DOCUMENT RESUME

ED 280 977 CE 046 770

AUTHOR Psacharopoulos, George
TITLE Curriculum Diversification, Cognitive Achievement and Economic Performance: Evidence from Colombia and Tanzania.
INSTITUTION London Univ. (England). Inst. of Education.
PUB DATE May 86
NOTE 75p.; Paper presented at the Vocationalising Education Conference (London, England, May 7-9, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Academic Achievement; Access to Education; Cognitive Ability; Cost Effectiveness; *Developing Nations; Equal Education; Foreign Countries; Labor Market; Outcomes of Education; Prevocational Education; *Program Effectiveness; Program Evaluation; Secondary Education; Socioeconomic Background; *Student Characteristics; *Vocational Education
IDENTIFIERS *Colombia; *Tanzania

ABSTRACT

A study evaluated diversified secondary school systems in Colombia and Tanzania. It compared advantages that might have accrued to diversified school students and graduates relative to more conventional types of formal training. A random sample of approximately 14,000 school students following diversified and conventional secondary curricula was taken just before graduation to obtain information on students' socioeconomic background and educational characteristics. The same students were contacted one to three years later to record further education or labor market activities. Schools were compared according to four main criteria. One was concerned with equity of access to education, and the other three with the efficiency of resource use: access to the two types of school by students with different socioeconomic origins (equity), cognitive learning outcomes (internal efficiency), labor market outcomes (external efficiency), and cost effectiveness (economic efficiency). Results indicated that compared to schools offering only conventional curricula, the diversified schools recruit more students from poorer origins and impart higher cognitive skills to their graduates. Graduates of such schools often cost more to educate than those of control schools and despite their superior cognitive skills, they did not find jobs more easily and did not earn more than graduates of control schools. (YLB)

University of London Institute of Education
Department of International and Comparative Education

VOCATIONALISING EDUCATION CONFERENCE

7-9 May, 1986

CURRICULUM DIVERSIFICATION, COGNITIVE ACHIEVEMENT AND ECONOMIC PERFORMANCE: EVIDENCE FROM COLOMBIA AND TANZANIA

George Psacharopoulos

The World Bank

Department of International and Comparative Education
University of London Institute of Education
20 Bedford Way, WC1H 0AL

Revised January 1986

CURRICULUM DIVERSIFICATION, COGNITIVE ACHIEVEMENT AND ECONOMIC PERFORMANCE: EVIDENCE FROM COLOMBIA AND TANZANIA

by

George Psacharopoulos
The World Bank

Presented at the Conference on
Vocationalizing General Education
Institute of Education, University of London
May 7 - 8, 1986

Table of Contents

CURRICULUM DIVERSIFICATION, COGNITIVE ACHIEVEMENT AND ECONOMIC PERFORMANCE: EVIDENCE FROM COLOMBIA AND TANZANIA

George Psacharopoulos *
The World Bank

I. Introduction

Diversifying the secondary school curriculum to include pre-vocational subjects has been an educational policy that has flourished over the last decade in many third world countries. The often cited objective of diversification is to free students from being locked into the traditional fixed curriculum. The diversified curriculum ought to provide a wider set of future career options than could otherwise be had if the more uniform curriculum were followed. This has been the stated rationale of diversified schools and from it derives their popularity. Many governments have invested heavily in diversified schools as a means to make the rapid expansion of secondary education consistent with a better match between the skills learned in school with those needed in the labor market.

* This paper is based on a more comprehensive World Bank research project on Diversified Secondary Curricula (DiSCuS, RPO 672-45), in collaboration with the Colombia Ministry of Education, the Instituto SER de Investigacion (Drs. Eduardo Velez and Carlos Rojas), the Tanzania Ministry of Education and the Institute of Education, University of Dar es Salaam (Professor I. Omari). William Loxley was the main consultant to the project and Ana-Maria Arriagada served as research assistant. Professors Philip Foster, Keith Hinchliffe and Antonio Zabalza provided various inputs to the project. Robin Horn was very helpful in revising the first draft. For a more extensive treatment of the subject see Psacharopoulos and Loxley (1985). For a more succint exposition see Psacharopoulos (1985). The views expressed here are those of the researchers and should not be attributed to the World Bank or the Governments of the two countries.

Abstract

During the last decade many developing countries have "diversified" their curricula at the secondary school level by introducing pre-vocational subjects alongside the traditional academic ones. The most-often stated rationale for such education reform is to widen students' choice of future careers and thus make the school system more relevant to the world of work. But in spite of the popularity of such educational innovation, no comprehensive studies or empirical evaluations have been made of the effects of curriculum diversification on national development. Policymaking has been based on the bona fide intuitive assumption that the inclusion of pre-vocational subjects in the secondary education curriculum offers better employment opportunities and outcomes than traditional academic schooling.

This study reports the results of an evaluation of diversified secondary school systems in Colombia and Tanzania. A random sample of about 14,000 school students following diversified and conventional secondary curricula was taken just before graduation, to obtain information on the students' socio-economic background and educational characteristics. The same students were contacted one to three years later to record their destination to further education or labor market activities. Schools offering diversified curricula were compared to those offering pure academic or vocational subjects, according to four main criteria. Of these criteria, one is concerned with equity of access to education, and the other three with the efficiency of resource use: first, access to the two types of school by students with different socio-economic origins (equity); second, cognitive learning outcomes (internal efficiency); third, labor market outcomes (external efficiency), and fourth, cost-effectiveness (economic efficiency).

The results indicate that relative to the schools offering only conventional curricula, the diversified schools recruit more students from poorer origins and they impart higher cognitive skills to their graduates. However, graduates of such schools often cost more to educate than those of control schools and despite their superior cognitive skills they do not find jobs more easily and do not earn more than the graduates of control schools.

This negative result might be due to the short horizon of the longitudinal tracer study. Hence another survey of the same cohorts is contemplated some years hence, when graduates have become more settled in their careers.

As a strategy for modernizing the instructional content of secondary schools, curriculum diversification is based on a set of assumptions concerning relationships between conventional secondary education, educational innovation, and the nature of a national economy's employment-opportunities structure. It is assumed that in most cases, especially in developing countries, there exists a fundamental mismatch or lack-of-fit between types of education and training typically offered in conventional schools, and the skills and other charateristics required of many graduates in the world of work. 1/ In addition, it is also assumed that the content and methods of conventional secondary school education unrealistically exaggerate the educational and occupational aspirations of graduates. 2/

In spite of numerous arguments put forth in support or opposition to diversified education in the third world, little empirical evidence exists to confirm or reject hypotheses in favor of this type of schools. The purpose of this study is to begin to compare any advantages that might have accrued to diversified school students and graduates relative to more conventional types of formal training. Potential advantages stemming from diversification could be measured in several ways: first, wider access to secondary schooling by less

---

1/ Variants of this basic rationale have been exposited by Ahmed and Coombs (1975), Dore (1975) on Sri Lanka, Van Renasburg (1974) on Botswana, Court (1972) on Kenya, Orata (1972) on the Philippines, Lourie (1978) on Panama, Benoit (1974) on Colombia, Nyerere (1967) on Tanzania, King (1978) on Kenya, Ruddell (1979) on Ghana, Weeks (1978) on Papua New Guinea, Schiefelbein (1979) on Colombia and Chile, Figueroa, Prieto and Gutierrez (1974) on Cuba, and Unger (1980) on China.

2/ See Klingelhofer (1967), Oxtoby (1977), Evans and Schimmel (1970), Silvey (1972), and Ruddell (1979).

privileged socio-economic groups of the population (equity); second, higher cognitive attainment measured by test scores in both pre-vocational and academic subjects (internal efficiency); and third, better labor market outcomes, e.g. better employment opportunities or higher returns to investments in acquiring a combination of academic and pre-vocational skills as opposed to merely one or the other (external efficiency).

Countries selected for the empirical investigation of diversification should meet at least two criteria that would allow a proper evaluation: first, programs should have been in place long enough and be well implemented, and second, diversification should have been introduced on a scale large enough to permit appropriate sampling. Secondary school diversification has proceeded farthest in Latin America and East Africa. Colombia has been chosen as a case country in Latin America because it extensively implemented public diversified education alongside purely vocational and academic secondary schools. Tanzania has been selected as a case country in East Africa because diversification there is a well-established policy based on self-reliance and has been well spread throughout the educational system.

II. Historical Background

Adaptation of a pre-vocational element to the traditional secondary academic curriculum in the Third World has developed over the past two decades in response to economic, social and political pressures. Such pressures continue to profoundly shape schooling policies today, often leading to educational reform of the type that is evaluated in this study. 3/ There have been at least two major lines of reasoning which argue for and against the introduction of a vocational bias in the traditional academic secondary curriculum — one economic and one political.

The economic argument in favor of diversification centers around the perceived need to orient the formal education system to the needs of the world of work. 4/ It is based on the assumption that economic growth and development are technology-led, and that traditional education, apprenticeship and on-the-job training are not adequate means to train sufficient numbers of workers to meet current and future demand for skilled labor required by the growing sectors of the economy. This is further bolstered by the allegation that a system of academically-oriented education instills attitudes in most students towards white-collar occupations in the urban-modern wage economy and not towards manual occupations and skills that are in short supply.

A second major stated reason for diversifying secondary education is based on a socio-political strategy which pursues equity considerations. It is believed that an academically-oriented system will produce gross inequalities between a small elite of educated (those who succeed in the system) and their uneducated counterparts.

3/ For a review of implementing educational innovations, see Lillis and Hogan (1983).

4/ Cliffe (1973), Diyasena (1976), Figueroa et al (1974), Lema (1978), Price (1973), Sato (1974), Tchen (1977) and Vulliamy (1980).

Those expressing opposition to diversification have emphasized its inability to attract competent teachers and suitable equipment, the possible diminution of the over-all quality of education causing the graduate to be neither proficient in academic knowledge nor in specialized vocational skills, thereby retarding the possibility of skill formation on the job. 5/ At best, students will acquire only a vague general orientation to vocational skills, it is contended. Opponents of secondary diversified education programs also complain that since vocational secondary schooling is often more costly than academic secondary programs, such a curriculum hardly qualifies as a cost-effective method to eliminate enrollment discrepancies between rich and poor, urban and rural students.

If vocational knowledge can less easily adapt to workplace conditions and needs than general academic knowledge, it may restrict future employment and earnings opportunities (Blaug 1979, Conroy 1979, Dore 1975, Evans and Schimmel 1970, Godfrey 1977). If so, this deficiency might imply that school systems should leave highly differentiated training to firms in the private sector and/or specialized vocational training organizations, such as SENA in Colombia , and instead gear instruction toward teaching the use of established knowledge and analytical methods for problem solving.

The implementation of diversified education differs according to country-specific conditions. Put simply, however, either vocational subjects are taught in schools physically separated from academic schools, or they are placed parallel (side-by-side) in a "comprehensive school style." In the diversified setting, vocational and academic curricula are taught to respective students

---

5/ See Foster (1965), Blaug (1979), and Grubb (1979).

with some crossing-over permitted. For our purposes, diversified education refers to secondary schools which provide a wide range of curricula encompassing courses of study which are typically found only in all-academic or in all-vocational schools.

The Case Study Models

Colombia and Tanzania have both extensively experimented with diversified secondary education over the past decade. As each nation was faced with reconciling its developmental needs with the capacity of secondary education systems to meet these objectives, diversification was expected to play an increasing role in matching educational enrollments with employment prospects.

