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Financing Technical Education in LDCs: Economic Implications from a Survey of Training Modes in the Republic of Korea

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September 1985

Education and Training Department

Operations Policy Staff

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FINANCING TECHNICAL EDUCATION IN LDCs: ECONOMIC IMPLICATIONS FROM A SURVEY OF TRAINING MODES IN THE REPUBLIC OF KOREA

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ABSTRACT

Economic and fiscal constraints of the present decade have forced LDC governments to invest selectively in human resource development. It has become increasingly important for LDCs with expanding industrial sectors to seek cost-effective ways of producing skilled manpower which would maximize returns on scarce resources. Alternative training modes are being explored because the traditional technical education system may no longer keep pace with changing industrial skill requirements.

Public educational expenditures in many LDCs are generally biased towards the formalized vocational sub-sectors. Taking South Korea as an example, vocational education within the traditional school system is allocated a much bigger share of public resources than the non-formal system. There is however, growing realization that the private industrial sector should bear more of the training responsibility since firms would be best able to train efficiently for their own skill needs.

To examine the argument that in-plant training by private industry merits greater emphasis, a survey of different training modes in South Korea was carried out. Results from a rate-of-return analysis using survey data indicate that social returns are highest for in-plant training followed by vocational institute training and lowest for technical high school training. Additionally, the analysis points out several important weaknesses in the Korean technical education system. They are: (1) inefficient use of public resources due to duplication of training effort by public agencies and private firms. This occurs when vocational training institute and technical high school graduates require further in-plant training before they are considered adequate for the job in certain industries; (2) wastage due to overlap in training provided by the formalized vocational training and technical education systems; and (3) low internal efficiency of the formalized vocational training system as a whole.

The findings of this survey raise further policy issues pertaining to technical training that are common to many LDCs. These issues revolve around the question of how limited funds could be efficiently deployed to produce the right kinds and amounts of skilled labor.

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SUMMARY AND CONCLUSIONS

The lack of skilled manpower is one of the critical impediments to industrial development in many LDCs. Consequently, governments of these LDCs have, in the last two decades, diverted more resources from general primary and secondary education to technical education which is considered to be more effective in producing individuals with the necessary industrial skills. This paper examines how scarce public resources are currently deployed in LDCs to promote technical education and also more importantly, whether these resources are being used efficiently in the production of skilled industrial workers.

The general term, "technical education" as used in this paper, covers a wide spectrum of skill-imparting modes which range from vocational education as transmitted through the formal school system to institutionalized vocational training and non-formal on-the-job training. The varying weights given (by LDC governments) to different training modes are usually reflected by the amount of public funds allocated to each. Recent empirical studies on the returns to education indicate that vocational training that is specific to the needs of an industry yields higher rates-of-return than formalized technical education in schools. Public spending in many LDCs is, however, still relatively biased towards the latter. To document this bias, I have chosen a sample of ten LDCs for review based upon the availability of cost data and well-defined training structures in the country. These countries are the Republic of Korea, the Philippines, Thailand, Malaysia, Brazil, Colombia, Argentina, Ecuador, Mexico and Morocco.

The distribution of public educational expenditures in the ten countries surveyed reveals a distinct bias towards public financing of general secondary and formalized technical education. Only Brazil, Colombia and the Philippines have allocated more resources to vocational training schemes than to technical education within the formal school system. However, this review does not take into account private input of industrial firms into technical education. For LDCs with strong private sectors, it may be unnecessary for the government to increase financial support for vocational training if firms have been or could be motivated to train for their specific needs.

The bias in public spending towards traditional forms of technical education in schools is detrimental to the development of alternative training modes which may be more cost-effective. However, before deciding how resources should be reallocated in order to reduce this bias, it is crucial to determine which training mode(s) would best serve the particular needs of each LDC. Before continuing to pour scarce public funds into any type of training, LDC governments have to evaluate each training mode in terms of cost and suitability of outputs.

In the Republic of Korea, there has been growing realization that private industry should shoulder more of the public training burden since firms would be best able to train effectively for their specific needs. This issue is closely linked with the need to upgrade the efficiency of resource-utilization in technical education and to mobilize alternative financing sources for skilled manpower production.

To examine the above argument that in-plant training by private industry merits greater emphasis, a survey on different training modes in the Republic of Korea was carried out. Results from a rate-of-return analysis using survey data indicate that in-plant training yield the highest social returns followed by vocational institute training and then technical high school training.

Findings of the survey point to several important weaknesses in the Korean technical education system. First, public resources are used inefficiently due to the duplication of training effort by public agencies and private firms. This occurs when graduates of vocational training institutes and technical high schools require further in-plant training before they are considered to have attained the required skill-proficiency in certain industries. Second, there is wastage arising from the overlap in training provided by the formalized vocational training institutions. Third, the formalized vocational training system suffers from low internal efficiency due mainly to high unit costs which in turn, are attributed to the low instructor-pupil ratio in vocational training institutes.

The Korean authorities are currently exploring various alternative financing mechanisms for technical training. The existing levy system which decrees that all firms with more than 300 workers must provide in-plant training or contribute a stipulated amount to a Vocational Training Promotion Fund, has proved too cumbersome to manage. Hence, a payroll tax on all private corporations (similar to what exists in Brazil and Argentina) has been broached. The proceeds of such a tax would be used for promoting technical training and upgrading existing training systems.

I. Introduction

Development of Skilled Industrial Labor through Technical Education

1.1. Industrial growth mandates a steady supply of skilled labor, among other critical inputs. General education does not equip individuals with technical skills; hence, in order to industrialize after the Second World War, many LDCs have shifted focus from primary and secondary education to technical education. The key issue (which is also the focal point of this paper) is how scarce resources could be utilized most efficiently to develop technical education and therefore produce the needed skilled manpower for the industrial sector.

Technical education, as used in this paper is a general term covering a whole array of skill-imparting modes. 1/ These range from vocational education as transmitted through the formal school system to institutionalized vocational training to formal or non-formal on-the-job training. Although all these training modes are usually used in combination to produce skilled labor, LDC governments have placed emphasis on one or more modes at different points in time. Generally, the varying weights given to skill training modes are determined by the types of outputs which are in high demand and this in turn, is determined by the stage of industrial development in the country. The case of South Korea exemplifies this observation.

Technical Education in the Republic of Korea

1.2. After two decades of rapid economic growth, South Korea is now at the threshold of a highly industrialized society. The changing industrial technology demands a new type of manpower structure consisting of technicians

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1/ For a comprehensive definition of technical education, see Kugler and Reyes (1978), pp. 296-297.

and technologists instead of skilled operatives and craftsmen. The Korean vocational training system while being one of the best of its kind in Asia, must further evolve in order to keep pace with the changing skill requirements of an industrial sector that is moving away from labor-intensive light industries to high technology industries.

In restructuring the technical education system in response to technological change, Korean authorities face three critical questions. The first involves defining the roles of existing training modes such that there is minimum overlap in training curricula and that outputs are compatible with industrial skill requirements. The second question is how greater participation in technical training by private industry could be motivated and enforced, given the importance of firm-specific training in meeting higher skill requirements. Finally, the question of costs and financing of technical education has to be resolved such that valuable national resources would be mobilized efficiently to produce the right kinds of skilled labor.

Issues of Interest

1.3 In this paper I shall take an in-depth look at the third issue mentioned previously, discuss the ramifications of the first two and finally draw out some policy implications for the promotion of technical education in South Korea. The overall objective is to gain some insight into how limited public funds in LDCs could be allocated efficiently to develop those human resources which are vital for economic growth.

Section II sets the scenario through a review of some cost data on technical education in selected LDCs. The usefulness of this exercise lies not so much in making a cross-country comparison of training expenditures, but in documenting the bias in public spending towards technical education that is transmitted through the school system. Such a bias is naturally detrimental to the development of alternative training modes which may be more cost-effective.

Section III summarizes the strengths and weaknesses of the present Korean technical education system. The roles of the Technical High School, the Junior Technical College and the Vocational Training Institute are examined in terms of relevance of their outputs for meeting present and future industrial skill requirements. The increasing prominence of in-plant training centers is another vital issue discussed in this section.

Section IV looks at the social returns to technical high school education as well as to training at the public vocational training institutes and in-plant training centers. The analysis uses cost and earnings data obtained through a survey of eleven in-plant training centers, four vocational training institutes and three technical high schools in South Korea. Ideally, one would wish to examine the cost-effectiveness of different training modes; caution has to be exercised in this case because formalized technical education programs in South Korea are designed to meet different social and economic objectives and to cater to different target groups. Additionally, outputs may not be comparable and therefore a cost-effectiveness comparison of different training modes is not relevant nor appropriate.

Finally in Section V, I shall explore some possible strategies for improving technical education in South Korea in terms of reducing training costs and increasing overall efficiency. To lighten the public burden in training, alternative financing mechanisms are essential; a discussion of potential development in this area concludes this paper.

II. Public expenditures on technical education in selected LDCs

The allocation of public resources across different educational sub-sectors is generally a function of political ideology and perceived needs. However, growing fiscal constraints in the last two decades have forced many LDC governments to invest selectively in education such that returns on scarce resources would be maximized.

Recent empirical studies 2/ indicate that vocational training that is specific to the needs of an industry yields higher rates-of-return than formalized technical education in schools. Public spending in many LDCs is however, still relatively biased towards the latter. To examine the pattern of educational expenditures, a sample of ten LDC's has been chosen for review based upon the availability of cost data and well-defined training structures in the country. These countries are South Korea, the Philippines, Thailand, Malaysia, Brazil, Colombia, Argentina, Ecuador, Mexico and Morocco. Annex 1 describes the problems associated with collecting relevant cost data on these countries.

2/ A recent study conducted in Malaysia found social rates-of-return to in-plant training, institutional training and vocational education to be 25%, 19% and 12%, respectively. For details, see S. Cohen (1983).

Levels of public spending on technical education

2.1. In the drive to meet critical skill shortages, many LDCs have increased the amount of resources for expanding technical education. In the Philippines for example, the concern for occupation-oriented human resource development is reflected in the growth of expenditures from 314 million pesos in 1978 to 923 million pesos (20% of the total education budget) in 1980. 3/ However, most of this increase is allocated to the expansion of formalized technical education in schools which may not be the most cost-effictive way to train skilled workers. More resources should probably be diverted to vocational training systems that are designed to meet specific industrial skill requirements.

In the ten countries surveyed, a variety of manpower training strategies are used in combination; these are summarized in Annex 2. The general observation from this survey is that in countries where the school system is the most advanced and the average level of schooling is highest, as in South Korea and Argentina, the vocational training system has been integrated the most into the formal education system. On the other hand, in those countries with a weak education tradition and in which the educational attainment of the working class is very low, as in Brazil and Morocco, vocational training institutions established outside the school system are more prevalent.

3/ Figures abstracted from World Bank Staff Appraisal Report #2750-PH on the Vocational Training Project in the Philippines, 8/26/82.

Annex 3 gives the public expenditures by selected educational sub-sector for each of the ten countries in the sample. Since the cost figures reflect expenditure levels for different years, no generalization could be made about public spending on technical education across countries. Nevertheless, within each country (with several exceptions) there appears to be a distinct bias towards public financing of general secondary and formalized technical education. Among the various educational sub-sectors, vocational training receives the least amount of public funds.

The above observation becomes apparent when the amount of public expenditure on each sub-sector is expressed in terms of percentage share of total educational expenditures. These percentages are presented in Table 1. With reference to this table, only Brazil, Colombia and the Philippines have allocated more public funds to vocational training schemes than to technical education within the formal school system. South Korea being a country with a strong traditional school system, provides more financial support to technical schools than to vocational training schemes. Nevertheless, the total amount allocated to the technical and vocational sub-sectors is much less than that allocated to general secondary education.

A variety of financing mechanisms is used across the different training systems reviewed in Annex 2 for each of the ten countries in the sample. Table 2 indicates the main methods of financing these training systems. However, such methods represent only those financing mechanisms arising from public sources of public legislature. Annex 4 gives a brief description of financing mechanisms in each of the ten countries surveyed.

Some general conclusions from the survey

2.2 Although it is tempting to conclude from the findings of this brief survey of ten LDCs that vocational training receives insufficient public funding given its importance, we have to note that private input into this sub-sector has not been considered. Private firms may contribute to general vocational training through special purpose taxes or conduct their own skill training programs. For LDCs with strong private sectors, it may be unnecessary for the government to increase financial support for vocational training if firms have been or could be motivated to train for their specific needs.

Finally, an important question has to be resolved before deciding how public resources should be reallocated within the education sector. To determine which technical education mode(s) would best serve the particular needs of each LDC, cost-effectiveness studies on training are necessary. The present study on costs of alternative training modes in South Korea (described in the following sections) takes a similar approach in determining how skill shortages could be met effectively through the right kinds of training programs. Before continuing to pour scarce public funds into any type of training, LDC governments have to evaluate each training mode in terms of cost and suitability of outputs.

