Store clerks, warehouse workers, and filing clerks	19			
		General office clerks	10			
		Other clerical workers	21			
			51.1%			58.3%
Sewing and fashion	20	Tailors, sewers, and related workers	4			
		Percent directly matched	20.0%	Percent more widely matched	20.0%	
Hotel trades and home economics	93	Cooks, waiters and bartenders	38			
		Percent directly matched	40.9%	Percent more widely matched	40.9%	
All courses of study	9,798	Percent directly matched	37.4%	Percent more widely matched	46.7%	

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