(a) Colombia: A Multi-Track Diversified System. The diversified secondary schools, called INEM (Institutos Nacionales de Educacion Media) combine academic with pre-vocational subject tracks under one roof in a six year program. During the first two-years, students are exposed to pre-vocational subjects in order to acquaint them with knowledge and career options in the various trades. The second two-years are devoted to a vocational orientation such as agriculture or commerce along with some additional academic study, but the emphasis is clearly placed on the vocational course work. During the last two-year cycle, further specialization takes place. A student enrolled in the general industrial training program in the preceeding cycle might now focus on metal work, construction, or perhaps electrical mechanics, or he may concentrate in an academic option. There also exist the CASD (Centros Auxiliares De Servicios Docentes), which pull students out of their formal school setting two or three

days a week to give them special hands-on training in vocational skills deemed important in the local labor market.

In addition to the diversified education system operating in Colombia, there remains the traditional academic course of study in private and public secondary schools. It was hoped, however, that diversified education would ultimately attract many students away from poorer quality private academic secondary schools and give them a chance to pursue vocational subjects of their choice, in addition to continuing a lighter load of academic coursework.

(b) Tanzania: A Uni-Track Diversified System. The Tanzanian educational system is better understood when placed in the context of the country's economic system which stresses public ownership and control of most major enterprises. The public sector predominates and it is the educational system which is geared to providing the trained manpower needs if this sector is to run efficiently. Because education and employment growth is monitored by the government, Tanzania, unlike Colombia, has not introduced diversification only as a means to match the supply of middle level skills to manpower requirements. Rather, the main impetus for diversification in Tanzania stems from a strong sense of commitment to the ideals of work education similar to that found in the Chinese, Cuban and Soviet vocational educational systems.

Because of Tanzania's philosophy of self-reliance and self-sufficiency in producing skilled manpower, students are required to gain experience in practical subjects in addition to academic pursuits by "majoring" in a vocational subject of their choice while in secondary school.

(c) Colombia and Tanzania: Alternate Routes to Curriculum Diversification. Because of basic differences in their cultural, political, and economic environments, Colombia and Tanzania provide two different proving grounds for the testing of diversified secondary curriculum strategies. In Colombia, students rotate through vocational options, then focus on one, and finally specialize in a particular skill, all the while taking academic coursework along with their vocational studies. In the end, these graduates receive a diploma which entitles them to university entrance.

Tanzania students, on the other hand, are restricted to one vocational topic in a specialized physical setting. This pre-vocational program takes place during the first four years of secondary school alongside the standard academic material. Since the final two years of the six-year secondary school cycle are highly selective, most students terminate their schooling after the fourth year.

Despite these differences, both implementations are good examples of curriculum diversification in that each provides the student with a wide range of coursework typically found only in all-academic or all-vocational schools and each implementation is flexible enough to give students the option of pursuing more advanced academic work or more specialized technical training (in vocational institutes).

III. Methodology

In spite of the intuitive reasoning that specialized knowledge would be beneficial for an expanding modern economy, there exists no definitive evidence in support of this assumption. The central research question is whether the outcomes of diversified education vary substantially from those of conventional academic and purely vocational secondary schooling. Two clusters of outcomes have been identified as the main "dependent variables" in this study: (1) what is learned in school and (2) what is later accomplished in post school economic activities.

The Hypothesis Testing Points

Given the time span between the socio-educational inputs and outputs, a longitudinal tracer study was chosen (Psacharopoulos and Hinchliffe, 1983). We have defined three testing points in time for assessing the possible effects of diversified curricula: (a) Effects observable while the student is still in school; (b) Effects observable about one year after graduation, when the graduate might be in his first employment or further education; and (c) A fuller assessment of the graduate after he has been out of school for some years.

The starting point in the two country cases was the schools in a given district where diversified curricula have existed for a number of years, along with other non-diversified schools. Random sampling was used to obtain representative national coverage of high school students in proportion to their numbers enrolled in particular curricular programs. A survey administered to high school seniors just prior to graduation was used to collect base-line information. A follow-up survey was administered to the same cohort one year after graduation in order to assess the initial post-school outcomes.

Of course, in order to assess the performance of diversified schools (target group) on a set of agreed criteria, information was raised on a number of students who did not attend such schools (control group). Thus, the testing of hypotheses reduces to the statistical significance of differences between target and control group mean performance on a set of indicators, standardized for a set of non-school related factors.

In Colombia, the baseline sample consisted of 8051 students in INEM schools and the remaining 4800 students, the control group, in traditional vocational schools pursuing specialties which correspond to INEM specialties or in standard academic secondary schools. The Tanzania sample consisted of 4181 students with 1025 (the control group) in traditional academic secondary school settings.

Hypothesis Testing

Regression analysis has been used as an attempt to detect any significant effects of particular school biases on a number of performance indicators. The regressions are of the general type:

Y = f(Curriculum Bias, family characteristics, individual student characteristics, school characteristics, regional characteristics)

where Y could be any of the outcome (dependent) variables discussed earlier.

The first test is whether the coefficient referring to bias is significantly different from zero and in the affirmative case if it has the expected sign. Assuming that the coefficient is significant and has the expected sign, the next question is: How does its size compare to the cost of

obtaining this effect. For example, it might prove to be the case that curriculum bias X has a greater impact on graduates' earnings relative to subject Z, but when taking into account the cost of the two subjects, it is subject Z that is more cost-effective and hence should be promoted.

Survey Instruments

Three sets of instruments have been used in each country study designed to raise the necessary information for hypothesis testing.

Q.1. Individual student questionnaire, administered to those still in the last year of target and control secondary schools.

Q.2. School questionnaire, filled in by the headmaster of the schools included in the survey.

Q.3. A graduate follow-up questionnaire administered to those who left school one year ago (and also three years ago, in the case of Colombia).

(For the actual questionnaires used see Psacharopoulos and Loxley 1984b).

Blocks of Main Variables

Annex 1 gives the means and standard deviations of the main variables used in the study:

1. Background Indicators. Included in the student questionnaire were items asking about parental education, occupation and income level along with a list of possessions like the number of books in the house. Information on personal characteristics such as age, sex, verbal and mathematical ability was also obtained.

2. Future Plans and Aspirations. Besides the previous mentioned "objective" set of variables such as age, sex, ability, and SES, information was also raised on the students' educational and occupational expectations. These "subjective" measures can serve as either independent or intermediate variables to isolate outcome differences accruing to curriculum programs.

3. Exposure Time to Curriculum Subjects. As a way to control for amount of exposure to given courses of study, students were asked to check the courses enrolled in and state the number of class periods attended per week. Information was also obtained from the headmaster on the time schedule for each class subject.

4. School Quality Variables. School questionnaires were designed to capture information on the overall quality of each school's learning environment. Such measures make it possible to control for the effects of variable school resources on learning and to establish the magnitude of the impact of school quality on student achievement across various curriculum programs.

5. Cognitive Achievement Tests on Subject-Matter. Special tests were administered to each individual student in the various core curriculum subjects (e.g., commerce, agriculture, technical as well as academic subject matter. Examination items can be found in Psacharopoulos and Loxley 1984b). From these tests, scores were obtained for each student from which it was possible to compare strengths and weaknesses in knowledge across all curriculum subjects, regardless of the stream in which the student was enrolled.

6. General Ability Tests. A good measure of general ability would be a student's primary school leaving score because such a test would tell what a pupil knew before entering secondary school and being exposed to a high school curriculum. In both Tanzania and Colombia, these early attainment scores could not be secured for various logistical reasons. Consequently, in Colombia, selected items from the ICFES tests (National Examination Board) were

administered to students while in secondary school and used as ability measures or proxies for intelligence. These tests were associated with high reliability coefficients and by design were intended to tap general aptitude rather than achievement on a specific subject. In Tanzania, both verbal and quantitative tests of general ability constructed by the local research team were administered to students in the sample during the base year data collection. The reliability of these tests was acceptably high.

7. Non-cognitive Outcomes (Modernity Attitudes). In both countries non-cognitive tests in psychological modernity were constructed and administered to students. These measures of students' beliefs were collected in order to test the hypothesis that student attitudinal outcomes vary according to curriculum program enrolled in. In similar fashion to cognitive differences assumed to exist across program tracks due to curriculum differences, it is reasoned that if diversified schools can make students less traditional in their beliefs and attitudes, they will serve as agents of social change and ultimately influence economic development (McClelland 1961).

8. Further training and Employment Indicators. The follow-up survey raised information on the actual destination of the base-year cohort one year after graduation. For those who were in training or further education, the type of institution and field of study was recorded. For those in employment, the sector of economic activity, occupation, earnings and hours of work were recorded as well as how long they waited before getting a job. For those who were looking for work, information was raised on their reservation wage and sources of finance. Job changes within the one year span were recorded as well.

IV. Who Attends Diversified Schools?

Table 4.1 shows that in Colombia INEM and non-INEM academic tracks recruit more from the higher income families, and that INEM tracks are less differentiated than Control schools in terms of the parental occupational areas from which they draw their recruits. Namely, compared to control schools, INEM schools draw more students from lower socio-economic backgrounds. (INEMs were built in the poorest areas of the cities). Thus, as intended, the diversification strategy has successfully drawn more secondary school student aspirants from lower socio-economic backgrounds. Presumably some of these students might not have attended high school if INEMs were never introduced. But, of course, such students might have enrolled to any type of secondary school built in their area.

Table 4.1

Family Characteristics by School Type and Curriculum Subject, Colombia 1981 Cohort

Subject	Family Characteristics	INEM	Control
Academic			
	Family Income (monthly pesos)	24,602	37,564
	Father's Education (years)	6.9	7.8
	Father in Agricultural Work (%)	9	15
	Father a non-manual employee	40	37
	Father a business owner	10	12
Commercial			
	Family Income	22,859	31,080
	Father's Education	5.6	6.6
	Father in Agricultural Work	8	9
	Father a non-manual employee	37	38
	Father a business owner	11	15
Industrial			
	Family Income	21,367	25,517
	Father's Education	5.6	6.3
	Father in Agricultural Work	7	9
	Father a non-manual employee	35	39
	Father a business owner	8	12
Agricultural			
	Family Income	17,230	19,342
	Father's Education	5.4	4.7
	Father in Agricultural Work	21	60
	Father a non-manual employee	34	16
	Father a business owner	7	6
Social Services			
	Family Income	19,595	29,556
	Father's Education	5.5	7.4
	Father in Agricultural Work	11	23
	Father a non-manual employee	37	36
	Father a business owner	12	13
Overall			
	Family Income	22,220	30,282
	Father's Education	5.9	6.8
	Father in Agricultural Work	9	16
	Father a non-manual employee	37	36
	Father a business owner	10	12

Regarding Tanzania, Table 4.2 offers mean values on a set of common family background attributes known to proxy social well being. Fathers of commercial students are the most educated in the sample (6.6 years). Students from the high income families tend to pursue programs which specialize in commerce, while those coming from low income families attend agricultural programs. Although it is probably at the entrance to secondary schools where the largest social class differences sort themselves out, technical and agricultural programs are attracting students from lower socio-economic origins.