Table 1: Percentage Share of Public Educational Expenditures by Sub-Sector 1/

Country	Year	General Secondary Education	Technical Education in Secondary Schools 2/	Vocational Training Schemes 3/ (Institutional and In-plant)
Colombia	1978	20.9	4.9	15.7
South Korea	1982	24.2	4.2	0.5
Philippines	1980	13.9	5.6	14.7
Morocco	1981	39.5	26.4	13.1
Brazil	1974	62.7	0.3	3.2
Ecuador	1980	14.7	3.5	0.7
Mexico	1980	9.9	4.8	2.3
Argentina	1978	27.2	6.5	0.8
Malaysia	1980	28.0	1.1	1.6
Thailand	1980	15.9	5.8	0.2

Source: Based on Annex 2.

1/ 100% for all educational sub-sectors.

2/ These are generally recurrent expenditures reported by the respective Ministries of Education.

3/ Figures include expenditures for institutionalized training schemes as well as vocational training expenses funded by special-purpose taxes like the payroll tax and direct government subsidies.

Table 2: Source of Finance* for Technical Education and Vocational Training

Country	General Revenues From Public Budget	Direct Government Grant/Subsidy	Revenue From Payroll Tax	Revenue from Other Special Purpose Taxes
Colombia	X	X	X	
South Korea	X	X		X
Philippines	X			X
Morocco	X	X	X	
Brazil	X		X	
Ecuador	X	X	X	X 1/
Mexico		X		X 2/
Argentina	X		X	
Malaysia	X	X		
Thailand	X	X		

*Presence of funding source indicated by X.

1/ This source arises from a 0.2% levy on the importation of industrial equipment.

2/ This is not so much a tax as direct contributions from private industry.

II. The technical education system in South Korea

In the wake of rapid industrialization in the 1960's and the 1970's, the South Korean government developed three major avenues for the production of semi-skilled and skilled technical manpower. They are: (1) the Technical High School and the Technical Junior College (under the Ministry of Education); (2) the Public Vocational Institute (under the Ministry of Labor); and (3) the In-Plant Training Center (run by private industry). The status of (1) is summarized in Annex 5, while Annex 6 gives the status of (2) and (3).

Based upon relative training capabilities and expected expansion, the government stipulated in the mid 1970's that the formal system (under the Ministry of Education) was to train 30% of the required skilled workers while the informal system (directly or indirectly under the Ministry of Labor) was to train the remaining 70%. The current trend is for an increasing emphasis on the informal system, with special attention on in-plant training by private industry. To increase the level of in-plant training, a Basic Law on Vocational Training was enacted in 1976 to promote in-plant training by all firms employing more than 300 workers. Firms which fail to act in accordance with the Law would have to pay a training levy that is determined annually by the Ministry of Labor based upon relative training costs. On the other hand, firms which provide training can apply for exemptions against the training levy if they have fulfilled the stipulated targets. All proceeds from the training levy are put into a Vocational Training Promotion Fund.

Recent studies by the Korean government[4/] on the demand and supply of skilled workers reveal that the shortage of manpower is not attributed to supply capacity per se but to wage structure and working conditions (Lee, 1984). This implies that the traditional method of increasing supply is not the solution to the problem. Before a new approach to the problem could be devised, one has to examine each existing training mode in terms of its strengths and weaknesses. Such an exercise is a prerequisite towards evaluating the internal and external efficiency of the technical education system which in turn, is essential for identifying possible ways of alleviating skilled manpower shortages.

Strengths of the present Korean technical education system

3.1. The technical high school system is an extensive network covering 133 units with a capacity to produce more than seventy thousand skilled production workers annually. Although the stress is on occupational education, the technical high school also provides students with general education and the opportunity to advance to higher education at the Junior Technical College or university. With reference to Figure 1, a technical high school student can either opt for employment directly upon graduation or continue onwards to become a professional engineer within thirteen years. The system as such, provides alternative channels and therefore greater occupational mobility for the student.

4/ The Korean Vocational Training Institute conducted a study in 1983 to project the demand for skilled workers against the supply of them. The study showed that there will be an annual surplus of 29,104 skilled workers from 1981 to 1986. However, due to frequent turnover of workers, there is a high dropout ratio which brings the yealy average number of dropouts to 376,200. Given this fact, each year will see the shortage of 347,096. This finding suggests a new concept of surplus and shortage which implies that the shortage of skilled manpower is not attributed to supply capacity per se.

There are currently twenty-five public vocational training institutes (VTIs) throughout South Korea which offer high quality, intensive skill training to youths from diverse educational and socio-economic backgrounds. As shown in Figure 1, the highest level attainable for a VTI graduate is that of master craftsman - an occupational classification equivalent in status to that of a professional engineer. This channel therefore provides school dropouts and youths from disadvantaged socioeconomic backgrounds an opportunity to progress as far as college graduates. Besides training for entry-level employment, VTIs also offer skill-upgrading courses for semi-skilled workers.

In-plant training by private industrial firms is the only training mode which is devised specifically to meet the job-specific skill needs of different industries. Since it is difficult for public authorities to forecast skill shortages accurately in highly specialized industries and thence take remedial action, the firms themselves have to train for their future manpower needs. Additionally, unlike the case of formalized technical training, there is no time lag between the demand for new skills necessitated by technological change and the implementation of appropriate in-plant training programs. It is logical therefore, for the Korean government to focus upon in-plant training as a means of producing the right kinds of skilled manpower for industrial growth.

Weaknesses in the System

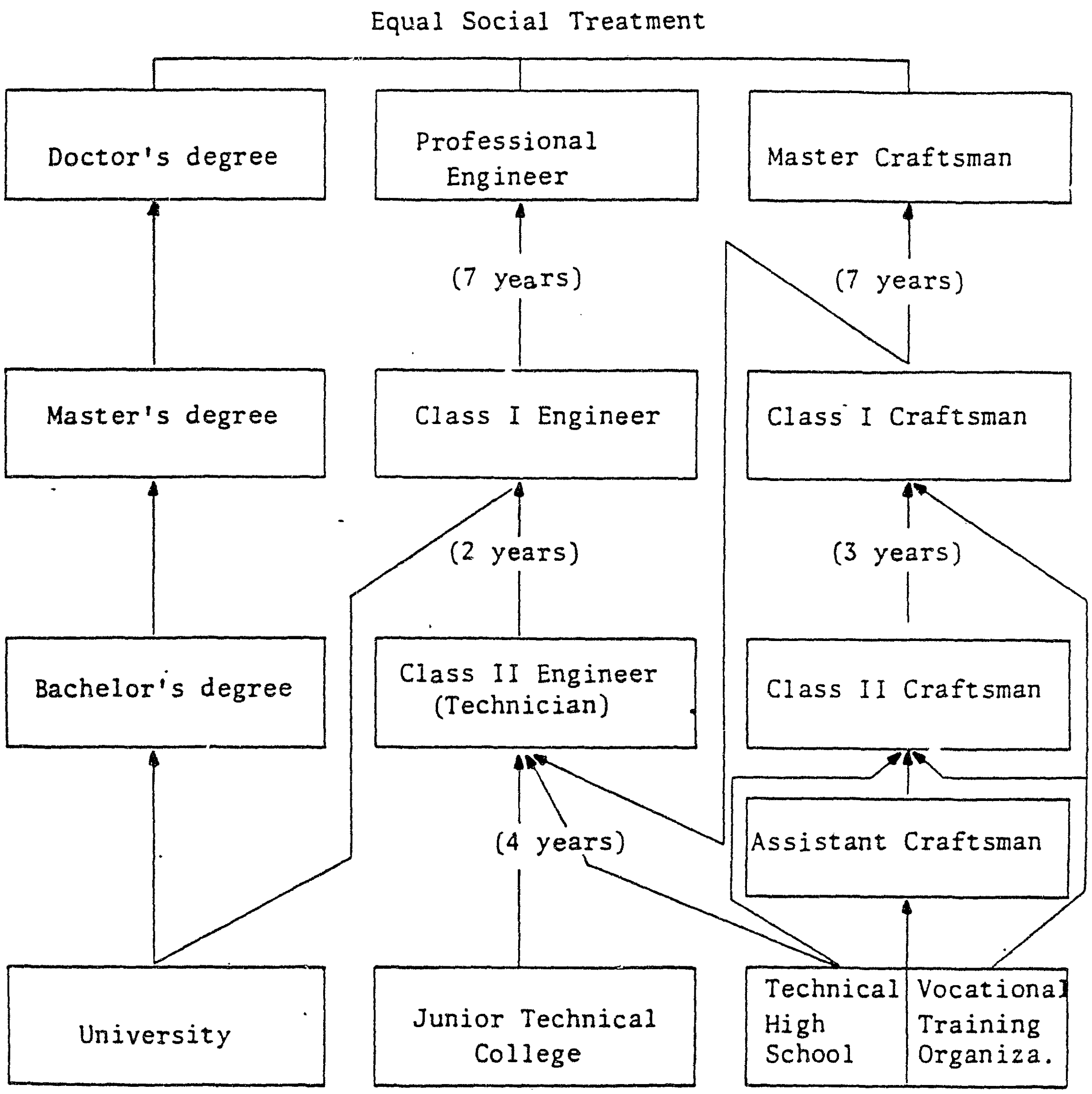
3.2. To maintain its relevance as a training mode, the role of the technical high school in Korea has to be redefined. As indicated clearly in Annex 5, increasing numbers of technical high school graduates are advancing to higher education instead of seeking employment in industry. At the same time, less than 50% of all graduates have found employment immediately upon graduation. This seems to indicate that a technical high school education is more useful as a foundation course for higher education than as a means of providing individuals with immediate marketable skills for the industrial sector.

The technical high school system is currently confronting another crisis in the form of reduced demand. According to J.K. Lee (1984), the number of applicants for technical high schools has decreased significantly due to the inability of their graduates to compete favorably with general high school graduates for places not just in general-stream colleges but even in engineering colleges.

The number of junior technical colleges fell from 41 in 1980 to 34 in 1983 (see Annex 5). This decrease according to J.K. Lee (1984), is largely due to the low employment rate of graduates and the difficulty of equipping such colleges. The low employment rate of slightly more than 30% is largely attributed to the downward assignment of engineering college graduates to technician's work. 5/ Many junior technical colleges have since been upgraded to four-year colleges.

5/ As shown in Figure 1, engineering college graduates normally compete with junior technical college graduates only at the Class I Engineer level when the latter have had six years of industrial experience. Now with the downgrading of the former to technician's work, fresh graduates of junior technical colleges would be at a disadvantage when competing with engineering college graduates for Class II Engineer (technician) positions. The downgrading is due to the surplus of engineering college graduates in South Korea.

Figure 1: Career paths of graduates from the technical stream



Source: Korea Vocational Training and Management Agency, Management of Technical Manpower through Vocational Training and Qualification Testing, p.13

The shortages of technical high school and junior technical college graduates forecasted by manpower studies conducted in 1976 and 1979 did not materialize, resulting in a surplus of such labor. The recent economic recovery and projected growth in the next decade will demand a large supply of skilled labor; however, the question of whether technical high school graduates would be suitable candidates is highly debatable. If technical high schools are to produce outputs with the appropriate marketable skills, the training curriculum in these schools would have to be revised towards this end.

The major problem with in-plant training appears to be the sharp drop in numbers receiving such training since 1980 (see Annex 6). The levy system designed to foster in-plant training has, in practice, proved to be cumbersome to manage. The Ministry of Labor specifies annually, the number of workers to be trained by skill category and fixes a levy on firms in accordance with estimated training costs. Employers are able to qualify for exemptions if their training plan is approved. Contributions to training costs from exemptions under this scheme have been less than 20% on average; given the burden of obtaining approval, many firms have opted not to participate.

Due to slow economic growth and the present enhanced supply, employers seem unconcerned about the availability of skilled labor. This, coupled with the laxity of the government in implementing in-plant apprenticeship schemes required by the Vocational Training Law of 1974 will give rise to future skill constraints should the economy grow at the forecasted rate in the next decade.

IV. Survey of three technical training modes in South Korea

To gauge the internal efficiency of the technical education system in South Korea, a rate-of-return analysis on different training modes is necessary. Data for this rate-of-return analysis was collected through a survey of eleven in-plant training centers, four public vocational training institutes and three mechanical technical high schools located in the industrial areas of Seoul, Incheon, Changwon, Ulsan and Pusan (see Figure 2). As an instrument for data collection, a questionnaire (attached as Annex 7) was administered in the course of interviews with training personnel of industrial firms and administrative staff of VTIs and technical high schools.