Table 4.2

Father Characteristics of Secondary School Students by Curriculum Bias, Tanzania 1981 Cohort

Curriculum Bias	Income in Shillings	Percent in Wage Employ.	Percent Farmer	Educ. in Yrs.
Agricultural	6656	50	48	5.7
Technical	7088	60	47	5.2
Commercial	7834	50	31	6.6
Academic	7181	54	45	5.9

V. Cognitive Achievement

(a) Colombia

The achievement rankings by school type and program reveal INEM schools frequently outperform control schools, especially on academic tests (Annex Table 2.1). On the surface, it appears that INEM schools have their intended effect of exposing all their students to a quality academic program since commercial, agricultural and industrial students are taught academic subjects alongside INEM academic students. Furthermore, the INEM vocational programs usually require an additional rigorous program of applied math and science courses aimed at reinforcing the vocational specialization. This latter exposure helps to bolster still further the quality of the academic curriculum already found in each INEM school, and together help account for the strong INEM academic performance.

Because these mean differences do not take into account out-of-school influences such as sex, age, ability and social origins which might differentially affect achievement independent of school placement, regression analysis was employed to control for those out of school influences which might account for higher scores before students were assigned to various schools or curriculum programs. The track representing pedagogy students is treated as the reference group (omitted dummy variable).

Annex Table 2.2 presents regression findings for general academic achievement (humanities and science items to which all individuals in the study were exposed), and commercial achievement - as an example of vocational achievement. Results from this vocational test regression show that when background and school factors are held constant, mean vocational score depends strongly upon placement in the corresponding specialty track. Similar results

were obtained using other vocational achievement tests as the dependent variable. This table also shows the typically strong relationship between academic ability measures and school characteristics on the one hand and mean vocational achievement on the other.

Another way to assess the impact of the INEM curriculum is depicted in Table 5.1. For this table, the entire sample is divided into five groups on the basis of curriculum bias. After statistically controlling for background and ability factors as well as for mean teacher salary (a school quality proxy) in a multiple regression equation, it is possible to determine the effect of curriculum bias on achievement. For example, in the academic subsample, INEM program students earned 3.28 points more on average than control students on the academic achievement test, after adjusting for differences in background, ability and school quality. Industrial program students placed in INEM schools performed substantially better than control students on the industrial achievement test (15.71 points higher) and on the academic achievement test (8.01 points higher). This implies that industrial learning was not acquired at the sacrifice of academic learning. This is true of commercial and social science students as well, though the advantage of the INEM program is less marked. There were no significant differences between the adjusted means of INEM and non-INEM agricultural students.

The cost of these achievement gains is also indicated in this table, reported on a cost per point basis. Note that the cost of the achievement gain in the industrial group is negative indicating that the INEM program raises achievement at a lower cost for that subsample.

Table 5.1

Achievement Score Gain Associated with the INEM Programs, Colombia 1981 Cohort

Subsample:	Academic	Commercial		Industrial		Agricultural		Social Services	
Test:	Academic	Comm.	Acad.	Indus.	Acad.	Agric.	Acad.	Social	Acad.
INEM									
Achievement Gain	3.28	5.10	0.43	15.71	8.01	- -	- -	4.47	- -
Cost (Pesos) of Raising Achievement by 1 point	1067	392	4651	-420	-824			-626	

Notes: Background, ability and school factors controlled for.
All marginal coefficients are statistically significant at the 5 percent level or better.

- - Non significant gain

From a policy standpoint, the INEM vocational program is clearly superior to non-INEM programs in imparting vocational knowledge and can be particularly cost effective in certain vocational areas. Section VI below offers a more detailed explanation of the costs and cost-effectiveness of INEM schools.

(b) Tanzania

Annex Table 2.3 illustrates how performance on four achievement tests is distributed by curriculum bias, sex and public-private school ownership. Students in each bias do best in their specialization subject, males do better than females in agricultural, technical and academic subjects, but not in commerce, and public school means exceed private school means in all subjects.

As with the Colombia, regression analysis was employed to compare the scores of specialty track students relative to the academic control group, after statistically controlling for background and school characteristics. Annex Table 2.4 presents findings for four achievement tests. For each vocational test, the group trained in the subject of that test scored highest.

The various measures of school quality and school resources were obtained from school principals and students alike. As shown in Annex Table 2.4, learning outcomes do depend upon many of these school level factors. In all equations, mean achievement is particularly sensitive to changes in educational expenditure.

Table 5.2 provides a convenient method of evaluating the effectiveness of the vocational programs. In this table, the advantage of the vocational curriculum is evidenced by the higher mean scores obtained by the vocational students on measures of vocational learning. These average gain scores are reported after the sample population has been adjusted on background characteristics and ability measures. In all cases, the gains in vocational learning are obtained at the expense of some

English language achievement. Since the policy objective involves the development of vocational skills, then it is clear that these curricula effectively meet the goals of their design.

The second line of this table reports on the incremental cost of the various vocational tracks in relation to a purely academic curriculum, showing that the agricultural biased schools are the least cost-effective. The cost of raising commercial achievement by one point averages out to about 50 shillings, approximately 1.6 percent of the annual recurrent educational expenditures (roughly 3000 shillings per year). A more detailed discussion of costs and cost-effectiveness is found in the next section.

Table 5.2

Achievement Score Gain Associated with Vocational Curricula Bias Compared to Academic Control Curriculum Bias, Kenya 1981 Cohort

Curriculum Bias:	Technical		Commercial		Agricultural		Academic		
Test:	Tech.	Eng.	Comm.	Eng.	Agric.	Eng.	Comm.	Tech.	Eng.
Diversified School Achievement Gain	5.26	-4.05	5.43	-2.27	1.61	-2.24	-2.74	-4.09	-2.24
Cost (Shillings) of Raising Achievement by 1 point	71		50		348				

Notes: All achievement score differences are statistically significant at the 5 percent level or better. Background, ability and school factors are controlled for.

VI. Comparing Costs to Outcomes

The cost of schooling can be looked at from three viewpoints - society, government and the individual (or household). 6/ The specific cost components which may be relevant to these factors are (a) foregone output or earnings, (b) capital costs of buildings, furniture and equipment, and (c) direct recurrent costs.

(a) Colombia

Opportunity costs, as measured by the earnings of primary school leavers, were based on Psacharopoulos (1983) who used earnings data from a 1975 urban labor market survey in Colombia. Monthly earnings of a primary school leaver aged 22 at 1981 prices were calculated to be 5,813 pesos per month. The per pupil capital costs, annualized, have been based on the World Bank Appraisal Reports for the INEM and other secondary education projects in Colombia. Recurrent expenditures financed by households are available from the student questionnaire in some detail. Data on school expenditures including salaries, maintenance, utilities, materials and equipment were based on the school questionnaire.

Table 6.1 provides three pieces of relevant information: annual unit costs (capital and recurrent) of keeping a student in secondary school, group test score means in academic achievement, and the test score mean in each vocational specialization for the students taking that specialization. (Scores are adjusted for ability and out-of-school characteristics).

6/ The data sources and assumptions lying behind the cost calculations are to be found in Hinchliffe (1983).

The conclusions of the recurrent cost exercise undertaken were that:

a) variations between tracks in INEMs are small.

b) INEM academic and commercial tracks are around 20 and 14 percent more expensive, respectively, than the control counterparts.

c) INEM agriculture and industry tracks are significantly less expensive than the control counterparts (28 and 25 percent), and the same is true for the social services specialty but to a lesser extent (11 percent).

Table 6.1

Annual Direct Cost per Student and Achievement by School Type and Subject, Colombia 1981 Cohort

School Type/ Subject	Unit Cost[1/] (Pesos)	Adjusted Academic Achievement	Adjusted Vocational Achievement			
			Agr.	Comm.	S.S	Ind.
Academic INEM	25,700	53	-	-	-	-
Academic Control	22,200	50	-	-	-	-
Agriculture INEM	26,200	49	62	-	-	-
Agriculture Control	33,700	48	58	-	-	-
Commercial INEM	25,200	49	-	61	-	-
Commercial Control	23,200	49	-	56	-	-
Social Services INEM	25,000	48			57	-
Social Services Control	27,800	48	-	-	53	-
Industrial INEM	25,300	55	-	-	-	62
Industrial Control	31,900	47	-	-	-	46

Note: 1/ Cost refers to public schools only and includes school related expenses by students, government financed recurrent cost and annualized capital cost. It exludes foregone earnings. Achievement scores are adjusted for out-of-school characteristics.

There are two relevant sets of cost and achievement comparisons - the first comparing students following the same subject but within different types of school, and the second comparing the academic control group of students with students who have taken pre-vocational subjects.

Based on comparisons of costs with achievement, INEM schools are certainly no worse than non-INEM schools in imparting desired cognitive and non-cognitive outcomes to secondary school students. The fact that they seem to teach vocational skills more effectively than academic skills is

certainly consistent with their supposed function and mandate. Also, the fact that the INEM academic track produces an above-average crop of graduates suggests that such schools are not allowing vocational standards to rise at the expense of academic outcomes.

(b) Tanzania

The unit costing of Tanzania's secondary schools is more straightforward than was the case for Colombia because school type is automatically associated with the subject bias and hence expense accounts can be differentiated. Per student capital costs, annualised, have been calculated directly from the World Bank Appraisal Reports for diversification projects in Tanzania. School recurrent costs have been reported in some detail in the questionnaires. Private expenditures by school bias and school type (state and private) and by item are available. School expenditures covering salaries, materials and catering for both state and private schools are also available from the survey.

Total social costs of each type of school are dominated by foregone earnings, and differences in these according to school bias are statistically non-significant. However, looking only at recurrent costs, for state schools, these (from all sources) are 14 percent higher in the "biased" schools than in those emphasising purely academic subjects. For government financed recurrent costs, the bias schools are on average 34 percent more costly.

Table 6.2 presents average annual recurrent costs by curriculum program along with achievement scores in both academic and vocational subjects as to allow a contrast between cost differences and achievement outcomes by program track. Test score means have been adjusted to remove the influences of ability, sex, age, and other factors influencing school achievement.

Table 6.2
Recurrent Costs and Achievement Scores in Public Schools, Tanzania 1981 Cohort

Bias	Annual Unit Cost (Shillings)	Adjusted Mean Achievement Score				
		Vocational			Academic	
		Agric.	Tech.	Commerce	Math	English
Agricultural	3449	52			52	50
Technical	3263		53		55	48
Commercial	3160			55	49	49
Academic	2888	51	49	50	51	53

Note: Means are for public school students only and adjustments have been made to remove the effects of ability and out-of-school characteristics on achievement.

Thus, it appears that technical schools, though costing more than control schools, yield a substantial increase in both academic and vocational knowledge over the academic control group. Likewise, both agricultural and commercial students gain in levels of vocational knowledge for increased per student costs. However, they do so at the expense of academic knowledge relative to the control group.

VII. Graduate Destinations

(a) Colombia

The results reported below are based on a 62 percent response rate, slightly above the 60 percent minimum required by the sample design to yield school type-curriculum cells with sufficient observations for testing statistical significance. Table 7.1 gives the main activity destinations by school type and curriculum program. Thus, one year later, roughly one-third of the graduates were in school, one-third were working full time, and aside from 11 percent studying and working part time simultaneously, about one quarter of the sample was neither studying nor working.