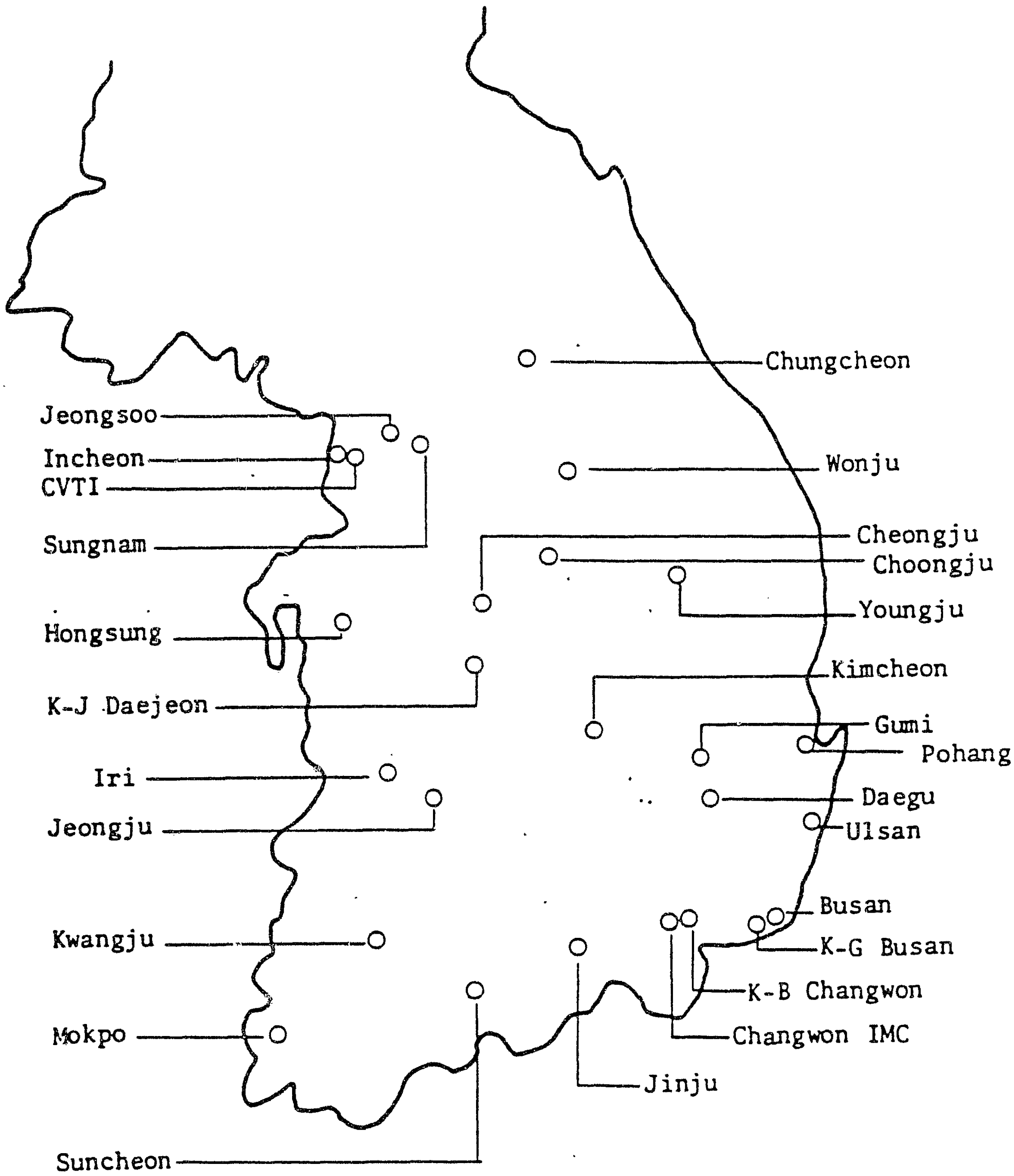
Although limited in size and scope, the survey produced some interesting cost data on in-plant training by several major shipbuilding and construction companies. Despite assurances of strict confidentiality, firms divulged only the range in wages paid to different categories of workers. To respect the management's wish for confidentiality, those firms included in the survey will be identified only by the industry they are in.

Training costs

4.1. Data on direct training costs were provided by the administrators of VTIs, technical high schools and in-plant training centers. These costs incoude only those items direclty related to training like salaries of instructors and administrators and cost of teaching and practice materials.

Figure 2

LOCATION OF TRAINING FACILITIES UNDER KOVTMA



Source: Korea Vocational Training and Management Agency, Management of Technical Manpower through Vocational Training and Qualification Testing, p.14

Direct costs per student are estimated for the duration of the training program which is six months, one year and three years for in-plant training, VTI training and technical high school education, respectively. Direct costs incurred by each training mode together with the computation of unit training cost in terms of cost per trainee-hour, are tabulated in Annex 8.

Table 3 presents the figures for average direct training cost per trainee-hour by trade for each of the three training modes surveyed. Although outputs of the different training modes are not strictly comparable, it is still useful to obtain some idea of relative unit training costs. An examination of unit cost figures reveals a distinct pattern; VTI training appears to be more expensive than in-plant training which in turn, is more costly than technical high school education.

The disparity in direct unit training costs between different training modes is largely due to differences in the teacher-pupil ratio of the VTI and the technical high school. Generally, all public VTIs have to abide by a 1:10 teacher-pupil ratio as stipulated by the Ministry of Labor while the corresponding ratio for technical high schools run in the magnitude of approximately 1:30. It must be noted that the direct costs of in-plant training are understated since the cost of time spent by production personnel in supervising trainees during on-the-job training has not been considered in the calculation. Such costs would probably not increase total direct training outlays by more than 10%.

A different picture appears when one examines unit costs in terms of cost per student for the length of the training program. Taking electric welding as an example, direct training cost per student for this trade is highest in the case of the technical high school, followed by the VTI which in turn, is more than twice as expensive as the in-plant training center. The logical explanation for this is that a technical high school education is more than twice as long in duration than VTI training while in-plant training generally takes only six months. Annex 8 details the differences in the length of training period between the training modes. Hence, even though unit cost per trainee-hour is low for the technical high school, total cost for the whole program will be high due to its length. An important point to note is that a technical high school student receives instruction in both technical and cultural subjects. Since it is difficult to isolate the technical component from the general curriculum, the estimated cost figures reflects the average cost for general instruction in all subjects. Such a value is probably lower than the actual figure for technical instruction alone.

Table 3: Direct Cost[1]/ per Trainee-Hour by Type of Training Mode

Trade	Tech.Hi.School	In-plant Training	Voc.Trg.Inst.
Electric Welding (construction)	495.61	841.17	1128.42
Electric Welding (shipbuilding)	-	631.36	-
Gas Welding (shipbuilding)	-	1266.67	-
Turning	479.98	407.20	1081.58
Milling	-	-	1098.58
Machine fitting	470.82	-	1067.41
Pipe fitting (shipbuilding)	-	760.98	-
Pipe fitting (construction)	447.59	605.32	1089.72
Electric fitting	424.44	817.24	957.10
Electronics	472.09	-	982.10
Electronic assembly	-	555.00	-
Sheetmetal fabrication (general)	454.26	322.03	826.83
Sheetmetal fabrication (automaking)	-	704.55	-
Hot rolling	-	565.69	-

Source: Based upon Annex 7.

Notes: 1. All costs are in 1984 won. The current exchange rate is about 800 won to one U.S. dollar. Unit training cost in terms of cost per trainee-hour is calculated by dividing total direct costs by the product of the number of training hours in the program and the number of trainees in the program.

To estimate the social cost of training, both the private cost and the opportunity cost of the student during training have to be added to direct costs. Annex 9 provides both a breakdown of private costs borne by vocational high school students and an estimate of yearly opportunity cost for the same group. The corresponding figures for general high school students have been included for comparison. As borne out by the figures, technical high school education appears to be more expensive than general high school education. Estimates of both private and opportunity costs for VTI students and in-plant trainees are taken from M.S. Kang (1983) and Y.C. Kim (1983) and tabulated in Annex 8. These figures are derived from national wage scales which have been adjusted by the death rate for each age bracket under the assumption that not all students discontinuing schooling would join the labor force.

Social costs are different for the three training modes due to three main factors: (1) technical high school students incur the highest private cost among the three groups because they have to pay tuition fees; (2) outlays of the training agency would be higher when free board and lodging are provided to trainees as in the case of the VTIs, and when firms provide both housing and wage stipends to their trainees; and (3) the amount of foregone earnings is highest for technical high school students due to the length of the training period. As a result of (1) and (3), it is not surprising therefore, that the social cost of producing a technical high school graduate is considerably higher than that for producing a VTI graduate.

As an annual exercise, all firms providing in-plant training participate in a survey of training costs conducted by the Ministry of Labor. Results of this survey are used mainly to determine the size of the training levy each year. There is, therefore some reason to expect that cost figures provided by training firms would be somewhat inflated. Annex displays some average cost figures by selected trades from the results of the 1983 survey by the Ministry of Labor in comparison with corresponding figures obtained through this much smaller study. The two sets of figures represent the total training outlays of firms; it is interesting to note that they do not differ significantly despite the fact that the latter set was obtained from a much smaller sample.

Benefits from training

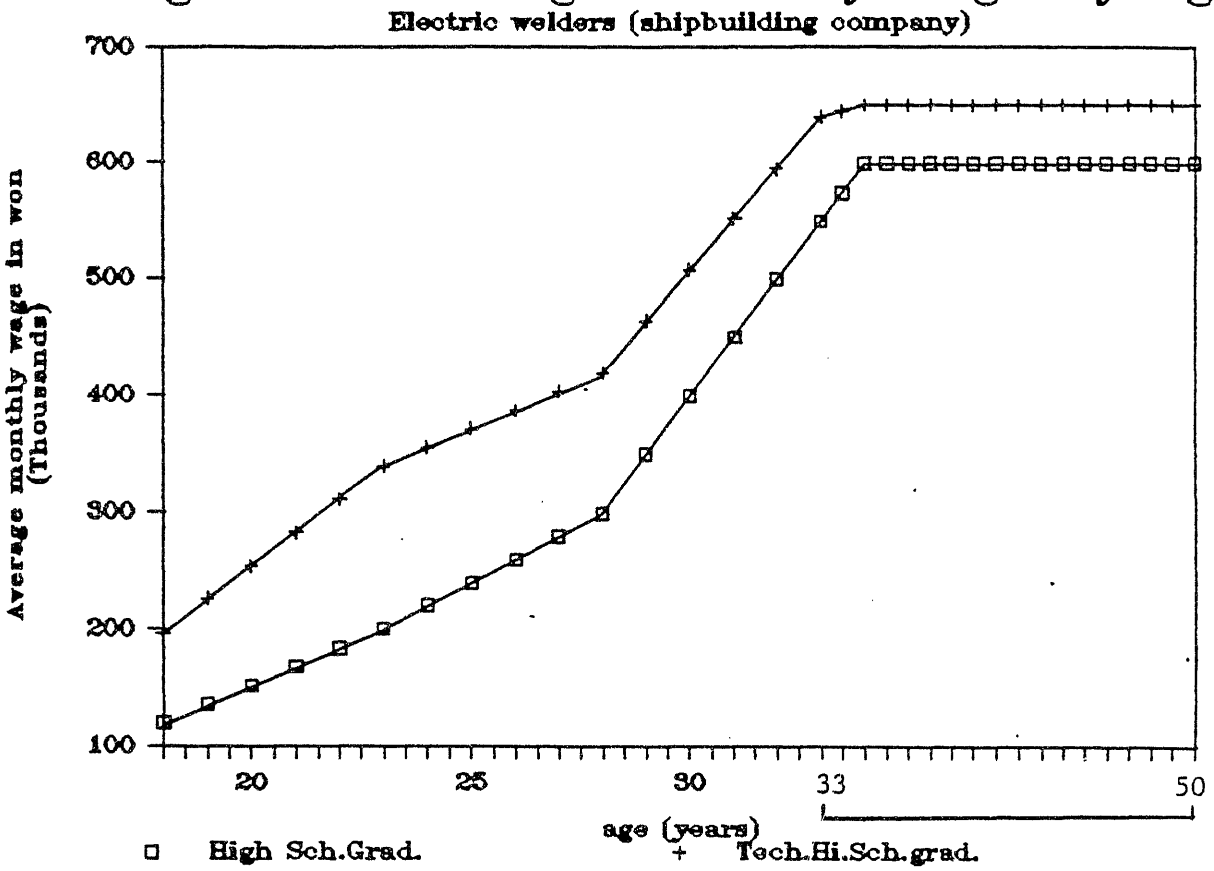
4.2. Since it was not possible in this survey to assess a worker's increase in productivity due to training in terms of direct output, benefits are assumed to be reflected by the increase in monetary compensation accruing to the worker over his active years. 6/ For reasons given in the previous section, earnings data from the survey were scanty; nevertheless, it was possible to assemble some earnings profiles using wage data provided by a shipbuilding company.

6/ The use of earnings as a measure of benefits is based on the assumption that in a perfectly competitive labor market, productivity is reflected in the wage which is the market value of the worth of the marginal worker.

The earnings profiles of two broad groups of workers in the company (welders and unskilled workers) were constructed from cross-sectional data on the wage-earnings of workers between the ages of eighteen and thirty-three. These data were abstracted from payroll information supplied by personnel managers. However, only four data points (one for each group between the ages of 15-20, 20-25, 25-30 and 30-35) were actually provided by the company; to construct the whole profile, it was necessary to assume that wages increase linearly between any two data points. Additionally, each data point is assumed to occur where the mid-point of each age-group intersects with the wage given for that group. Using this methodology, the age-earnings profiles of unskilled workers with high school certification and skilled workers trained either in-plant, or at VTIs or in technical high schools have been generated. Annex 11 details the earnings streams of these 4 groups of workers. Alternatively, such age-earnings profiles may be depicted graphically (see figures 3, 4, and 5).

Although the questionnaire for the survey included items for estimating the effectiveness of different training modes in terms of worker performance, career prospects and rate of passing skill certification tests, little data on these were collected due to reasons given previously. In-plant trainees included in the survey generally do not sit for the National Certification Tests for Class II Craftsman because they are in specialized trades like ship-outfitting (welding) which follow international skill proficiency standards. Technical high school and VTI students on the other hand, do sit for the National Certification tests. More will be said about the average passing rates for these two groups in the concluding section of this paper.

Figure 3: Average monthly wage by age

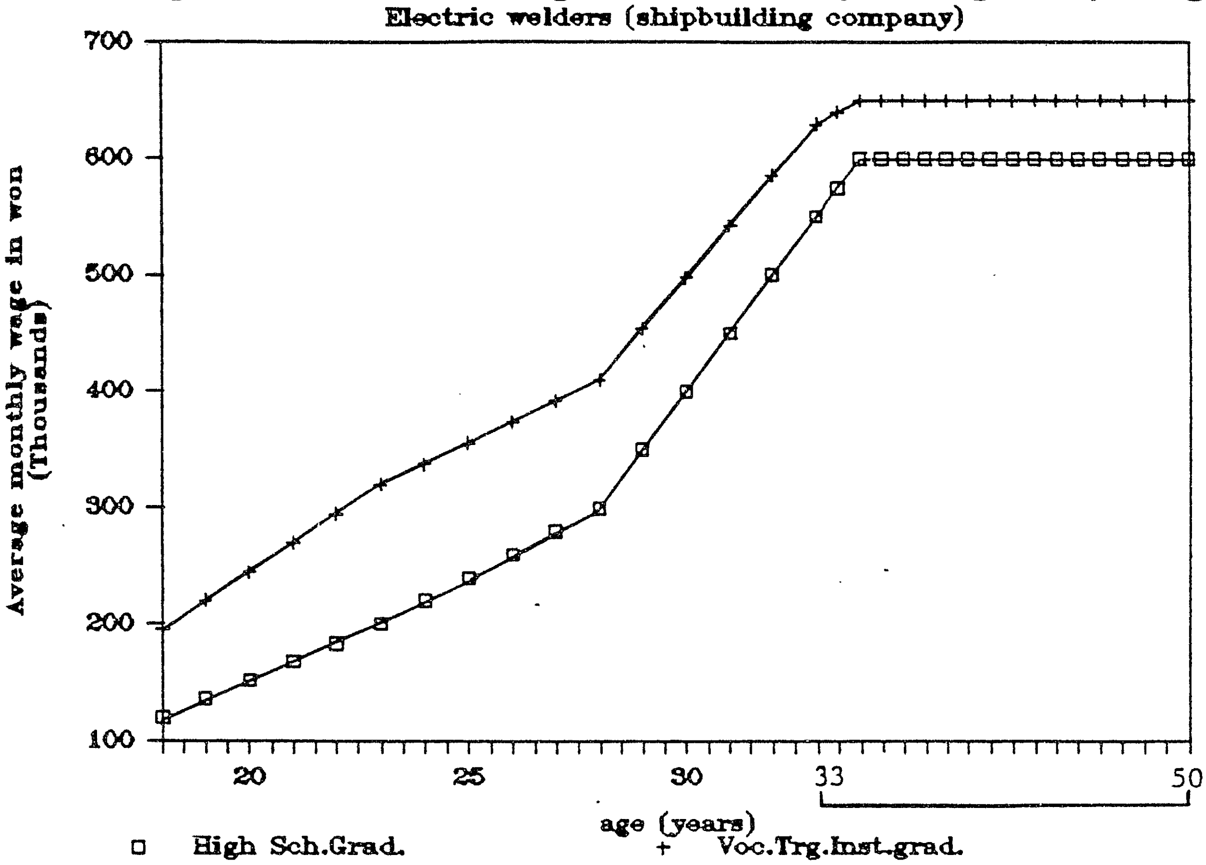


Source: Based on Annex J.

Notes: All data-points are interpolations except at ages 20, 25, 30 and 35 (see text).

Wage-earnings are assumed to peak at age 35 and remain constant thereafter till age 50.

Figure 4: Average monthly wage by age

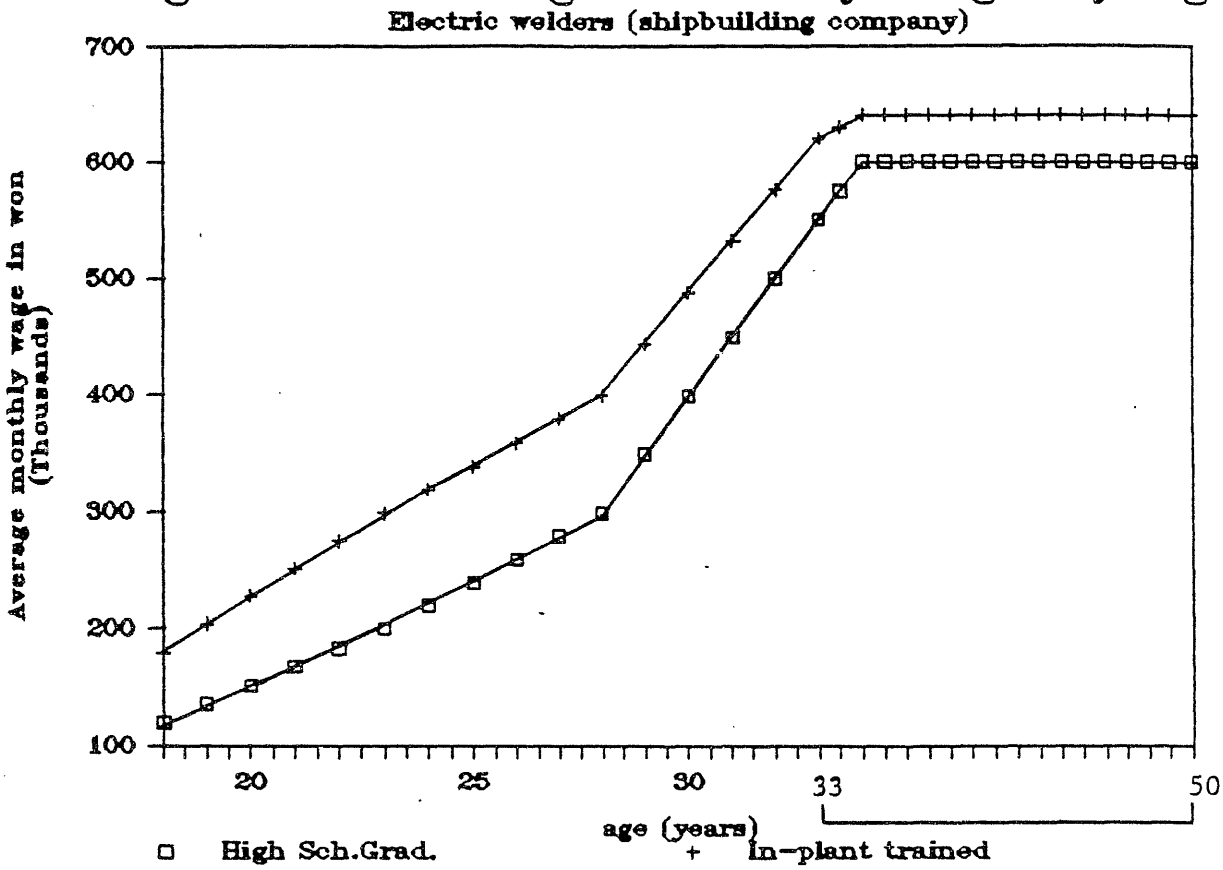


Source: Based on Annex J.

Notes: All data-points except at ages 20, 25, 30, and 35 are interpolations.

Wage-earnings are assumed to peak at age 35 and remain constant thereafter till age 50.

Figure 5: Average monthly wage by age



Source: Based on Annex J.

Notes: All data-points except at ages 20, 25, 30 and 35 are interpolations (refer to text).

Wage-earnings are assumed to peak at age 35 and remain constant thereafter till age 50.

Rate-of-return analysis

4.3. To estimate the incremental lifetime benefits accruing to welders trained through different modes, the earnings streams of these welders are compared, with the earnings stream of a control group which in this case, consists of unskilled workers in the same company who have had only general high school education. The earnings streams of all four groups are detailed in Annex 11. To derive the benefit streams, values on the earnings profile of the control group are subtracted from corresponding values on the earnings profile of each group of trained welders.

Basically, a discounting model is employed to derive the social rate-of-return to each type of training mode. The benefit streams derived as previously described, are discounted to present value and these are then equated to discounted cost streams. The discount rate which reduces net benefits to zero will be the internal rate-of-return to training. The cost and benefit streams for each training mode are displayed in pages (1), (2), and (3) of Annex 12.

Since the objective in this paper is to focus on the social rates-of-return to different modes of training, costs used in the calculation would be social costs which include all training outlays of the company as well as foregone earnings of the trainee during the training period. Attention must be drawn to the fact that the earnings streams used in the calculation are incomplete since they extend for only a period of fifteen years. This is due to the lack of data on the earnings of workers above the age of thirty-five. However, because incremental earnings after fifteen years become negligible after discounting to present value, their omission would not have a significant effect on the results of the calculation. Nevertheless, to complete the age-earnings profiles (figures 3, 4, and 5), wage-earnings are assumed to peak out age 35 and then remain constant till age 50 for all four groups of workers.

Table 4 presents the results of the present rate-of-return analysis on the training of skilled welders. The figures indicate that in-plant training yields the highest social returns followed by VTI training and then technical high school training. However, one should not make hasty conclusions about the relative profitability of different training modes just by looking at these rate-of-return figures because the outputs of these three training modes are not really comparable. In this particular company, VTI and technical high school graduates like other recruits from the general academic stream, have to go through six months of in-plant training before they are put on the job. This would imply that the shipbuilding industry demands higher skill levels in welding than what the VTIs and the technical high schools could equip their students with.

In accordance with the above situation, total training cost would be the sum of institutional and in-plant training costs. The rate-of-return calculation is therefore repeated using a new cost stream which takes into account both sets of costs. The adjusted cost and benefit streams are tabulated in pages (4) and (5) of Annex 12. The "new" rates-of-return to VTI and technical high school training are significantly lower than those derived previously; the "double-training" phenomenon in this situation points clearly to inefficient usage of resources for training and hence, merits the attention of policy makers.

Table 4: Social Rates-of-Return On Skilled Welder Training

Type of Training Mode	Social Rate-of-Return in percent (1)	(2)
In-Plant Training	28.3	n.a.
Voc. Trg. Institute	17.2	10.7
Technical High School	11.1	8.1

Source: Based on Annex 12

Notes:

(1) The outputs of each type of training mode are assumed to have acquired sufficient skill-proficiency for the job. Hence, the total cost of producing a welder would be just costs incurred during the period of institutional training.

(2) In reality, both VTI and technical high school graduates have to undergo another six months of in-plant training before they are assigned to regular welding jobs in the company. This implies that the total cost of producing a welder should include both institutional and in-plant training costs. As a result, the social rates-of-return on VTI and technical high school training are now lower than those derived under the previous situation.

V. General Conclusions on the Korean Technical Education System

As South Korea's industrial system becomes increasingly complex and the process of managing production becomes more difficult, efforts to raise the supply of skilled manpower in terms of both quality and quantity will be mandatory. This is yet another challenge to the technical education system which has to evolve in order to keep pace with changing skill requirements. The empirical study described in the previous section forms a useful launching pad for elucidating some of the ramifications of this challenge. Basically, a critical question to answer is whether resources are being effectively deployed in meeting this challenge and if not, what improvements would be possible.

A preliminary attempt to answer the above question was made by the Korean Educational Research Institute (KEDI) in 1983. A cost-effectiveness/ benefit study on vocational high school and junior technical college education was performed. The estimated rates-of-return on training through these two formalized systems are presented in Table 5 while the effectiveness index of outputs are summarized in Table 6. The findings indicate that investment in the vocational high school and the junior vocational college is beneficial to both the individual and society. Furthermore, the study shows that vocational training programs are effective in achieving non-economic outcomes like acquirement of knowledge and skills as well as job satisfaction.

Table 5: Rates-of-Return on Vocational Education

(percent)

School	Specialized Area	Social	Private
Vocational	Agricultural	14.6	17.1
High	Technical	14.9	17.8
School	Commercial	16.9	19.8
Junior	Agricultural	14.9	16.9
Vocational	Technical	14.2	16.2
College	Commercial	15.3	17.3

Source: Kang, M. (1983), p. 148.