Table 7.1

1982 Destination by School Type and Subject, Colombia 1981 Cohort (percent)

School Type/Subject in 1981	Post School Activity, 1982			
	Study	Work	Study/Work	Other
INEM				
Academic	34	30	9	27
Agricultural	29	27	15	29
Commercial	39	29	10	22
Social Services	43	26	9	23
Industrial	36	31	8	25
Average	37	29	10	24
Control				
Academic	38	29	13	20
Agricultural	34	36	11	19
Commercial	36	32	9	23
Social Services	46	26	12	16
Industrial	34	32	11	23
Pedagogy	41	29	10	20
Average	37	30	11	22
Overall	37	30	11	22

Contrary to the expectation that INEM graduates would differ from traditional graduates in terms of employment status, no major post-school activity differences can be documented between the distributions of INEM and non-INEM respondents, meaning that the type of school attended does not alter the initial destination of graduates.

Table 7.2 gives the probability of being in employment one year after graduation. Those coming from control vocational schools have more chances to be working one year after graduation, relative to all other groups.

Table 7.3 gives the mean earnings of INEM and Control graduates working full time. Earnings differences are very modest. But academic graduates earn more relative to the rest. With the exception of INEM academic graduates, actual earnings are clearly less than what graduates were hoping to earn before entering the labor market.

Do those coming from vocational curricula experience less unemployment before getting a job? The data for Colombia do not substantiate this hypothesis. If anything, they show the reverse as is indicated in Table 7.4, i.e., those who have followed vocational courses in either INEM or control schools have significantly longer periods of unemployment.

Table 7.2

Propensity of Working Full-time in 1982 by School Type and Subject, Colombia 1981 Cohort

(percent)

Subject	INEM	Control
Academic	29.6 (39.1)	28.7 (42.2)
Vocational	28.1 (39.3)	33.7 (43.9)

Note: Figures in parenthesis, include those who both work and study.

Table 7.3

Monthly Earnings by School Type and Track, Colombia 1981 Cohort

Subject	1982 Earnings (in Pesos)		
	INEM	Control	Sample
Academic	10,639	10,070	10,207
Agricultural	9,520	9,596	9,556
Commercial	9,664	9,322	9,493
Social Services	9,556	9,577	9,568
Industrial	9,408	10,291	9,902
Pedagogical	—	(10,426)	(10,426)
Average	9,854	9,980	9,887

Table 7.4

Period of Unemployment Before First Job by School Type and Track, Colombia 1981 Cohort

(in weeks)

Academic		Vocational	
INEM	Control	INEM	Control
21.2	21.6	25.6	26.4

Note: Between-subject differences are significant at the 0.01 level.

Thirty-one percent of all graduates reported in the 1982 follow-up that they were currently looking for work.

Are INEM students less likely to be seeking work? Clearly, those in full or part time study or employment cannot be classified as unemployed. Twenty-six percent of those already employed full-time are looking for other employment and fifty-eight percent of those neither studying nor working are actively seeking work, the rest representing non-labor force participants. When we examine responses by INEM/non-INEM membership, we note that in 1982, 30 percent of Control versus 34 percent of INEM students are currently looking for work. The percentage difference in this case is statistically significant ($P = .001$) and suggests that INEM students are more likely to be job hunting.

Of those seeking jobs, 85 percent claim to be still financially dependent on their parents or relatives, with no difference between INEM and non-INEM affiliation. On average, job seekers have been looking unsuccessfully for work during the past 22 weeks and would be willing to work for 12,000 pesos per month, a reservation wage which is much higher compared to going wage rates of those already employed. Proportionally more Control group graduates search for clerical work than INEM students, and these job seekers come just as often from agricultural and industrial tracks as from commercial tracks.

In summary, while proportions of INEM and Control graduates looking for work are much the same, and while both groups expect to earn much the same once a job is found, a few differences can be discerned regarding the kind of employment sought by individuals from the two groups.

The Class of 1978 Three Years Later

Given the long inherent gestation period associated with longitudinal studies, it was felt that the project could yield some early indications on the labor market destination and performance of secondary school graduates by introducing a pseudo-panel component to it. After the selection of the sample of schools and students for the 1981 cohort, addresses were obtained from the same school of the graduates of the 1978 class. A target sample of 2,000 such graduates was randomly selected from the school records and attempts were made to locate the graduates for the administration of a special questionnaire. This questionnaire raised retrospective information on the student's further education and occupational record between 1978 and the Fall of 1981 when the interviews took place. The questionnaires were completed by personal interview at the house of each selected graduate.

This data set was used to test the same hypotheses related to diversification as with the 1981 cohort, except of course those related to achievement as it was not feasible to administer cognitive tests to the 1978 cohort. (For a more comprehensive analysis of the 1978 cohort see Psacharopoulos and Zabalza 1984).

It was found that INEMs draw students from the lower socio-economic groups. This is a similar finding to the one obtained using data from the 1981 cohort. INEM school graduation and an academic subject are strongly associated with the propensity to study after secondary school. Also, those who study agriculture in INEMs have a much higher chance to continue further studies than entering the labor market

immediately after secondary school. Those coming from INEM schools are less likely to participate in the labor force or hold a job three years after graduation. Standardization for other factors influencing the employment probability by means of a logit regression accentuates the INEM disadvantage in producing employable graduates.

Eighteen percent of the entire cohort reported they were looking for a job in 1981, with a very small overall difference between INEM and control schools. However, most of those looking for a job either already hold a job or are studying. Excluding such cases, the overall unemployment rate among the cohort in 1981 is 6 percent with a negligible overall difference between INEM and control schools. But the unemployment rate is especially pronounced among control agricultural graduates (17.3 percent). According to logit adjusted probabilities of searching, control industrial graduates are the least as likely to be searching for a job in 1981.

The 1978 graduates spent on average 14 weeks to get their first job. Those coming from INEM schools had an advantage of one week over the control group in getting a job. However, school type and subject are statistically insignificant in explaining job search duration. By contrast, inspection of the minimum acceptable salary among those looking for a job reveals that job seekers have a reservation wage much higher than their classmates who are already employed. Clearly, most of the job search activity among the respondents is for improving their present economic situation.

Our overall conclusion is that INEM's have not increased the propensity of high school graduates to enter the labour force. In fact, in those cases in which a significant difference can be identified, we find that the influence of INEMs has tended to go in the opposite direction. INEMs have not influenced earnings either. But a final conclusion on this must await the availability of data from university graduates, since one of the differential effects of INEMs has been to increase the chances of attending university to a greater extent than traditional schools.

(b) Tanzania

The major post-Form IV avenues available to graduates are: entry into Form V; placement in teacher training or other public sector training; private sector salaried employment or self-employment; looking for a job or further training or voluntarily inactive.

The allocation of Form IV students by graduate activities (Table 7.5) shows no major differences in the way employment, further education and training are distributed based on the student's Form IV curriculum bias. But technical students are more likely to be employed and less likely to be seeking schooling, work or training. If one aggregates the Form V and training categories, one is still struck by the similarities among biases in terms of post-secondary school activities. Consequently, it is possible to infer that with the possible exception of technical students, all other ex-Form IV students stand nearly the same chances of going into employment.

Table 7.5

The 1982 Activity of Form IV Graduates,
Tanzania 1981 Cohort
(percent)

1982 Activity	1981 Form IV Bias				
	Agricultural	Technical	Commercial	Academic	Overall
Form V	25.3	33.3	34.2	27.5	29.5
Training	45.1	39.4	35.9	45.0	41.6
Working	13.7	17.4	14.2	14.1	14.4
Looking	15.8	9.8	15.7	13.4	14.5
Total	100.0	100.0	100.0	100.0	100.0

In the-follow up survey, those who were currently attending Form V were asked to list the courses they were presently taking. Such courses were clustered into the major fields of "technical," "commercial"and "agriculture."

Seventy-eight percent of all those in Form V take academic subjects exclusively (e.g. math, history, languages, social and physical sciences) and they are evenly distributed by Form IV bias. When the remaining 22 percent of respondents are considered, technical students pursuing technical courses in Form V are drawn mostly from the Form IV academic track and those majoring in agricultural science subjects were recruited heavily from commercial graduates. In short, there is little continuity between Form IV and Form V subject specialization.

The group of nearly 1000 Form IV graduates placed in training programs (including teacher training) comprised 42 percent of the 1982 follow-up respondents. When we subdivide this group by Form IV curriculum bias and examine the current training program graduates are enrolled in, we observe that nearly one half of the group are engaged in teacher training, most of them coming from the Form IV agricultural and commercial biases. The proportion of academic bias graduates who enter teacher training does not appear to be out of line with the rest of the graduates. The most interesting result is the small proportion of commerce bias graduates who take clerical training courses and the high proportion of technical bias students who take these courses. This would seem to imply on the one hand that post-Form IV clerical courses are not seen as adding anything to similar studies in schools and that on the other hand a substantial

proportion of technical students who opt for training see openings in the clerical field. Finally, the proportion of agriculture bias students taking agricultural training courses is slightly lower than for the other biases.

Nine percent of the respondents had found salaried employment one year after graduation and another five percent were self-employed. Salaried persons were primarily public sector workers in the 1982 follow-up. Forty-eight percent were in government, 12 percent in private, and the rest in parastatal employment. By economic sector, 29 percent were in commerce, 9 percent in agricultural jobs and 17 percent in manufacturing, with the remaining 45 percent in all other sectors. Roughly 47 percent of those employed were in secretarial-clerical jobs. Most job holders found their job after waiting six months. They worked, on average, 44 hours per week and earned 726 shillings per month before taxes.

When we examine workers by bias graduated from in 1981, we find 20 percent of agriculture students went into private sector employment, 57 percent of technical graduates went into government work exclusively, as did 55 percent of commercial graduates. Thus agricultural students are not as readily hired into the public sector as others. Their private sector activities do not necessarily include farming since one-third of these agricultural graduates work in commercial-secretarial occupations. Among those with salaried employment one half are employed in public sector clerical jobs, with no differences by Form IV curriculum bias, or public-private school graduate status. However, girls are twice as likely to end up in non-public sector employment. No significant differences emerge in earnings and weeks worked by curriculum bias.

About seven percent of the respondents were looking for full-time schooling or further training and another six percent were looking for work. Similar ratios of males to females, and public to private school group is disproportionately looking for training. Regarding those looking for work only, 65 percent are looking exclusively for government employment, 29 percent for employment in parastatals, and only 6 percent seek private sector work. This tendency for government employment varies little across Form IV curriculum bias, sex or public-private graduate affiliation and further suggests that those holding out are actually still looking for placement in government activities. The notable exception is technical school graduates who will seek private employment in greater proportion to the rest.

About one half are looking for secretarial-accounting positions regardless of curriculum placement in 1981. All but 15 percent started looking for jobs sometime in 1982, although private school graduates (24 percent) started looking as early as 1981.

Among those looking for work 70 percent are supported by lies, and 30 percent by odd jobs. Of the 70 percent, who are supported by family, slightly more come from the Form IV agricultural bias, and more are boys or private school graduates. On average, they expect to wait 11 more weeks before finding a job which 50 percent describe as secretarial-clerical in nature. In brief, among students looking for work, no major differences arise across sex, public-private school attended or Form IV curriculum bias.

Given the government wage controls, it is of interest to examine how respondents perceive their earnings prospects as they progress through the various educational, training and employment programs, and what they do in fact earn as graduates in the public and private sectors of the economy. Table 7.6 presents expected and actual earnings for respondents in the 1982 follow-up based on their Form IV curriculum bias. Information on the expected earnings before and at the time of Form IV graduation were obtained from the base year survey, while the post Form IV expectations of earnings were taken from the follow-up survey and include completion of any present schooling or training activity. Actual earnings were computed from follow-up data as well.