Table 6: Effectiveness Index of Outputs in Vocational Education

(percent)

School	Specialized Area	Average	A	B	C	D
	Average	93.2	86.8	65.6	105.0	115.4
Vocational	Agri.	117.2	95.5	146.9	104.5	121.7
High	Tech.	116.0	81.5	86.0	97.0	112.8
School	Comm.	83.0	86.0	50.6	82.7	112.5
	Average	109.6	88.0	102.5	140.4	107.5
Junior	Agri.	100.4	90.5	77.5	125.4	108.2
Vocational	Tech.	111.4	97.0	99.2	145.1	104.3
College	Buss.	116.0	75.5	128.8	148.9	117.7

Note: A: Acquirement of knowledge and skills
B: Rate of passing skill certificate test
C: Rate of employment
D: Degree of job satisfaction

Source: Kang, M. (1983), p. 147.

Although the present study has much narrower focus, the results of the rate-of-return analysis are not significantly different from those of the KEDI study. Both studies are useful in raising several critical issues related to technical education. They are as follows: (1) investments in vocational education should be considered in terms of manpower policy as well as educational benefit to the individual and society; (2) a new system has to be applied to upgrade the efficiency of vocational programs and to make reasonable allocation of resources for vocational training programs; and (3) the wage policy should be improved by readjusting the wage schedules in accordance with the level of educational attainment. Only the first two issues will be discussed at length in this paper.

The first issue has both efficiency and equity implications. To ensure efficient use of scarce resources, investments have to be both socially profitable and effective in producing the appropriate skilled labor. However, investments are often justified on the grounds that they are able to benefit disadvantaged groups. Hence, although VTI training may not be as cost-effective as in-plant training (unit training cost is highest for this mode among the three surveyed), the former enjoys special support from the Ministry of Labor since it provides pre-employment training to dropouts and youths from lower socio-economic strata. Annex 13 contrasts the student-composition of VTIs with that of the technical high schools in the survey.

Evidence of the second issue is seen from results of the analysis of survey data. The present study shows that resources are being used inefficiently in the production of skilled ship welders since technical high school and VTI graduates have to be given further in-plant training before they are able to attain the required skill proficiency for the job. The returns on these two training modes for this particular trade are lower than average returns on all trades as derived through the KEDI study. Such a situation is not unique to the training of shipwelders since two other companies in the survey which provide in-plant training in the construction trade also stipulated that recruits from VTIs and technical high schools have to undergo in-plant training before they are put on the job. Obviously, this calls for a reassessment of whether VTI and technical high school training are effective means of equiping individuals with directly-employable skills.

When one examines the curricula of the technical high school, the VTI and the in-plant training center, there appears to be a certain amount of overlap. To trim wastage due to duplication of training effort, the role of each institution has to be redefined. If the role of the technical high school is primarily to prepare students for entrance into junior technical colleges (as evidenced by the current trend), skill training should be provided only at the basic level. There should not be any overlap between technical high school training and in-plant training since the latter is geared towards meeting industry and firm-specific skill needs. Likewise, any overlap between the curricula of VTIs and in-plant training centers should be minimized. Being a formalized training institution, the VTI would not be flexible enough to respond quickly to changing industrial requirements and therefore should provide only general preparatory training for individuals at job-entry level.

The overlap in training curricula of the three different modes is illustrated in section (A) of Figure 6. Assuming that employers treat graduates from the technical and general academic streams alike (in terms of training needs), the efficiency of the system as whole could be improved by minimizing the overlap7/ between the training provided by in-plant centers and that provided by the technical high school and the vocational training institute. VTIs should provide short-term intensive skill training to unemployed youths that would enable them to attain the same skill-level of technical high school graduates. Both groups would then be comparable candidates for selection by prospective employers for in-plant training. This possible scenario is illustrated in section (B) of Figure 6.

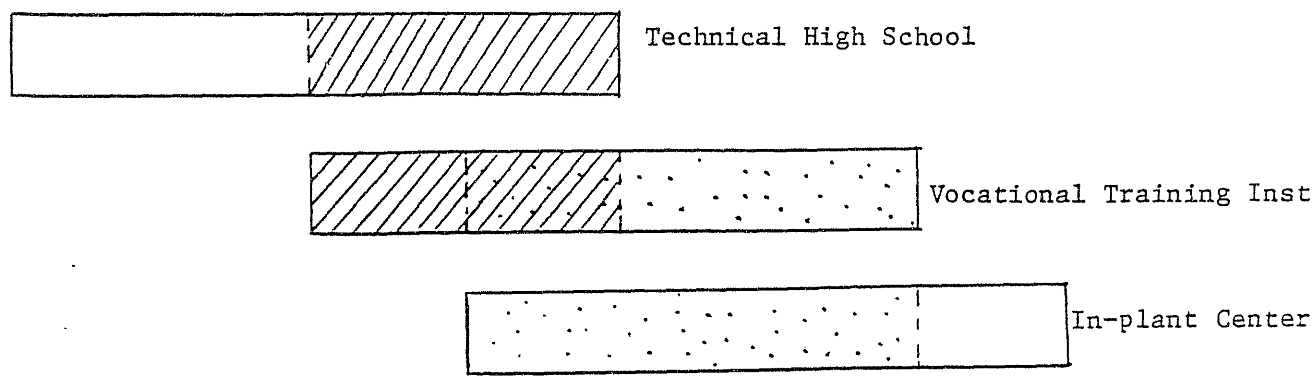
Besides looking at rate-of-return figures, the impact of each training mode on the workforce has to be considered as well when evaluating the efficiency of the technical education system. Although the VTI plays a distinct role as a public training institution for disadvantaged groups, the number of graduates each year is relatively small when compared to those from technical high schools and in-plant training centers. With reference to Table 7, less than 9% of 1982 entrants into the industrial workforce were VTI graduates. This implies that VTIs have yet to exercise a significant impact on the production of skilled industrial labor. However, as cautioned by several VTI administrators who were interviewed in the course of the survey, arbitrary expansion of the VTI system is unwise as the critical need at present is for upgrading training quality rather than training capacity.

7/ Although some overlap in training curricula may be useful in reinforcing skill-learning, the cost of in-plant training in addition to already relatively high institutional (VTI or technical high school) costs would be difficult to justify. As evidenced from the rate-of-return analysis of shipwelder-training, the addition of in-plant training costs to the general stream of training costs reduces the social rate-of-return from 17.3% to 10.9% in the case of VTI graduates (see Annex 12).

Lastly, an important point to note is that the production of skilled labor should not be uniquely a fiscal burden of the public sector; the private sector which benefits directly from training could play a bigger role. The Korean authorities are currently exploring various alternative
role. The Korean authorities are currently exploring various alternative
financing mechanisms to the existing levy system for technical training. For reasons cited previously, the levy system has not been too successfull in motivating training by private industry. Hence, a payroll tax on all private firms (similar to what exists in Brazil and Argentina) has been broached. The proceeds of such a tax would be used for promoting technical training and upgrading existing training systems.

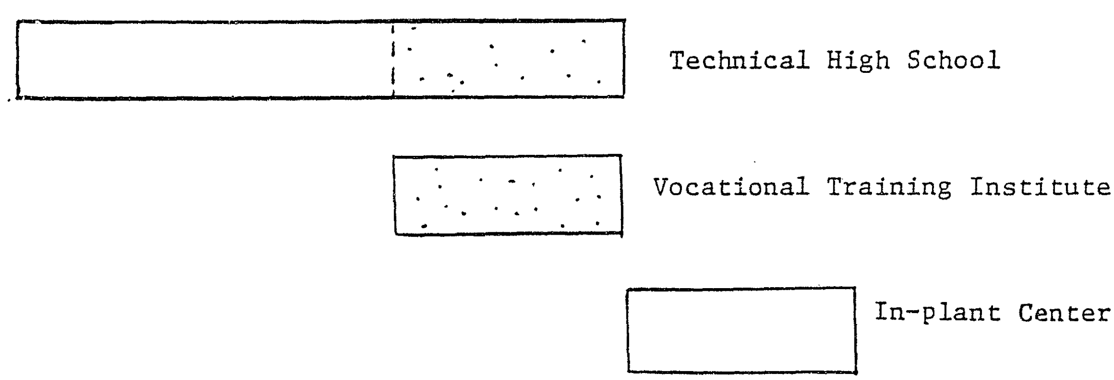
In summary, although the Korean situation may not be generalizable across all countries, important lessons on the use of resources in training can be learnt by examining the strengths and weaknesses of the Korean system. However, just improving the efficiency of the production process is not enough; an efficient technical education system has to work in tandem with a sound manpower policy based upon reliable forecasts of future industrial skill needs.

FIGURE 6: Inter-relationships between the Training Curricula of three Training Modes



A) Current situation

Note: Shaded areas represent overlap in training curricula.



B) Proposed scenario

Source: Courtesy of R.McGough, World Bank Industrial Training Specialist.

Table 7: Placement Rate of Graduates by Training Institutions

Institution	No. of Units in 1982	No. of Graduates in 1982	Placement Rate (1982 graduates
Public Vocational Training Institutes under KOVTMA	24	5,221	91.0% 1/
Technical High School (National & Public)	100	34,899	46.8% 2/
In-plant Training Center	289	30,131	100.0% 3/

Source: a/ Ministry of Education, Statistical Yearbook of Education, 1982.

b/ Ministry of Labor, Vocational Training in Korea, June 1984.

Notes: 1/ Percentage based upon mission estimates and information from KOVTMA. Although placement rate of VTI graduates in industry appears high, the number of VTI graduates who enter the industrial workforce each year is small relative to those who graduated from technical high schools and in-plant training centers. For example, in 1982, of those placed from the 3 groups upon graduation, oinly 9% comprised VTI graduates. Hence, the impact of VTI graduates on the entire industrial workforce would be very small.

2/ See Lee (1984), p. 16. The remaining 19.4% proceed on to Junior Technical College.

3/ Firms generally retain all those who have successfully completed their own in-plant training programs.

Problems of collecting data on educational expenditures

The primary sources of information on expenditure figures for technical education in a particular country are the World Bank's staff appraisal reports on vocational training projects and sector surveys on education. These figures are substantiated by annual reports on the recurrent budgets of various ministries and public agencies in LDCs.

The major problem in data collection lies in the scarcity of documentation on cost figures for technical education. Even when figures for public spending on training are given, these are probably incomplete due to several reasons. First, training expenditures are difficult to identify when they appear under different headings depending on the department. In some cases, vocational schools are run as normal administrative services, the staff being paid by the Treasury and not appearing in the budget of the Education Ministry. In other cases, appropriations for various divisions are used to fund certain educational activities although the budget may not indicate that the expense pertains to training.

Second, it is extremely difficult to make an exhaustive list of the training activities in any particular country. Training costs are often stated in budget reports in the form of an aggregated figure without elaboration of its components. Hence, it is virtually impossible to determine whether a certain cost estimate applies to the training activity of interest or not.

The mentioned problems notwithstanding, cost figures obtained from the survey (presented in Annex 3) are useful in elucidating how educational expenditures in LDCs are distributed across various sub-sectors. Of importance is not only how public spending on technical education compares with that on general secondary education, but also how resources are disbributed between formalized technical education and other vocational training schemes.

System of Vocational/Technical Training

South Korea

1. An extensive system of public vocational/technical high schools and junior vocational colleges under the jurisdiction of the Korean Ministry of Education.

2. Vocational training institutes for skilled worker training under the Ministry of Labor Affairs. These provide intensive training for school-leavers or graduates entering industry.

3. Private vocational/technical high schools.

4. In-plant training programs at basic, intermediate and advanced levels conducted by large firms with more than 300 employees.

The Philippines

1. 129 National Schools of Arts and Trades under the Ministry of Education and Culture. These conduct four-year trade technical secondary courses. The MEC also offers short vocational courses for out-of-school youth.

2. Private vocational schools.

3. Ten Regional Manpower Training Centers and fourteen Regional Manpower Development Offices which focus on the needs of out-of-school youth. These are run by the National Manpower and Youth Council.

4. Apprenticeship System under the Ministry of Labor Affairs and Employment.

5. Limited in-plant training by private employers. Industry Boards were organized under the NMYC and managed by the Industrial Manpower Development Division to encourage employer-participation in the planning and organization of industrial training.

Morocco

1. Upper secondary-level public technical education baccalaureat program and technical teacher-training and engineering studies at the post secondary level under the Ministry of Education.

2. Two higher agricultural education institutions under the Ministry of Agriculture.

3. Training programs run by the Office of Training and Employment Promotion (the Office). The Office is a public entity with financial autonomy under the auspices of the Ministry of Planning. It was created principally to train the necessary manpower, adapt training to the specific needs of the labor market, and promote the social advancement of workers.

Brazil

1. National Service for Industrial Apprenticeship (SENAI) under the National Confederation of Industry.

2. National Service for Commercial Apprenticeship (SENAI) under the National Confederation of Commerce.

3. Intensive Program for Manpower Training (PIPMO) which is a dependency of the Ministry of Education and Culture.

4. National Manpower Department (DNMO) under the Ministry of Labor and Social Security. In 1974 PIPMO absorbed the activities of DNMO and was itself taken over by the Ministry of Labor's Secretariat of Manpower.

5. Private training programs operated by employees.

Mexico

1. Upper secondary terminal technical training under the Colegio Nacional de Educacion Profesional y Technica (CONALEP).*

2. Higher-level technical training at the National Polytechnic Institute (IPN) and the Monterrey Institute of Technology.

3. Two minor programs to prepare technical instructors (ENAMACTI and ENAMACTA).

* The CONALEP program is designed to train skilled workers and lower-level technicians through terminal programs at the upper secondary level in close cooperation with the productive sector and in a variety of agricultural, industrial and service training programs.

Ecuador

1. Vocational-technical training at the upper secondary level under the Ministry of Education.

2. Entry-level training under institutionalized training programs under the Ministry of Labor and large public sector corporations.

3. Flexible terminal programs for semi-skilled and skilled workers operated by the Servicio Ecuatoriano de Capacitacion Professional (SECAP). In 1980 SECAP's training programs were carried out in six centers with three types of training programs - regular full-time programs for youths of 14-18 years of age, adult programs for new trainees of more than 18 years of age, and upgrading programs for employed workers.

Malaysia

1. Polytechnics and vocational schools at the secondary level run by the Ministry of Education.

2. Industrial Training Institutes under the supervision of the Ministry of Labor and Manpower. Courses include those for the National Apprentice Scheme, skill-upgrading for employed workers and Preparatory trade courses for out-of-school youth.

3. Skill training centers operated by MARA (Council of Trust for the Indigenous People). These provide trade training for youths.

4. Youth training centers run by the Ministry of Culture, Youth and Sports that offer disciplinary trade-training for out-of-school youths.

Thailand

1. The Department of Vocational Education (DOVE) of the Ministry of Education operate vocational schools, polytechnics and Area Vocational Centers.

2. The Institute for Technology and Vocational Education (ITVE) created within the Ministry of Education in 1975 is responsible for all diploma-level training and also grants degrees in technical subjects.

3. The National Institute for Skills Development (NISD) under the Department of Labor, Ministry of the Interior is responsible for vocational training centers.

4. The Department of Commercial Development, Ministry of the Interior runs various training programs.

5. Private secondary vocational education schools such as the Thai-German Technical School.

Argentina

1. The National Council for Technical Education (CONET) is the main agency responsible for the administering of public technical education programs (ENETS - national schools for technical education), as well as vocational training at the national level. CONET runs vocational training centers in occupations that corresponds to the manufacturing, utilities and construction sectors. In addition, private vocational schools train people mostly in the services sectors.

Colombia

1. Under a national apprentice program (SENA), a vast system of trades training has developed, based largely in SENA institutes or training centers. Employers participate through in-plant supervision of trainees. With the exception of some technical assistance there is no corresponding support by government of in-plant training by companies.

Public Expenditures for Selected Educational Sub-Sectors

Country		Year of Data	Currency	Total Recurrent Public Expenditure on Education		Public Expenditure by Type of Education: General Secondary		Technical Education in Schools		Expenditure on Vocational Training Schemes: Directly Financed by Government		Financed by Special Purposes Taxes		
South Korea	1/	1982	Won	1,793.9	b	433.5	b	74.6	b	3.9	b	4.5	b	a/
Philippines	2/	1980	Pesos	4,540	m	631.6	m	256.1	m	657.4	m	9.2	m	b/
Morocco	3/	1981	Dirhams	4,574	m	1,806	m	1,206	m	537.9	m	62.1	m	c/
Brazil	4/	1974	Cruzeiro	25.194	b	15.797	b	73.435	m	-		808	m	d/
Ecuador	5/	1980	Sucres	14.649	b	2.710	m	512.8	m	54.0	m	55.0	m	e/
Mexico	6/	1980	Pesos	114.913	b	21.604	b	5.516	b	1.171	b	1.500	b	f/
Argentina	7/	1978	Peso Argen	3.961	b	1,077.4	b	257.5	b	31.6	b	515,188.0	b	g/
Malaysia	8/	1980	Ringgit	2,575.5	m	875.67	m	28.33	m	42.46	m	-		
Thailand	9/	1980	Baht	15,867	b	2,574	b	920.3	m	30.4	m	-		
Colombia	10/	1978	US$	390.99	m	81.72	m	19.16	m	10.64	m	50.86	m	h/

Sources:

1/ (i) Vocational Training in Korea, Ministry of Labor, June 1984
(ii) World Bank, 1982b.
(iii) Statistical Yearbook of Education, Korean Minisitry of Education, 1982.

2/ (i) World Bank, 1982d.

3/ (i) World Bank, 1983a.
(ii) World Bank, 1983b.

4/ (i) World Bank, 1974.
(ii) O. Corvalan (1978), p. 69.

5/ (i) World Bank, 1982a.
(ii) O. Corvalan (1978), p. 69.

6/ (i) World Bank, 1981.
(ii) O. Corvalan (1978), p. 69.

7/ (i) World Bank, 1980a.
(ii) O. Corvalan (1978), p. 69.

8/ (i) World Bank, 1982c.
(ii) The Fourth Malaysia Plan, Government of Malaysia, 1981.

9/ (i) World Bank, 1984.
(ii) Education Sector Survey, Thai Government and UNESCO, 1983.

10/ (i) World Bank, 1980b.
(ii) O. Corvalan (1978), p. 69.
(iii) Statistical Yearbook (1980), UNESCO.

Notes:

a/ Figure represents the amount of training levy on firms for 1981. Training contribution rates are fixed by the government each year.
b/ This amounts to 25% of vocational training costs that are financed through a tax rebate scheme for private firms which participate in training.
c/ A 1% training levy on gross wages paid by private enterprises is imposed annually to raise revenues for vocational/technical training.
d/ SENAI and SENAC are funded by revenues raised through 1% payroll tax on all industrial and commercial firms.
e/ This is raised through a 0.5% wage levy on business and industry.
f/ This amount represents total contributions from private industry.
g/ Sourced from a 1% tax on the wage bill of private firms.
h/ Sourced from a 5% tax on all government agencies and a 2% payroll tax on all private employers.

Sources of Finance for Technical Education in Ten LDCs

In South Korea, public technical education is financed by revenues budgeted under the Ministry of Education and the Ministry of Labor. In 1976 the government instituted a new Basic Law for Vocational Training and established a Vocational Training Promotion Fund consisting of proceeds from a levy on firms and direct public grants. The levy on firms is determined every year by the Ministry of Labor. Firms with more than 300 employees can apply for a reduction in the levy if their training programs (in-plant or sponsored training at public institutions) are approved by the Ministry of Labor.

In the Philippines, resources for public technical education and non-formal vocational training are appropriated from budgeted revenues of the Ministry of Education and Culture, the National Manpower and Youth Council, and the Bureau of Labor Employment. To provide incentives for employer-participation in training, a tax rebate scheme was introduced in 1978 permitting the deduction of one-half of training costs from taxable income. However, as more than 75% of training costs are borne by employers, this incentive is too small to be effective.

Technical education in Morocco is financed by funds from the budget of the Ministry of Education. The higher agricultural education institutions are semi-autonomous and they receive a subsidy from the government budget. Training programs run by the Ministry of Youth and Sports are funded by resources channeled through that Ministry by the government. Training programs of the Office are financed through a 1% levy on gross wages paid by all private enterprises.

In Brazil, SENAI and SENAC are financially autonomous agencies funded by a 1% tax on the payrolls of all industrial and commercial firms. Recently, the government has imposed a measure of control over these two agencies; annual operating budgets of SENAI and SENAC now have to be approved by public authorities prior to execution. Employers with fewer than 500 employees are subject to a 1% payroll tax whereas larger enterprises contribute at the higher level of 1.2% of payroll. Since 1976 employers have been granted tax concessions for training expenditures under approved training projects.

The National Vocational Training Service (SENA) is the main source of vocational and technical training in Colombia. Somewhat similar to SENAI, SENA is a semi-autonomous institution operated by a Board consisting of representatives of the government, employers and workers under the auspices of the Ministry of Labor and Social Welfare. It is funded by an earmarked tax of 2% on the payrolls of private and decentralized, semi-autonomous public enterprises and 0.5% on Central, State and local government agencies. In addition, transfers of government funds and external aid contributions are provided to cover a portion of SENA's expenditures in the traditional sector.

CONALEP in Mexico is a decentralized, semi-autonomous public agency that is largely funded by the Federal Government. However, it can receive donations from industry; from December 1979 to January 1981, total contributions and contracts with state governments and various industries amounted to Mex$1,500 million. CONALEP's students are also required to pay tuition fees and to commit themselves to a deferred payment plan upon graduation and employment.

In Ecuador, about one-half of SECAP's total budget in 1980 came from a wage levy (0.5%) on the business and industrial sectors, with the remainder provided through government appropriations in conformity with the law specifying SECAP's sources of finance. Fiscal problems led the government to reduce its contribution and to require SECAP to revise its budgeted recurrent expenditure downwards. As a result, the government's contribution was limited to about 20% of SECAP's total budget in 1980.

In Malaysia, both vocational secondary schools and industrial training institutes are financed by public general revenues. Although the idea of implementing a tax-incentive scheme for training has been broached, no special-purpose tax exists to generate revenues for training. Vocational/technical training in Malaysia is still very much a burden of state and federal governments; participation by the private sector in training has been and still is very limited.

As in Malaysia, training programs in Thailand are run and financed by different public agencies with minimal participation and aid from private firms. There are however, various non-profit organizations which conduct their own non-formal training programs. Vocational schools, polytechnics and Area Vocational Centers are all funded by the Ministry of Education. The National Institute for Skills Development is a fiscal responsibility of the Department of Labor in the Ministry of the Interior.

In Argentina, CONET's main source of financing comes from general tax revenue accruing to the national government. In 1978, about 86% of its expenditure were funded through appropriates from the national budget. The remainder was covered by the proceeds from a technical education payroll tax collected from private firms that benefit from CONET's skill formation activities. This tax amounts to 1% of a firm's wage bill, but it can be lowered to a minimum of 0.2% on the basis of CONET's certification that the partially exempted firms have developed their own training facilities or are participating in cooperative training activities developed by CONET.

Status of Technical High Schools and Junior Technical Colleges

(a) Technical High Schools (1982 data)

Number of schools	100
Number of students	70,379
Number of graduates	62,645
Number of employed	29,318
Employment ratio	46.8%

Source: Ministry of Education, Educational Statistics Yearbook, 1982.

Career Patterns of Technical High School Graduates

Year	1979	1980	1981	1982	1983
Employment (%)	71.5	45.2	47.5	46.8	47.5
Continuing Schooling (%)	15.5	19.8	22.7	19.4	20.5

Source: J. K. Lee (1984), p. 16

(B) Status of Junior Technical Colleges

Year	Number of schools	Number of students	Number of graduates	Number of employed	Employment ratio (%)
1980	41	84,240	27,896	7,352	26.4
1981	38	72,856	30,792	7,072	23.0
1982	37	85,152	30,698	7,377	24.0
1983	34	78,389	34,244	10,739	31.4

Source: J. K. Lee (1984), p. 16.

ANNEX 6

Status of Public Vocational Training Institutes and In-plant Training Centers

Year 1/	Organization	No. of Training Organization	No. of Training Fields	No. of Trainees
1977	2/ KOVTMA	NA	NA	5,539
	3/ In-plant	558	151	58,739
1978	KOVTMA	NA	NA	10,041
	In-plant	553	157	73,038
1979	KOVTMA	NA	NA	12,817
	In-plant	575	156	90,992
1980	KOVTMA	24	NA	15,007
	In-plant	472	116	66,213
1981	KOVTMA	24	NA	13,013
	In-plant	388	140	48,406
1982	KOVTMA	24	66	15,663
	In-plant	289	104	30,131
1983	KOVTMA	25	60	12,377
	In-plant	183	82	20,960

Source: a/ Vocational Training Research Institute, An Analytic Study of Vocational Training & Technical Certification System, 1982.

b/ Ministry of Labor, Vocational Training in Korea, June 1984.

Notes: 1/ The period of the Fourth Korean Plan is from 1977 to 1981 while the Fifth Plan covers the years from 1982 to 1986.

2/ KOVTMA stands for the Korean Vocational Training Management Agency. Only those public vocational training institutes directly under the auspices of KOVTMA are considered here.

3/ The Basic Law of Vocational Training enacted in 1976 made it mandatory for industrial firms with more than 300 employees to provide in-plant vocational training. In-plant training programs are usually offered by the employer within his firm, with other employers jointly or by an organization of employers, collectively.

SKILL TRAINING SURVEY
Firm Questionnaire

Date: Month ________________ Year ______________

Name of Firm: ____

1. Location: City: ____________________

2. Name of workers employed by the firm:

   In the World ________ In this Country ________ In this Plant ________

3. What kinds of products do you produce?

   ____

4. Type of firm: Public Firm /_/ Parastatal /_/

   Private Firm, Foreign Capital /_/ Private Firm Local Capital /_/ Private Firm, Foreign and Local Capital /_/

5. What are the main trades and number of skilled workers in this plant?

Type of Skilled Workers	Number in this plant: Class II Craftsman	Assistant Craftsman
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8. Miscellaneous		

6. What are the main modes of training by which skilled workers in your firm are trained? Please check (v) the modes that are used.