Table 7.6

Expected Monthly Earnings at Three Points in Time and 1982 Actual Earnings by Sector of Employment, Tanzania 1981 Cohort (shillings per month)

Form IV Bias	Expected Earnings			Actual Earnings			
	Without Form IV	With Form IV	With Post-Form IV Studies	Public Sector	Private Sector	Self Emp.	All Sectors
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Agricultural	755	830	1325	722	776	1676	1100
Technical	773	844	1247	702	580	1560	892
Commercial	754	852	1356	697	820	1252	932
Academic	792	883	1252	746	787	1532	1065
Average	766	852	1307	716	777	1504	1013

It is interesting to note that those still looking for work put the level of "minimum acceptable earnings" at a much higher level of Sh. 957, ranging from Sh. 859 for academic students to Sh. 1051 for commercial students.

According to one of the main purposes of diversification, it would be expected that graduates of agricultural, technical and commercial biases would experience a shorter period of unemployment than those from academic schools. The data, however, do not support this as Table 7.7 shows.

Table 7.7

Unemployment Rates in 1982 and Expected Periods of Job Search, Tanzania 1981 Cohort

	Agric.	Tech.	Comm.	Acad.
Unemployment rate (percent)	16	8	16	13
Expected weeks to find work				
• those looking	11	9	9	10
• those in Form V	34	38	36	38
• those in training	35	36	32	31

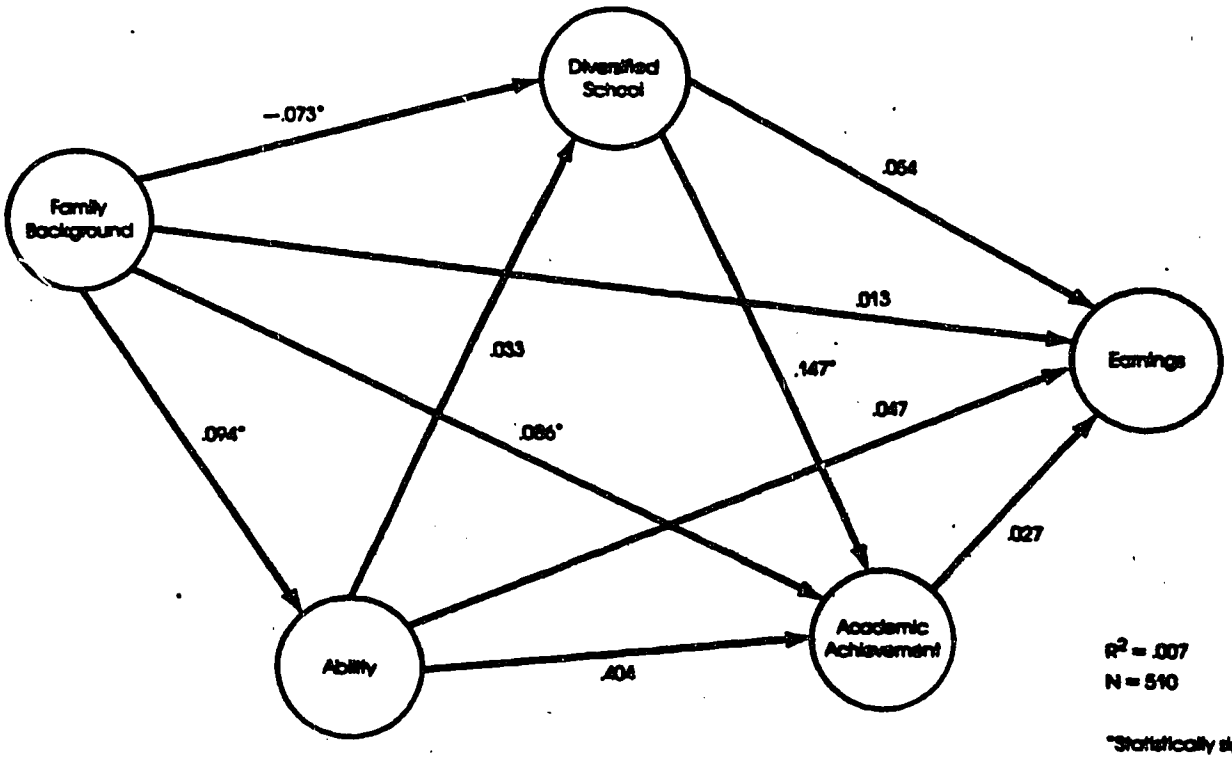
One year after graduation, 13 percent of academic students were still looking for either work or training while the percentages for technical, commercial and agricultural students were 8, 16 and 16 respectively. Similarly, these academic graduates did not believe that they had any longer period of time to wait for some activity than other students. Those graduates either in Form V or in training courses again showed no differences by bias in the period they expected to have to wait to acquire employment once they entered the labor force.

VIII. Testing the Causal Links Between School Type, Cognitive Skills and Earnings

A path model was fitted to those working full time one year after graduation in Colombia. Father's education in years and verbal aptitude were treated as exogenous to school type (INEM versus control), academic achievement and earnings one year after graduation from secondary school. Figure 8.1 gives estimates of the model using academic achievement as an intermediary variable. The model is fitted to all graduates with earnings in 1982, since all were exposed to the academic subject. No one factor was shown to have a signficiant effect on earnings, including achievement. The school-type-to-earnings link reveals no advantage of INEM over control schools in this context. This simply repeats our earlier finding that INEM versus control earnings differences are slight. When industrial achievement is substituted for academic achievement, achievement marginally causes higher earnings (i.e., a standardized path coefficient of .078 which is statistically significant at the 10 percent level). Other academic test scores in commercial, social services and agricultural subjects show no effects.

Figure 8.1

Path Model, Colombia — Academic Achievement as Intermediate Variable

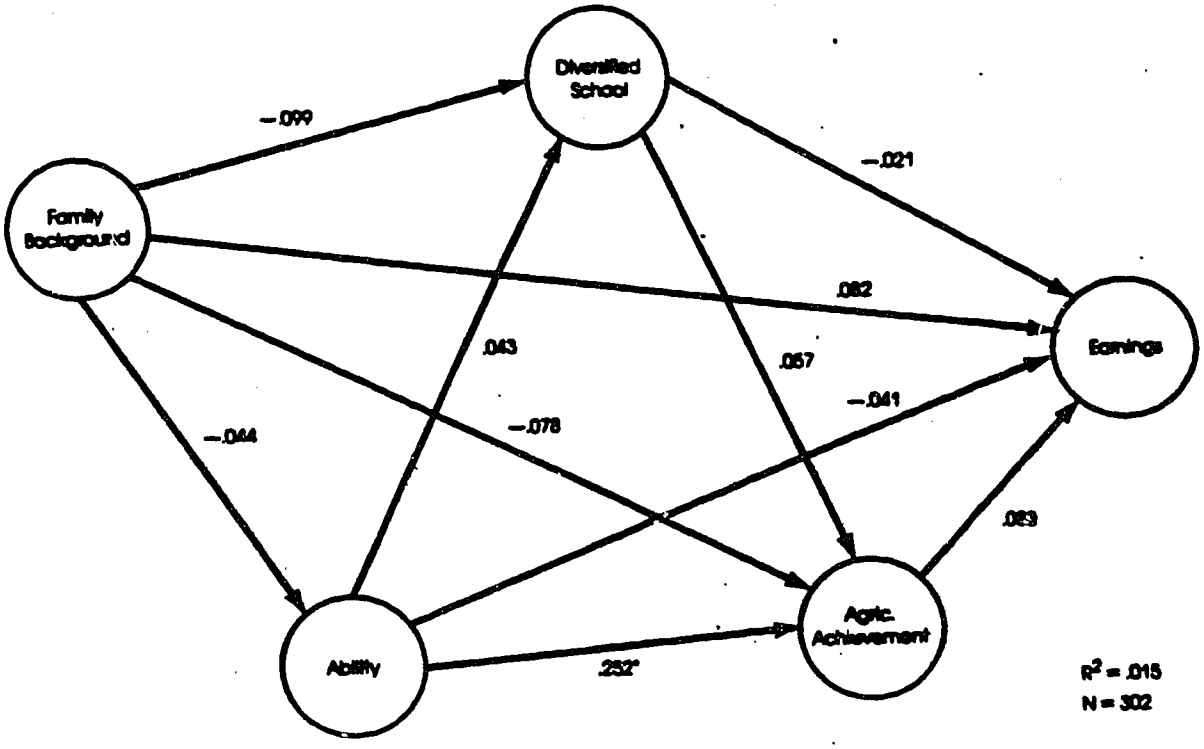


World Bank—26487

We also examined the links between father's education, student ability (a composite of verbal and non-verbal scores), school type (i.e., diversified versus control), subject achievement score and earnings one year after graduation from Form IV in Tanzania. Figure 8.2 presents the results of the path model using the agricultural score as the intermediate achievement variable. The achievement score was not found to have a significant effect on earnings, and neither did school type. When other tests are substituted into the achievement variable in place of the agricultural score, neither technical, commerce, mathematics or English achievement play any significant role in influencing earnings. Thus the academic curriculum bias has no effect on earnings different from the agricultural, technical or commercial biases.

Figure 8.2

The Effect of Diversification on Achievement and Earnings
Tanzania 1981 Cohort



World Bank—26491

IX. The Returns to Investment in Diversified Curricula

Earnings function adjusted 1981 mean differentials were used to estimate rates of return to investment in various curricula. The fact that in the case of Colombia we are dealing with a three year old cohort allows us to approximate a more valid "flat equivalent" earnings differential at age 22 and hence use the "short cut" rate of return method. (See Psacharopoulos 1981.)

Abstracting from the particular vocational specialization, INEM schools appear to have slightly higher returns (Table 9.1). But the academic subject in control schools appears to be associated with a higher rate of return. Given the nature of the earnings and cost data and the simplifying assumptions of the short cut formula, the differences in the rates of return between INEM and control schools cannot be regarded as significant. While some tracks appear to have higher profitability than others, the differences are not sufficiently wide to conclude that the introduction of pre-vocational tracks results in secondary schooling being less economically efficient. Conversely, there is no evidence to suggest their introduction increases economic efficiency.

Table 9.1

Approximate Social Rates of Return to Investment in Secondary Education by Subject and School Type, Colombia 1978 Cohort

(percent)

Subject	INEM		Control	
Academic	7.7		9.3	
Agricultural	9.1		7.2	
Commercial	8.4	8.8	9.3	8.3
Social Services	7.2		7.2	
Industrial	9.2		9.9	

Note: Based on earnings adjusted for ability and socio-economic factors, Annex Table 3.1.

The data set for Tanzania is not appropriate for a social rate of return to investment in secondary education calculation. To mention three reasons: (a) only a very small fraction of the 1981 cohort was in employment in 1982, (b) most of those employed work in the non-competitive sector of the economy, hence their earnings do not necessarily reflect the marginal product of labor, and (c) the relative earnings refer too early in the career of the graduate to approximate the flat lifetime equivalent earnings differential assumed by the "short cut" method.