MODE OF TRAINING	WITHIN THE FIRM	OUTSIDE THE FIRM
1. On-the-Job Training		
2. Class-Size Training		
3. Cooperative Training		
4. Short Term (1 to 5 Working Days) Workshops and Seminars		
5. Long-Term Training (In-Country, Out-of-Plant)		
6. Long-Term Training (Out-of-Country)		

7. How much training has been undertaken last year <u>within the premise of your firm</u>? What has been the cost?

Skill for which training has been organized in this firm	Number of trainee hours last year	Number of teacher hours engaged	Cost per teacher hour	Total material cost last year
Miscellaneous				

8. Do trainees receive wages during their period of training? Do they also receive additional stipends to cover expenses?

Skills for Which Training Has Been Organized In This Firm	Number of Trainees Last Year	Average Duration Of Training In Calender Time	Average Monthly Wage During Training	Average Stipend Paid Per Trainee Per Month
Miscellaneous				

9. Please give the following information regarding administrative staff involved in organizing in-plant training last year.

Number of Administrative Staff Engaged in Organizing In-Plant Training	Average Monthly Salary Per Administrative Staff 1/

1/ Include monthly value of bonuses and overtime pay.

10. What are the average monthly earnings of workers with the following characteristics?

	Age in Years			
Education	15-20	20-25	25-30	30-35
Less than Primary				
Primary School Graduate				
Middle School Graduate				
General High School Graduate				
Vocational/Technical High School Graduate				
Vocational Training Institute Graduate				
Skilled Workers				

Skill Training Survey
Skilled Worker Questionnaire

1. Name of firm: ____________________

2. Type of skilled workers: ____________

3. How many of your skilled workers in this trade have the following background in terms of formal education and training?

Initial Education	Route taken to become a skilled worker: No Organized Training 1/	Route taken to become a skilled worker: In-Plant Training	Total
Less Than Primary			
Primary School Graduate			
Middle School Graduate			
General High School Graduate			
Vocational/Technical High School Graduate			
Vocational Training Institute Graduate			
Total			

4. Please compare skilled workers in this trade trained by various modes in terms of current work performance, and prospects for career advancement.

1/ That is, by experience only.

Scale	Code
Much Worse	1
Slightly Worse	2
More or less the same	3
Slightly better	4
Much better	5

4.1 With reference to those trained in a vocational/technical high school, how do you rate those trained via organized in-plant training: Please circle the appropriate number.

Initial Formal Education	Current Work Performance					Career Prospects				
Less Than Primary	1	2	3	4	5	1	2	3	4	5
Primary School Graduate	1	2	3	4	5	1	2	3	4	5
Middle School Graduate	1	2	3	4	5	1	2	3	4	5
General High School Graduate	1	2	3	4	5	1	2	3	4	5

4.2 With reference to those trained in a vocational/technical high school, how do you rate those trained in a vocational training institute.

Initial Formal Education	Current Work Performance					Career Prospects				
Less Than Primary	1	2	3	4	5	1	2	3	4	5
Primary School Graduate	1	2	3	4	5	1	2	3	4	5
Middle School Graduate	1	2	3	4	5	1	2	3	4	5
General High School Graduate	1	2	3	4	5	1	2	3	4	5

5. Given the following initial educational backgrounds, how many hours of course work (theory and practice) are needed to turn out skilled workers in this trade?

Initial Education	Working Experience With	Working Experience Without
Less Than Primary		
Primary School Graduate		
Middle School Graduate		
General High School Graduate		
Vocational/Technical High School		
Vocational Training Institute Graduate		

6. Given the following initial educational backgrounds, what were the passing rates last year of workers in your firm who sat for the National Technical Qualification tests for certification as Class II Craftsman and Assistant Craftsman?

Initial Education	Written Skill Test (% Passed)		Practical Skill Test (% Passed)	
	Class II Craftsman	Assistant Craftsman	Class II Craftsman	Assistant Craftsman
Less Than Primary				
Primary School Graduate				
Middle School Graduate				
General High School Graduate				
Vocational/Technical High School Graduate				
Vocational Training Institute Graduate				

7. What are the average total monthly earnings in won of skilled workers in this trade when they have the following characteristics?

	Age		
Education	15 - 20	20 - 25	25 - 30
Less Than Primary			
Primary School Graduate			
Middle School Graduate			
General High School Graduate			
Vocational/Technical High School Graduate			
Vocational Training Institute Graduate			

Skill Training Survey

Questionnaire for Vocational/Technical High School or Vocational Training Institute

Date: Month ______________ Year ______________

Name of School/Vocational Training Institute ______________________

1. What kind of institution is this? Vocational Training Institute ____
   Vocational/Technical High School ____

2. Geographic Location: City ______________

3.

Trade (Programs)	Enrollment Freshmen	Junior	Senior	Total
Turning				
Machine fitting				
Welding				
Plumbing				
Electric fitting				
Others				
Total				

4. What is the number of students 1/ in the 5 main skill programs with the following initial educational backgrounds?

Initial	Training Program In: 1. Turning	2. Machine fitting	3. Welding	4. Electric fitting	5. Plumbing
Middle School Graduate					
General High School Graduate					
Total					

1/ Exclude those enrolled in night courses.

5. How many hours of course work (theory and practice) do students take to complete training in the 5 main skill programs? Does the length of training vary according to their initial educational background?

Initial Education	Training Program In: 1. Turning	2. Machine fitting	3. Welding	4. Electric fitting	5. Plumbing
Middle School Graduate					
General High School Graduate					

6. Last year, how many contact hours of coursework (theory and practice) did teachers provide in total for the skill programs listed in Question 5 and for all skill programs?

Training Program In	Last Year: No. of Contact Hours Provided by Teachers
1. Turning	
2. Machine fitting	
3. Welding	
4. Plumbing	
5. Electric fitting	
Total for all the above programs	
Total for all courses in the school	

7. Last year, what was the expenditure in this institution in the following categories?

Category	Number Of Staff	Total Annual Cost in Local Currency
Teaching: Permanent Staff		
Teaching: Temporary Staff		
Administrative Staff		
Material and Other Consumables		

SUMMARY OF TRAINING COST DATA OBTAINED THROUGH SURVEY OF THREE TRAINING MODES

Trade	Location of Training Center	Length of training (hours)	Number of trainees in 1983	Private cost during training (won) (1)	Opportunity Cost of Trainee during program (won) (2)	Direct cost per Trainee in program (won) (3)	Direct Cost per trainee-hour of program (won)	Ave. Direct Cost per trainee-hour for trade (won)	Social Cost per Trainee in program (won) (4)
Electric welding (construction)	Changwon	1,180	200	-	219,576	980,000	830.51		1,619,576
"	Anyang	1,080	100	-	219,576	833,500	771.76		1,413,076
"	Seoul	900	590	-	219,576	880,000	977.78		1,219,576
"	Inchon	1,080	116	-	219,576	847,403	784.63	841.17	1,366,979
" (shipbuilding)	Pusan	1,100	105	-	219,576	685,000	622.73		1,324.576
"	Masan	1,000	40	-	219,576	640,000	640.00	631.36	1,099,576
" (automaking)	Ulsan	1,056	55	-	219,576	972,000	920.45	1318.18	1,611,576
Electric welding (VTI)	Changwon VTI	2,016	80	-	274,289	2,433,695	1207.19		2,957,984
"	Chung-Soo VTI	1,800	45	-	274,289	1,999,289	1110.72		2,573,578
"	Pusan VTI	2,000	90	-	274,289	2,424,289	1212.14		2,948,578
"	Ulsan VTI	1,892	65	-	274,289	1,861,015	983.62	1128.42	2,385,304
Electric welding (M.Tech.Hi.Sch.)	Changwon M.T.Hi.Sch.	5,244	120	533,766	673,162	2,494,226	475.63		3,901,154
"	Seoul Mech. High School	6,465	173	665,931	673,162	3,296,327	509.87		4,635,420
"	Pusan Mech. High School	5,244	270	609,009	673,162	2,629,006	501.34	495.61	4,161,177
Gas welding (shipbuilding)	Changwon	1,200	711	-	219,576	1,520,000	1266.67	1266.67	2,219,576
Pipe-fitting (shipbuilding)	Changwon	1,200	164	-	219,576	910,000	758.33		1,609,576
"	Puson	1,100	50	-	219,576	840,000	763.64	760.98	1,299,576

Trade	Location of Training Center	Length of training (hours)	Number of trainees in 1983	Private cost during training (won) (1)	Opportunity Cost of Trainee during program (won) (2)	Direct cost per Trainee in program (won) (3)	Direct Cost per trainee-hour of program (won)	Ave. Direct Cost per trainee-hour for trade (won)	Social Cost per Trainee in program (won) (4)
Pipe fitting (construction)	Anyang	1,080	100	-	219,576	683,500	632.87		1,263,076
"	Seoul	900	345	-	219,576	520,000	577.78	605.32	859,576
Pipe fitting (VTI)	Chung-Soo VTI	1,800	30	-	274,289	2,261,503	1256.39	1256.39	2,835,792
Pipe-fitting (M.Tech.Hi.Sch.)	Pusan Mech. High School	5,244	270	609,009	673,162	2,382,146	454.26		3,914,317
"	Seoul Mech. High School	6,465	173	665,931	673,162	2,957,228	457.42		4,296,321
"	Changwon M.T.Hi.Sch.	5,244	120	533,766	673,162	2,260,566	431.08	447.59	3,667,494
Electric fitting	Inchon	1,080	108	-	219,576	582,620	539.46	817.24	1,103,196
" (VTI)	Chung-Soo VTI	1,800	30	-	274,289	1,767,787	982.10		2,342,076
"	Pusan VTI	2,000	90	-	274,289	1,864,289	932.14	957.12	2,438,578
Electric fitting (M.Tech.Hi.Sch.)	Seoul Mech. T.Hi.Sch.	6,465	170	665,931	673,162	2,804,623	433.82		4,143,716
"	Pusan M.T.Hi.Sch.	5,244	90	609,009	673,162	2,258,674	430.72		3,790,845
"	Changwon M.T.Hi.Sch.	5,244	120	533,766	673,162	2,143,752	408.80	424.44	3,550,680
Turning (VTI)	Changwon VTI	2,016	90	-	274,289	2,197,762	1090.16		2,722,051
"	Ulsan VTI	1,892	93	-	274,289	1,861,021	983.63		2,385,310
"	Chung-Soo VTI	1,800	30	-	274,289	2,063,473	1146.37		2,637,762
"	Pusan VII	2,000	90	-	274,289	2,212,289	1106.14	1081.58	2,786,578

Trade	Location of Training Center	Length of training (hours)	Number of trainees in 1983	Private cost during training (won) (1)	Opportunity Cost of Trainee during program (won) (2)	Direct cost per Trainee in program (won) (3)	Direct Cost per trainee-hour of program (won)	Ave. Direct Cost per trainee-hour for trade (won)	Social Cost per Trainee in program (won) (4)
Turning (automaking)	Ulsan	1,056	50	-	219,576	430,000	407.20	407.20	1,069,576
Turning (M.Tech.Hi.Sch.)	Pusan Mech. High School	5,244	900	609,009	673,162	2,505,562	477.80		4,037,733
"	Changwon M.T.Hi.Sch.	5,244	120	533,766	673,162	2,365,692	451.12	479.98	3,772,620
Sheetmetal Fab. (construction)	Changwon	1,180	236	-	219,576	380,000	322.03	322.03	1,019,576
Sheetmetal Fab. (automaking)	Ulsan Motor Co.	1,056	50	-	219,576	744,000	704.55	704.55	1,383,576
Sheetmetal Fab. VTI	Changwon VTI	2,016	40	-	274,289	1,666,889	826.83	826.83	2,191,178
Sheetmetal Fab. (M.Tech.Hi.Sch.)	Pusan Mech. High School	5,244	180	609,009	673,162	2,382,146	454.26	454.26	3,914,317
Hot rolling	Pusan	1,096	35	-	219,576	620,000	565.69	565.69	1,019,576
Electronics Assembly	Masan F.T. Zone Trg.C.	1,000	113	-	219,576	555,000	555.00	555.00	894,576
Machine Fitting (VTI)	Chung-Soo VTI	1,800	30	-	274,289	1,961,503	1089.72		2,535,792
"	Pusan VTI	2,000	90	-	274,289	2,212,289	1106.14		2,786,578
"	Ulsan VTI	1,892	93	-	274,289	1,861,021	983.63		2,385,310
"	Changwon	2,016	60	-	274,289	2,197,762	1090.16	1067.41	2,722,251
Machine Fitting (M.Tech.Hi.Sch.)	Pusan Mech. High School	5,244	900	609,009	673,162	2,505,562	477.80		4,037,733
"	Changwon	5,244	480	533,766	673,162	2,365,092	451.01		3,772,020
"	Seoul M.Sch.	6,465	213	665,931	673,162	3,126,789	483.65	470.82	4,465,882

Trade	Location of Training Center	Length of training (hours)	Number of trainees in 1983	Private cost during training (won) (1)	Opportunity Cost of Trainee during program (won) (2)	Direct cost per Trainee in program (won) (3)	Direct Cost per trainee-hour of program (won)	Ave. Direct Cost per trainee-hour for trade (won)	Social Cost per Trainee in program (won) (4)
Electronics (VTI)	Chung-Soo VTI	1,800	30	-	274,289	1,767,787	982.10	982.10	2,342,076
Electronics (M.Tech.Hi.Sch.)	Seoul Mech. T.Hi.School	6,465	178	665,931	673,162	2,957,228	457.42	472.09	4,296,321
Milling (VTI)	Ulsan VTI	1,892	90	-	274,289	2,063,473	1090.63		2,587,762
"	Pusan VTI	2,000	90	-	274,289	2,212,289	1106.14	1098.39	2,786,578

Source: (a) M.S. Kang (1983) and Y. Kim (1983).
(b) Data from mission questionnaire.