Subject to the above qualifications, the set of adjusted earnings reported above has been used to calculate indicative social rates of return to investment in the four curriculum biases, if nothing else in order to summarize the cost and benefit differentials associated with them. Table 9.2 presents the estimated "rates of return" which in fact highlight the interplay of costs and benefits differences between the four curricula. Thus the academic (control) bias exhibits the highest rate of return (6.3 percent) and the technical bias the least (1.7 percent). Of course the usefulness of this calculation lies more in the relative comparison between biases rather than the absolute level of the returns.

Table 9.2

Indicative Social Rates of Return to Investment in Secondary Education, Tanzania 1981 Cohort

(percent)

Form IV Bias	Rate of Return
Agricultural	5.4
Technical	1.7
Commercial	3.2
Academic (control)	6.3
Overall	3.7

Note: Returns based on mean earnings adjusted for ability and other socio economic factors, Annex Table 3.2.

X. Conclusions

This study has been concerned with whether the introduction of diversified curricula into secondary schools has resulted in any differences between those groups of students who enrolled in pre-vocational courses and those who concentrated solely on academic programs on a number of "outcomes" such as equity, higher cognitive achievement or better labor market performance.

1. Equity of Access

In both Colombia and Tanzania diversified schools have drawn their clientele from the lower socio-economic groups of the population. Hence, educational expansion via this sort of innovation had the intended equity effect. But, of course, a similar equitable effect might have been obtained by increased provision of any type of secondary schooling.

2. Cognitive Achievement

In Colombia, INEM schools have apparently been successful in raising the level of what is learned in school, especially regarding vocational knowledge. This gain in vocational knowledge has been achieved without sacrificing academic knowledge. When costs are introduced and related to cognitive outcomes, INEM agricultural, industrial and social services streams also show substantial increases in performance in spite of the fact that these schools use less resources.

In Tanzania, the achievement test scores showed that students in vocational courses always score higher on tests of their specialization

than the control (academic) group.

While all pre-vocational biases involve additional costs relative to the academic (non-biased) schools, the gains in vocational learning for technical and commercial students are significant. For all groups there is some tradeoff between gains in the vocational subject and losses in the academic ones.

3. Post-School Outcomes

An important qualification is that only a minority of secondary school leavers in Colombia and Tanzania have directly entered the labor market one year after graduation. As a result, the follow-up surveys which were conducted in each country in late 1982 can give only limited indications of the effects of different forms of secondary schooling on the labor market performance of school leavers. (Further tracing of the same cohorts is anticipated to occur in the future in order to complete the picture.)

With these qualifications in mind, the external outcomes of diversification are discussed below in the framework their stated rationale, i.e., that such curricular reform leads to:

- less private demand for post-secondary schooling;
- a closer relationship between school bias and specialization of post-school training;
- a higher propensity for labor force participation at the end of secondary schooling;

- employment in the field of pre-vocational specialization;
- shorter periods of unemployment (job search) following secondary school graduation;
- higher graduate earnings; and
- higher social returns to investment in education.

(a) The Demand for Post Secondary Schooling

Conventional secondary schooling has often been criticised as gearing its students solely towards additional education. Increasing the emphasis in secondary schools on subject matter which leads students that this level of education might be a terminal one has been commonly put forward as an appropriate educational policy.

In Colombia there is virtually no difference in the proportions of academic and pre-vocational students from either type of school who continue studying. Neither curriculum diversification nor the introduction of INEMs has led to a reduction in the desire of secondary students to continue with some type of formal education. Thus, pre-vocational studies appear to be used in the same way as academic studies i.e., simply to gain qualifications for further academic study.

Similarly, evidence from Tanzania does not support the view that the incorporation of pre-vocational studies into secondary school has decreased the demand for more schooling. The very high private demand for post-secondary schooling does not appear to be diminished by the introduction of pre-vocational studies. But the effective supply of places determines the actual enrollment.

(b) School curriculum and type of Post-School Training

It is often argued by advocates of diversification that the additional subjects are pre-vocational rather than vocational. In other words, there should be no expectation that a graduate of these schools is fully trained. A close correspondence between type of bias and type of further training could, however, be expected.

Post-secondary education in Colombia can be at either the university, post-secondary institute (instituto tecnico) or non-accredited level. One year after graduation, 25 percent of non-INEM graduates and 24 percent of INEM graduates were currently or had previously been in some sort of training program. The dominant post-secondary training courses taken cover commercial subjects and the level of demand for these courses is equal across tracks. Among INEM graduates, those having taken industry and agriculture are more likely to take industrial courses than are the others; similarly INEM academic graduates take humanities-related courses in a greater proportion than do other graduates. Among non-INEM graduates, the proportion of industry track graduates taking technical courses is surprisingly low. The distribution of secondary school graduates across post-secondary studies shows that INEM students are more likely to follow their secondary school specialization (i.e., academic or vocational) through to post-secondary education.

The Tanzania tracer study reveals that teacher training clearly dominates the training activity. The proportion of academic bias graduates who enter teacher training does not appear to be out of line with the rest of the graduates. One interesting result is the small proportion

(6 percent) of commerce bias graduates who take further clerical training courses and the high proportion of technical bias students who take these courses (21 percent). This would seem to imply on the one hand that post-Form IV clerical courses are not seen as adding anything to similar studies in schools, and that on the other hand a substantial proportion of technical students who opt for training see openings in the clerical field. Finally, the proportion of agriculture bias students taking further agricultural training courses is lower than for the other biases (5 percent). Thus a close relationship between school bias and the content of training courses subsequently followed has not been demonstrated.

(c) The propensity for labor force participation at the end of secondary schooling

This hypothesis is partly related to the first. The suppositions behind it are (again) that fewer students will demand further schooling if they have had some pre-vocational training and also that they will be less likely to require training programs. In short, they will be more prepared, attitudinally and in terms of skill acquisition, to immediately enter the labor force. To focus on the data more sharply, the observations for agricultural, commercial and industrial studies are aggregated under the heading of vocational subjects.

In Colombia there is virtually no difference in the employment rate between those who followed academic or vocational courses in the INEMs, or between these groups and control academic graduates. Students who followed vocational courses in control schools, however, are more likely to enter the labor force full time after completing secondary studies, than any of the other group. If instead of simply comparing those

graduates who work only, we also add to this group those who "work and study" some changes occur. Control academic graduates then show slightly more willingness to enter employment than graduates from either of the two INEM groups. Incorporating those who combine work and study, control school graduates as a whole are more likely to be in some kind of employment immediately after secondary school than are INEM graduates (around 43 and 39 percent, respectively).

In Tanzania one year after leaving Form IV, only 14 percent of graduates were in wage or self employment. While students from technical bias schools showed an above average propensity to be in employment (17 percent), those from the other two pre-vocational biases showed no different behavior to academic students. With respect to the nature of wage employment, there were no significant differences by bias in the type of work gained or in the level of earnings. Nor were there differences in the time taken to acquire employment.

(d) Employment and the field of pre-vocational specialization

Even if diversification of the curriculum does not lead to a higher rate of employment immediately after secondary school, it could be hypothesized that those who do work will do so in occupations and sectors more in line with the curriculum subject followed. This issue can thus be looked at in two ways: first, by examining the occupational groupings into which INEM and control academic and vocational graduates flow and second, by basing the discussion on economic sector. The range of occupations entered by graduates is very wide and has been narrowed down into groupings.

Comparing outcomes by INEM/control or academic/vocational dichotomies in Colombia produces no obvious pattern apart from teaching being a much less likely occupation for control graduates. For a particular track within a particular school type some differences emerge, e.g., INEM academic graduates are least likely to be in vending, control vocational graduates are least likely to be blue collar workers, and control academic students are least likely to be in teaching. The occupational distribution has also been further disaggregated by each of the vocational tracks. Again, there is very little pattern and no greater likelihood that graduates who follow the commerce track are working in secretarial and other white collar jobs in greater proportions than graduates from other tracks, or that more industrial track students are working in blue collar jobs.

A second way of identifying any employment differences between students from different school types and tracks is to consider sectors of employment. Again, there are no major differences in the degree to which graduates of different school types or tracks enter the various economic sectors - apart from INEM students being more likely to work in personal services.

Thus, one year after graduation there is no strong evidence to show that students who followed an academic or vocational curriculum enter different types of jobs or work in different sectors of the economy. The same is true regarding the INEM/control distinction.

Turning to Tanzania, fifty percent of those who did obtain wage employment found public sector clerical jobs and in general it is not possible to observe any correspondence between bias and job type. For instance, commerce students are no more likely to be working in clerical jobs than are academic or agriculture bias students. Thus graduates from the academic, agricultural and commercial streams show no differences in their pattern of employment. Technical stream graduates, however, obtain employment more in line with their specialization.

(e) Unemployment following secondary school graduation

The idea behind this hypothesis is that graduates with some pre-vocational training will be likely to have more definite ideas of the kind of employment they want and will have some recognizable skills. At the same time employers may regard them as requiring less on the job training and therefore as being more attractive candidates. As a result, the period of unemployment among graduates from such curricula should be less.

The data for Colombia do not substantiate this hypothesis. If anything, they show the reverse, i.e., those who have followed vocational courses in either INEM or control schools experience significantly longer periods of unemployment until they land their first job (26 versus 21 weeks, respectively). The hypothesis that unemployment rates will be lower and job search periods shorter for those with pre-vocational schooling is not substantiated.

In Tanzania, one year after graduation 13 percent of academic students were still looking for either work or training while the percentages for technical, commercial and agricultural students were 8, 16

and 16 respectively. Those in Form V or in training courses again showed no differences by bias in the period they expected to have to wait to acquire employment once they entered the labor force. Thus the unemployment rate for academic school leavers is below those for the agriculture and commerce biases and above that for the technical bias. Anticipated periods of job search do not vary significantly by bias.

(f) Initial earnings of graduates

On the argument that diversification provides either vocational training which gives graduates a higher productivity in employment or pre-vocational training which reduces the amount of required learning-on-the-job, initial earnings of diversified schooling graduates may be expected to be above those received by graduates who followed the academic track.

But the difference in average earnings between INEM and control graduates in Colombia is only one percent, in favor of the control group. Before any conclusions are drawn from the Colombian figures, it should be repeated that in addition to only 30 percent of the sample working, the range of earnings within each track and school type is very wide and differences in the means between tracks are not statistically significant. At the very least, however, it can be said that there is no evidence to support the hypothesis that the initial earnings of those students following pre-vocational studies will be higher than those of students who were in academic streams.

In Tanzania, only 9 percent of Form IV students were in salaried employment one year after graduating and therefore any data presented on earnings can only be regarded as an approximation. The data give average monthly earnings of Sh. 709, 710, 736 and 762 for technical, commercial, agricultural and academic students, respectively.

It is interesting to note that those still looking for work put the level of "minimum acceptable earnings" at a much higher level of Sh. 947, ranging from Sh. 857 for academic students to Sh. 1057 for commercial students. Therefore, although only a very small proportion of school graduates were working one year after leaving secondary Form IV, the data do not support the hypothesis that initial earnings of students from pre-vocational biases will be higher than those received by other students.

(g) The Returns to Education

The external effects of introducing diversified secondary schooling could in principle be measured by looking at differential earnings and costs between types of schooling. Subject to a number of qualifications, mean earnings and costs by subject have been utilized so as to arrive at a rough approximation of social rates of return.

In the case of Colombia no major differences were discovered between the returns to education for those coming from the two types of schools and different tracks, the overall profitability to such investment being of the order of 8 to 9 percent.

By any standard, the rates of return in Tanzania are low ranging from 2 to 6 percent. The technical bias has the lowest return - a reflection of the higher unit cost associated with this bias. Conversely, the academic bias exhibits the highest rate of return. All that can be said at this point, is that the first indications do not corroborate the hypothesis that the introduction of pre-vocational studies into secondary schooling can be justified on the basis of their economic payoff being greater than for academic schooling.

REFERENCES

Ahmed, M. and Coombs P. Education for Rural Development: Case-Studies for Planners, prepared by the International Council for Educational Development under sponsorship of the World Bank and the United Nation's Children's Fund, New York. Praeger, 1975.

Benoit, A. Changing the Educational System: A Colombian Case-Study, Weltforum Verlag, Munich, 1974.

Blaug, M. "The Quality of Population in Developing Countries, with Particular Reference to Education and Training". In Hauser P. (ed.), World Population and Development: Challenges and Prospects, Syracuse University Press, 1979.

Cliffe, L. "The Policy of Ujamaa Vijijini and the Class Struggle in Tanzania". In L. Cliffe and J. Saul (eds.). Socialism in Tanzania, Vols. I and II, Nairobi, East Africa Publishing House, 1973.

Conroy, W.G., Jr. "Some Historical Effects of Vocational Education at the Secondary Level". Phi Delta Kappa, 1979, 267-271.

Court, D. Village Polytechnic Leavers: The Maseno Story, Nairobi, University of Nairobi, Institute of Development Studies, Working Paper No. 70, 1972.

Diyasena, W. Pre-vocational Education in Sri Lanka, Paris, Unesco, 1976.

Dore, R. The Diploma Disease, London, Allen and Unwin, 1975.

Evans, D.R. and Schimmel, G.L. The Impact of a Diversified Educational Program on Career Goals at Tororo Girls High School in the Context of Girls Education in Uganda, Amherst, Centre for International Education, University of Massachusetts, 1970.

Figueroa M., Prieto R. and Gutierrez F. The Basic Secondary School in the Country: An Educational Innovation in Cuba. Prepared for the I.B.E., Paris, 1974.

Foster, Philip J. "The Vocational School Fallacy in Development Planning." In Anderson, C.A. and Bowman, Mary J. (eds.) Education and Economic Development, Chicago, Aldine, 1965.

Godfrey, M. "Education, Productivity and Income: A Kenyan Case Study". Comparative Education Review, Vol. 21, No. 1, 1977.

Grubb, W. Norton "The Phoenix of Vocational Education: Implications for Evaluation". In The Planning Papers for the Vocational Education Study, Washington, D.C., National Institute of Education, 1979, 195-215.

Hinchliffe, K. "Cost Structures of Secondary Schooling in Tanzania and Colombia". Education Department, The World Bank, Washington D.C., 1983. (mimeo).

King, K. Education and Self-Employment, Paris, Unesco, IIEP, 1978.

Klingelhofer, E. "Occupational Preference of Tanzanian Secondary School Pupils", Journal of Social Psychology, 1967.

Lema, A. A. Education for Self-Reliance: a Brief Survey of Self-Reliance Activities in Some Tanzanian Schools and Colleges, Institute of Education, University of Dar-es-Salaam, 1978.

Lillis, K., and Hogan, D. "Dilemmas of Diversification: Problems Associated with Vocational Education in Developing Countries," Comparative Education, Vol. 19, No. 1, 1983.

Lourie, S. Production Schools and Rural Employment in Panama, Paris, 1978.

McClelland, D. The Achieving Society, Free Press of Glencoe, New York, 1961.

Nyerere, J.K. Education for Self-Reliance, Dar-es-Salaam, Government Printer, 1967.

Orata, Pedro T. Self-Help Barrio High Schools: The Story of 250,000 Students, Earning their Education and Preparing Themselves for Life, Singapore, Eastern Universities Press for Seameo Regional Center for Educational Technology, 1972.

Oxtoby, Robert "Vocational Education and Development Planning: Emerging Issues in the Commonwealth Caribbean". Comparative Education, Vol. 13, No. 3, 1977.

Price, R.F. "The Part-work Principle in Chinese Education". Current Scene, Vol. XI, No. 9, September 1973.

Psacharopoulos, G., "Education and Private versus Public Sector Pay'. Labour and Society, 8, No. 2, April-June, 1983.

Psacharopoulos, G. and Loxley, W., Diversified Secondary Education and Development, Johns Hopkins University Press, 1985.

Psacharopoulos, G. and Loxley, W., "Diversified Secondary Curriculum Study (DiSCuS) - Survey Instruments", Education Department, The World Bank, February 1984b.

Psacharopoulos, G. and Hinchliffe, K., "Tracer Study Guidelines", Education Department, The World Bank, 1983.

Psacharopoulos, G. and Zabalza, A. The Destination and Early Career Performance of Secondary School Graduates in Colombia: Findings from the 1978 Cohort, Education Department, The World Bank, Staff Working Paper No.653, 1984.

Psacharopoulos, G., "Returns to Education: An Updated International Comparison", Comparative Education, 1981.

Psacharopoulos, G., "Curriculum Diversification in Colombia and Tanzania: An Evaluation," Comparative Education Review, Vol. 29, No. 4, November 1985: 507-25.

Ruddell, D. "Vocationalising Ghana's schools: Purpose and Product," Unpublished Ph.D Thesis, Faculty of Commerce, University of Birmingham, 1979.

Sato, Kuniu An Alternative Approach to Vocational Education. ILO, Asian Regional Team for Employment Promotion, Bangkok, 1974.

Schiefelbein, Ernesto Education and Employment in Latin America, Paris, Report Studies, 1979.

Silvey, J. "Unwillingly to School: The Occupational Attitudes of Secondary School Leavers in Uganda." In Jolly (Ed.) Education in Africa, Nairobi, East African Publishing House, 1972.

Tchen, Y. "Education and Productive Work in China", Prospects, Vol. VII, No. 3 1977.

Unger, J. "Bending the School Ladder: the Failure of Chinese Education Reform in the 1960's." Comparative Education Review, Vol. 24. No.2, June, 1980.

Van Resnburg, P. Report from Swaneng Hill: Education and Employment in an African Country, Stockholm, The Dag Hammarskjold Foundation, 1974.

Vulliamy, G. SSCEP and High School Outstations. A Case Study. ERU Research Report No. 33, University of Papua New Guinea, 1980.

Weeks, S. The Foster Fallacy in Educational Planning. ERU Research Report No. 32, University of Papua New Guinea, 1978.

Annex Table 1.1

Means and Standard Deviations of Selected Variables,
Colombia 1981 Cohort

Variable/Category	Mean	Standard Deviation
Base Year Sample (N = 8051)		
Background		
Male	.509	.501
Urban Residence	.873	.333
Age	18.5	1.750
City Labor Force Participation Rate (%)	15.10	18.10
City Per Capita Income (Pesos)	1,041	862
Family Income (Pesos)	27,007	47,036
Father is Blue Collar	.132	.339
Father is Non-Manual Employee	.365	.482
Father is Self Employed	.252	.434
Father is Farmer	.131	.337
Father is Business Owner	.110	.314
Number of Siblings	5.17	2.84
Father's Education in Years	6.46	3.61
School Type		
INEM	.404	.491
School Type/Subject		
INEM Academic	.108	.311
INEM Agricultural	.022	.145
INEM Commercial	.119	.324
INEM Social Services	.047	.212
INEM Industrial	.108	.310
Control Academic	.183	.386
Control Agricultural	.046	.210
Control Commercial	.121	.326
Control Social Services	.034	.181
Control Industrial	.117	.322
Control Pedagogical	.095	.214
Other School-Related Variables		
Repeated Primary	.237	.426
Per Pupil Annual School Expenditure	628.56	1,125.60
Private Student Expenditure	1,874	626
Student/Teacher Ratio	18.85	4.94
Private School Student	.194	.395

Continued

Variable/Category	Mean	Standard Deviation
B. 1982 Follow-up (N = 4,925)		
Studying	.374	.484
Working	.297	.457
Working and Studying	.104	.305
(Looking for Work) Other Activities	(.225)	(.463)
Further Schooling		
In Full Time University Study	.194	.396
In Other Coursework	.174	.373
Had Post-School Training	.256	.437
Labor Market Outcomes		
Salaried Employment	.265	.417
Self-employment	.067	.250
Earnings Per Month	9,650	4,086
Hours Worked	41.9	13.15
Weeks Waited for First Job	24.47	33.09
Weeks Worked	64.14	56.09
Sector of Economic Activity		
Agriculture	.018	.105
Mining/Industry	.117	.276
Construction	.053	.067
Transport	.031	.052
Commercial/Financial	.426	.465
Public Services	.037	.062
Social Services	.269	.317

Annex Table 1.2

Means and Standard Deviations of Selected Variables, Colombia 1978 Cohort

Variable/Category	Mean	Standard Deviation
C. 1978 Cohort (N = 1,826)		
Background		
Male	0.521	0.499
Age	21.859	1.864
Siblings	5.608	2.838
Father's Education (Years)	9.775	3.302
Father is Farmer	0.117	0.322
Father is Laborer	0.111	0.315
Father is Employee	0.354	0.478
Father is Professional	0.297	0.457
Father is Business Owner	0.086	0.281
Family Income (pesos)	28440	32516
Urban Born	0.875	0.330
School Type/Subject		
INEM	0.427	0.494
Academic	0.250	0.433
Commercial	0.199	0.400
Industrial	0.202	0.401
Agricultural	0.123	0.329
Social Sciences	0.086	0.281
Pedagogy	0.136	0.343
1978 First Destination/Work Characteristics		
Studying	0.262	0.440
Working and Studying	0.261	0.439
Working	0.364	0.481
Self-Employed	0.025	0.158
Earnings	5405	3748
Hours Worked	39.054	14.235
Weeks to Find Job	14.157	17.784
1981 Status/Work Characteristics		
Studying	0.287	0.452
Working and Studying	0.220	0.414
Working	0.367	0.482
Self-Employed	0.039	0.195
Earnings	10292	5474
Hours Worked	40.205	12.403
Looking for Work	0.177	0.382
Weeks Looking	27.254	30.596