Notes: (1) Private cost is borne by the student/trainee and includes items like tuition fees, textbooks, supplies, uniforms, etc. VTI students, unlike Technical High School students, are not yet charged any tuition fees.

(2) Opportunity cost represents a student's foregone earnings during training. The figures used in the above table for opportunity cost are taken from Y. Kim (1983). He calculated the social opportunity cost of education by school level using the Korean 1981 wage scale as baseline data.

(3) The direct cost of training is normally borne by the agency (public or private) responsible for the program. Direct cost includes only those items directly related to training, e.g. wages of instructors, administrators, training materials expense.

(4) The social cost of training is the sum of (1), (2), (3) plus other expenses tied to training like stipends paid to trainees, housing and board subsidies and transport allowances.

Private and Opportunity Costs of General High School and Vocational High School Education

School Level (Only National and Public Schools included)	Private Educational Expenditure per Student per year (1) (won)	Yearly Opportunity Cost per Student (won)	Public Educational Expenditure per Student per year (2) (won)	Social Cost* per Student per year (won)	Social Cost per Student-Hour** (won)
General High School (Average for all schools)	185,996	233,092	213,510	632,598	343.80
Vocational High School (Average for all schools)	177,922	233,092	412,180	823,194	447.39

Source: M.S. Kang (1983) and Y.C. Kim (1983).

Notes:

(1) Private educational expenditure per student consists of the cost items below:

Cost Item	General High School	Voc. High School
Textbooks	10,013	9,604
Instructional matls.	48,937	28,013
Supplies	15,361	18,263
Extracurricular	14,656	15,480
Uniforms	45,996	27,251
Group Activities	28,993	21,851
Transport	22,040	28,730
Total Private Cost	185,996	177,922

(2) Only direct outlays on training are included. The main cost items are as follows: (i) remuneration of all instructors as well as the administrative staff for training; (ii) the cost of all materials for instruction and practice; (iii) replacement cost of disposable tools used in training.

* Social Cost = Public Cost + Private Cost + Opportunity Cost

** This is an unit cost obtained by dividing the total social cost of training a student by the total number of training hours.

COMPARISON OF AVERAGE IN-PLANT TRAINING COSTS OBTAINED FROM TWO SURVEYS

TRADE TRAINING PROGRAM	AVERAGE IN-PLANT TRAINING COST PER TRAINEE BY TRADE (IN WON)*	
	MOLA 1984 SURVEY (1)	IBRD 1984 SURVEY (2)
Gas welding (shipbuilding industry)	1,882,580	2,000,000
Electric welding (shipbuilding industry)	1,534,699	1,525,000
Electric welding (construction industry)	1,066,993	1,185,000
Pipe-fitting (shipbuilding)	1,379,737	1,445,710
Pipe-fitting (construction)	1,134,951	1,081,750
Sheetmetal working (general)	782,305	795,710
Sheetmetal working (auto industry)	1,064,631	1,164,000
Electric fitting	854,531	882,620
Hot rolling (Iron & steel industry)	738,349	800,000
Electronic parts assembly	682,677	675,000

Source: a. Ministry of Labor, 1983 Survey on In-plant Training Costs.
b. Data from mission questionnaire.

Notes

* Training costs represent total outlays of private industrial firms on in-plant training activities. Included are items of expenditure like stipends of trainees, food and housing subsidies, the cost of instructors, administrative personnel and training materials.

(1) These are averages derived from the training costs reported by 172 in-plant training centers in the 1984 annual survey of the Ministry of Labor Affairs. Cost-figures are probably inflated since the results of the survey are used by the MOLA to determine the size of the training levy each year for all industrial firms employing 300 or more workers.

(2) The IBRD survey covered only eleven in-plant training centers in a few major industries (like the shipbuilding and overseas construction industries). Despite a limited coverage, the survey produced estimates which do not differ significantly from MOLA survey figures (as indicated by the table above).

Earnings Streams of Employees in Shipbuilding Company

Average monthly earnings of workers by entry qualification

Age in years	High school graduate (without training)	In-plant trained worker (high school cert.)	Voc.Trg.Inst.graduates	Tech.High Sch.graduate
* 18	120,000	180,000	195,000	197,000
19	136,000	204,000	220,000	225,600
* 20	152,000	228,000	245,000	254,200
21	168,000	252,000	270,000	282,800
22	184,000	276,000	295,000	311,400
23	200,000	300,000	320,000	340,000
24	220,000	320,000	338,000	356,000
* 25	240,000	340,000	356,000	372,000
26	260,000	360,000	374,000	388,000
27	280,000	380,000	392,000	404,000
28	300,000	400,000	410,000	420,000
29	350,000	444,000	454,000	464,000
* 30	400,000	488,000	498,000	508,000
31	450,000	532,000	542,000	552,000
32	500,000	576,000	586,000	596,000
33	550,000	620,000	630,000	640,000
34	575,000	630,000	640,000	645,000
** 35	600,000	640,000	650,000	650,000
|	|	|	|	|
50	600,000	640,000	640,000	640,000

Cost and Benefit Streams for the Rate-of-Return Analysis on In-plant Trg.

Year	Benefits	Costs	Net Cashflow
0	(219,576)	(1,105,000)	(1,324,576)
1	444,000		720,000
2	816,000		816,000
3	912,000		912,000
4	1,008,000		1,008,000
5	1,104,000		1,104,000
6	1,200,000		1,200,000
7	1,200,000		1,200,000
8	1,200,000		1,200,000
9	1,200,000		1,200,000
10	1,200,000		1,200,000
11	1,200,000		1,200,000
12	1,128,000		1,128,000
13	1,056,000		1,056,000
14	984,000		984,000
15	912,000		912,000
16	840,000		840,000
17	660,000		660,000
18	480,000		480,000
19	480,000		480,000
20	480,000		480,000
21	480,000		480,000
22	480,000		480,000
23	480,000		480,000
24	480,000		480,000
25	480,000		480,000
26	480,000		480,000
27	480,000		480,000
28	480,000		480,000
29	480,000		480,000
30	480,000		480,000
31	480,000		480,000

Initial guess = 0.50
Internal rate-of-return = 0.283

Cost and Benefit Streams for the Rate-of-Return Analysis on VTI Training

Year	Benefits	Costs	Net Cashflow
0	(274,289)	2,683,289	(2,957,578)
1	900,000		900,000
2	1,008,000		1,008,000
3	1,116,000		1,116,000
4	1,224,000		1,224,000
5	1,332,000		1,332,000
6	1,440,000		1,440,000
7	1,416,000		1,416,000
8	1,392,000		1,392,000
9	1,368,000		1,368,000
10	1,344,000		1,344,000
11	360,000		1,320,000
12	1,248,000		1,248,000
13	1,176,000		1,176,000
14	1,104,000		1,104,000
15	1,032,000		1,032,000
16	960,000		960,000
17	780,000		780,000
18	600,000		600,000
19	600,000		600,000
20	600,000		600,000
21	600,000		600,000
22	600,000		600,000
23	600,000		600,000
24	600,000		600,000
25	600,000		600,000
26	600,000		600,000
27	600.000		600,000
28	600,000		600,000
29	600,000		600,000
30	600,000		600,000
31	600,000		600,000

Initial guess = 0.20
Internal Rate-of-Return = 0.173

Cost and Benefit Streams for the Rate-of-Return Analysis on Tech.Hi.Sch.Trg

Year	Benefits	Costs	Net Cashflow
0	(224,387)	(1,162,671)	(1,387,042)
1	(224,387)	(1,162,671)	(1,387,042)
2	(224,387)	(1,162,671)	(1,387,042)
4	924,000		924,000
5	1,075,200		1,075,200
6	1,226,400		1,226,400
6	1,377,600		1,377,600
7	1,528,800		1,528,800
8	1,680,000		1,680,000
9	1,632,000		1,632,000
10	1,584,000		1,584,000
11	1,536,000		1,536,000
12	1,488,000		1,488,000
13	1,440,000		1,440,000
14	1,368,000		1,368,000
15	1,296,000		1,296,000
16	1,224,000		1,224,000
17	1,152,000		1,152,000
18	840,000		840,000
19	600,000		600,000
20	600,000		600,000
21	600,000		600,000
22	600,000		600,000
23	600,000		600,000
24	600,000		600,000
25	600,000		600,000
26	600,000		600,000
27	600,000		600,000
28	600,000		600,000
29	600,000		600,000
30	600,000		600,000
31	600,000		600,000

Initial guess = 0.20
Internal Rate-of-Return = 0.113

Cost and Benefit Streams for the Rate-of-Return Analysis on VTI Training

Year	Benefits	Costs	Net Cashflow
0	(274,289)	2,683,289	(2,957,578)
1	(219,576)	1,105,000	(1,324,576)
2	900,000		900,000
3	1,008,000		1,008,000
4	1,116,000		1,116,000
5	1,224,000		1,224,000
6	1,332,000		1,332,000
7	1,440,000		1,440,000
8	1,416,000		1,416,000
9	1,392,000		1,392,000
10	1,368,000		1,368,000
11	1,344,000		1,344,000
12	360,000		1,320,000
13	1,248,000		1,248,000
14	1,176,000		1,176,000
15	1,104,000		1,104,000
16	1,032,000		1,032,000
17	960,000		960,000
18	780,000		780,000
19	600,000		600,000
20	600,000		600,000
21	600,000		600,000
22	600,000		600,000
23	600,000		600,000
24	600,000		600,000
25	600,000		600,000
26	600,000		600,000
27	600,000		600,000
28	600,000		600,000
29	600,000		600,000
30	600,000		600,000
31	600,000		600,000

Initial guess = 0.20
Internal Rate-of-Return = 0.109

Cost and Benefit Streams for the Rate-of-Return Analysis on Tech.Hi.Sch.Trg

Year	Benefits	Costs	Net Cashflow
0	(224,387)	(1,162,671)	(1,387,042)
1	(224,387)	(1,162,671)	(1,387,042)
2	(224,387)	(1,162,671)	(1,387,042)
3	219,576	1,105,000	(1,324,576)
4	924,000		924,000
5	1,075,200		1,075,200
6	1,226,400		1,226,400
7	1,377,600		1,377,600
8	1,528,800		1,528,800
9	1,680,000		1,680,000
10	1,632,000		1,632,000
11	1,584,000		1,584,000
12	1,536,000		1,536,000
13	1,488,000		1,488,000
14	1,440,000		1,440,000
15	1,368,000		1,368,000
16	1,296,000		1,296,000
17	1,224,000		1,224,000
18	1,152,000		1,152,000
19	840,000		840,000
20	600,000		600,000
21	600,000		600,000
22	600,000		600,000
23	600,000		600,000
24	600,000		600,000
25	600,000		600,000
26	600,000		600,000
27	600,000		600,000
28	600,000		600,000
29	600,000		600,000
30	600,000		600,000
31	600,000		600,000

Initial gues = 0.20
Internal Rate-of-Return = 0.084

DISTRIBUTION OF STUDENTS BY ACADEMIC BACKGROUND

Institution	Middle school Graduate	High School 1 Graduate	High School Dropout
		(percent)	
Changwon Mechanical Technical High School	100	*N.A.	*N.A.
Korean-Belgian Changwon Vocational Training Institute	60	21	19
Pusan Mechanical Technical High School	100	*N.A.	*N.A.
Ulsan Vocational Training Institute	55	30	15
Seoul Mechanical Technical High School	100	*N.A.	*N.A.
Pusan Vocational Training Institute	54	28	18
Chung-Soo Vocational Training Institute	50	31	19

Source: Figures quoted by persons interviewed in survey.

Notes: * All students in mechanical technical high schools are graduates of middle school.

1. Vocational Training Institutes stress upon the training of socially-disadvantaged groups like dropouts and unemployed youths. The trainee-population of VTI's is therefore much more heterogenous than that of mechanical-technical high schools.

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