Annex Table 1.3

Means and Standard Deviations of Selected Variables,
Tanzania 1981 Cohort

Variable/Category	Mean	Standard Deviation
A. Base Year Sample (N = 4,181)		
Background		
Male	.668	.047
Age	19.1	1.30
Urban Residence	.179	.384
Number of Siblings	6.36	2.720
Mother's Education (in Years)	4.33	3.045
Father's Education (in Years)	5.97	3.296
Father's Annual Income (in Shillings)	5318	11010
Regional Per Capita Income (in Shillings)	944	980
Father is Farmer	.419	.493
Father is Professional	.101	.301
Father White Collar	.119	.324
Father is Teacher	.060	.237
Father Blue Collar	.101	.302
Father is Otherwise Employed	.200	.400
Father is Self Employed	.526	.499
Expectations		
Will Seek Private Employment	.051	.221
Expected Post Form IV Earnings (Sh./Month)	836	649
Achievement Score (Non -Standardized)		
Kiwahili	46.500	9.499
Math	36.400	16.300
English	41.500	12.300
Commercial	6.060	2.720
Agricultural	6.140	2.590
Technical	6.940	2.999
Ability		
Verbal Aptitude	10.353	3.822
Nonverbal Aptitude	7.330	3.200
Modernity Score	5.830	2.570

continued

Variable/Category	Mean	Standard Deviation
School Bias/Ownership		
Private Agricultural	.053	.255
Public Agricultural	.277	.447
Private Technical	.021	.143
Public Technical	.097	.296
Private Commercial	.129	.335
Public Commercial	.179	.383
Private Academic	.074	.262
Public Academic	.170	.402
Private Expenditure per Student (Sh./Year)	1759	1292
Public Teacher Expenditure per Student	1045	870
B. 1982 Follow-up (N = 2,297)		
Destination		
Form V	.295	.456
Training	.416	.493
Salaried Employment	.091	.288
Self-Employed	.053	.224
Looking for Placement	.144	.351
Expectations		
Expected Earnings of Form V Students	3450	7653
Expected Earnings of Students in Training	1282	944
Labor Market Outcomes		
Earnings of Salaried Workers	699	153
Earnings of Self-Employed	319	304
Satisfied with Training Program	.653	.476
Hours Worked per Week (Salaried Worker)	42.8	16.8
Hours Worked per Week (Self Employed)	41.6	23.3
Sector of Economic Activity		
Public Sector	.077	.266
Private Sector	.010	.102
Self-Employed	.053	.224

Annex Table 2.1

Mean Scores by School Type and Subject, Colombia 1981 Cohort

School Type/ Subject	Achievement Score					
	Academic	Agri-culture	Com-mercial	Social Serv.	Indus-trial	Pedagogy
INEM						
Academic	<u>54</u>	51	49	54	51	51
Agricultural	50	<u>61</u>	47	49	51	50
Commercial	48	51	<u>60</u>	49	49	49
Social Services	47	51	47	<u>56</u>	49	53
Industrial	50	51	48	49	<u>58</u>	50
INEM Overall	51	51	51	51	52	50
Control						
Academic	<u>50</u>	49	49	50	49	49
Agriculture	45	<u>58</u>	46	46	49	49
Commercial	50	48	<u>57</u>	49	48	47
Social Services	49	51	47	<u>54</u>	47	49
Industrial	51	48	46	48	<u>53</u>	48
Pedagogy	49	48	45	50	47	<u>58</u>
Control Overall	50	49	49	49	48	50

Notes: Raw scores (x) on all tests are standardized (normalized) to a mean of 50 and a standard deviation of 10, according to the formula

$$T = \frac{10\ (x-\bar{X})}{S_x} + 50$$

Underlined scores refer to those taking the test in the area of their curriculum specialization.

Annex Table 2.2

Achievement as a Function of Background and School Characteristics, Colombia 1981 Cohort

Variable	Academic Achievement		Commercial Achievement	
Constant	23.748		30.910	
Background				
Male	0.531	(1.56)	-0.598	(1.75)
Age	-0.070	(0.82)	0.484	(0.57)
Verbal Ability	0.387*	(23.38)	0.135*	(8.17)
Mathematical Ability	0.064*	(4.08)	0.062*	(3.97)
Family Owns Business	-1.229*	(3.07)	-0.711*	(1.78)
Books Owned By Household	0.012*	(4.25)	0.003	(1.06)
Father's Education	0.106*	(2.49)	0.345	(0.81)
Log of Family Income	0.118	(1.31)	0.235*	(2.63)
Father Blue Collar	-0.880*	(2.10)	-0.390	(0.93)
Father Non-Manual Employee	-0.448	(1.42)	0.236	(0.75)
Father Business Owner	1.119*	(2.27)	1.071*	(2.17)
School Characteristics [1/]				
INEM Academic	4.325*	(7.71)	3.832*	(6.83)
INEM Agricultural	0.123	(0.13)	1.862*	(1.97)
INEM Commerce	-0.007	(0.01)	15.289*	(28.12)
INEM Social Science	0.291	(0.43)	2.551*	(3.80)
INEM Industrial	1.833*	(3.10)	3.478*	(5.88)
Control Academic	0.261	(0.48)	4.154*	(7.58)
Control Agricultural	-1.636*	(2.24)	1.554*	(2.12)
Control Commerce	0.763	(1.43)	11.043*	(20.75)
Control Social Science	-1.573	(1.36)	1.956	(1.70)
Control Industrial	0.372	(0.53)	0.412	(0.58)
Private School	-4.057*	(9.59)	-1.418*	(3.36)
Mean Teacher Salary	-0.62E-7*	(15.96)	-0.32E-7*	(10.08)
Per Student Expenditure	0.002*	(18.91)	0.001	(9.70)
R^2	.30		.31	
N	4233		4233	

1/ Curriculum bias categories are evaluated in relation to the pedagogy bias (the omitted category)

* Statistically significant at the 5 percent level or better.

Numbers in parenthesis are t-values.

Annex Table 2.3

Mean Achievement Score by
Curriculum Bias and Other Characteristics,
Tanzania 1981 Cohort

Characteristic	Test Score			
	Agricultural	Technical	Commercial	Academic
Curriculum Bias				
Agricultural	53	50	48	50
Technical	50	57	48	50
Commercial	47	47	54	49
Academic	50	50	49	52
Sex				
Male	51	51	50	52
Female	49	47	51	47
School Ownership				
Public	52	52	51	52
Private	46	46	49	46

Note: Academic test refers to mathematics, Kiswahili and English language.

Annex Table 2.4

Achievement as a Function of Background and School Characteristics, Tanzania 1981 Cohort

Variable	Test Score in Technical		Agriculture		Commercial		English	
Constant	31.997		42.304		41.767		34.243	
Background								
Male	2.031*	(4.80)	0.477	(1.02)	0.321	(0.68)	2.385*	(5.78)
Age	-0.255	(1.82)	-0.271	(1.76)	-0.345*	(2.23)	-0.447*	(3.27)
Books at Home	-0.003	(0.67)	0.006	(1.17)	0.005	(0.89)	0.018*	(3.63)
Urban Birth	-0.010	(0.02)	0.231	(0.45)	1.419*	(2.79)	-0.613	(1.36)
Father's Education	-0.055	(0.98)	-0.118	(1.90)	0.024	(0.38)	0.007	(0.13)
Log Father Earnings	-0.107	(0.97)	-0.059	(0.49)	-0.157	(1.30)	-0.020	(0.18)
Father Self Employ	0.278	(0.77)	0.952*	(2.41)	0.853*	(2.15)	0.619	(1.77)
Father Farmer	-0.215	(0.49)	-0.208	(0.43)	0.027	(0.05)	-0.185	(0.43)
Father in Trades	0.783	(1.34)	0.442	(0.69)	0.338	(0.52)	-0.666	(1.17)
Father Salesman	0.038	(0.06)	1.079	(1.69)	0.069	(0.10)	-0.295	(0.52)
Father Professional	0.708	(1.10)	1.781*	(2.53)	2.158*	(3.06)	0.009	(0.01)
Verbal Aptitude	0.190*	(9.75)	0.220*	(10.29)	0.126*	(5.89)	0.250*	(13.17)
Math Aptitude	0.233*	(12.37)	0.137*	(6.65)	0.091*	(4.40)	0.262*	(14.27)
School Characteristics								
Agriculture Bias	-2.275*	(5.15	-0.385*	(0.79)	-4.616*	(9.49)	-2.802*	(6.51)
Commercial Bias	-1.923*	(3.32	-3.261*	(5.45)	2.861*	(4.76)	-3.936*	(7.40)
Technical Bias	4.937*	(8.02	-2.877*	(4.25)	-3.000*	(4.42)	-5.453*	(9.08)
Private School	-1.753*	(3.59)	-2.554*	(4.77)	0.092	(0.17	-1.575*	(3.31)
Teacher Education Level	0.122	(1.36)	-0.135	(1.37)	0.357*	(3.62	0.095	(1.09)
Per Student Expenditure	.74E-03*	(4.56)	.55E-03*	(3.07)	.29E-04	(0.16	.16E-03	(1.05)
Student/Teacher Ratio	-0.007	(0.28)	-0.046	(1.68)	-0.027	(0.97)	-0.119*	(4.87)
Teacher Salaries	-0.001*	(3.41)	-0.001*	(2.47)	-51E-04	(0.11)	.27E-03	(0.69)
Academic Periods	0.015*	(1.99)	0.008	(0.97)	-0.001	(0.21)	0.003	(0.46)
R^2	.32		.19		.15		.37	
N = 2803								

* Statistically significant at the 5 percent level or better.

Numbers in parenthesis are t-values.

Annex Table 3.1

The Determinants of Labor Earnings
Colombia 1978 Cohort

Variable	Coefficient	(t)
Constant	-2635	(.96)
Age	266*	(3.10)
Male	1247*	(3.45)
Siblings	-37	(.75)
Urban Born	-44	(.09)
Residence Years	-17	(.61)
Big City	712	(1.35)
City p/c Income (000)	1	(1.07)
Primary School Repeater	243	(.76)
Secondary School Repeater	-143	(.41)
Father's Occupation		
- Employee	-215	(.45)
- Laborer	-521	(.89)
- Self-employed	127	(.25)
- Business Owner	1128	(1.74)
Father's Years of Schooling	123*	(2.47)
Mother's Years of School	-3	(.05)
Private Secondary School	244	(.52)
Studies Now	847*	(2.80)
Number of Post-Secondary Courses	50	(.52)
Duration of Training Courses	5	(1.01)
Months in Present Job	33*	(3.42)
Private Sector Employee	-1323*	(4.18)
Full-Time Worker	1054*	(2.49)
Weekly Hours Worked	62*	(4.22)

continued/

Annex 3.1 - Continued

Variable	Coefficient (t)	
SUBJECT 1/	INEM	CONTROL
- Academic	-560 (.81)	37 (.06)
- Commercial	-231 (.40)	64 (.11)
- Industrial	153 (.24)	770 (1.23)
- Agricultural	131 (.14)	-769 (.99)
- Social Services	836 (1.23)	-551 (.49)
R^2	.164	
N	884	

Notes: Mean dependent variable (Y) = 10,002

1/ Set of school curriculum specific dummies. Reference group is pedagogy graduates.

* Significance better than 5 percent.

Annex Table 3.2

The Determinants of 1982 Labor Earnings,
Tanzania 1981 Cohort

Variable	Coefficient	(t)
Constant	2051.48	
Background		
Father is Farmer	- 22.50	(0.20)
Father's Education in Years	19.38	(1.21)
Nonverbal Ability	.05	(0.49)
Regional GNP	.04	(0.92)
Male	2.01	(0.09)
Attended Private School	5.30	(0.04)
Age	- 30.07	(0.42)
Urban Residence	- 1.69	(0.42)
Achievement Score		
Commercial Achievement	- 5.70	(1.00)
Agricultural Achievement	10.09*	(1.75)
Technical Achievement	- 3.97	(0.50)
Math Achievement	12.77*	(1.90)
English Achievement	- 1.69	(0.35)
Work Characteristics		
Self-Employed	543.77*	(4.50)
Started Work in 1981	- 116.37	(0.52)
Work in Private Wage Sector	7.15	(0.06)
Graduated From:		
Agricultural Bias	102.35	(0.52)
Technical Bias	- 110.27	(0.42)
Commercial Bias	- 27.92	(0.39)
R^2	.224	
N	302	

Notes: Omitted school program variable is academic control.

* Statistically significant at the 10 percent level or better