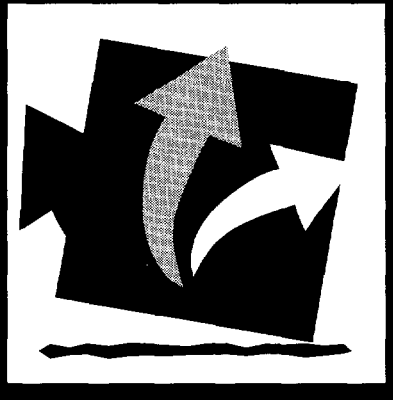
SP DISCUSSION PAPER NO. 9811



An Alternative Technical Education System: A Case Study of Mexico

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July 1998

Social Protection
LABOR MARKETS, PENSIONS, SOCIAL ASSISTANCE
THE WORLD BANK

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LCSHD

The International Journal of Educational Development, Forthcoming, 1998
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[Key Words: Secondary education; technical education; educational policy; program evaluation; comparative analysis; labor and employment]

*The author thanks Jose Dominguez-Urosa, John Innes, Mari Minowa and David Warren for the collaboration in collecting the data and an anonymous referee for valuable comments. The views and remaining shortcomings are the author's and should not be attributed to the World Bank.

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Abstracts

Many developing countries have relied on the varied forms of diversified secondary technical education as the main venue for training skilled workers and mid-level technicians. But there have been numerous and strong critics against this mode of technical education. As an alternative, the Mexican Government established the CONALEP system in the late 1970s. This study tests the viability of the system by evaluating CONALEP graduates' labor market performance in comparison with other forms of education. It also supplements the scant literature on the transition from technical education to work and on the use of technical skills. Through innovations — inter alia, an autonomous national organizational structure, decentralized operations, strong links to industry, use of industry-experienced instructors, terminal program with modest cost recovery, and highly practical courses — CONALEP has forged an effective technical secondary education system aimed at the Mexican labor market with substantial spill-over effects. Although it is a Mexican program, the special features of the CONALEP system bear policy implications for other countries as well. With globalization and rapidly changing technology requirements of the Mexican economy, however, this alternative form of technical secondary education faces new challenges, notably adjustment of its curriculum to changing market circumstances and improvement of its external and internal efficiency.

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I. Background

1.1 Liberalization of economic activities on a global scale coupled with the high rate of youth unemployment in both advanced and developing countries led to a growing concern over meeting emerging labor market skill requirements and increasing worker productivity [World Bank 1995]. There is reason for concern. Both privately- and publicly-provided training often proved inadequate to produce the types and quantities of workers for today's labor markets. Some argue that private-sector-provided training is an efficient way to develop worker skills; however, evidence shows that the private sector often fails to provide trained labor. Reasons include: reluctance of firms to provide training in general skills because of fear of worker mobility and poaching, and insufficient economies of scale in small- and medium-size firms, which employ 60% to 80% of workers in many developing countries [World Bank 1991]. A private firm may be interested in providing in-service training in firm-specific skills, but is unlikely to provide pre-service training in general skills.

1.2 Approaches generally taken by countries to cope with this problem can be classified into three: the traditional apprenticeship approach or on-the job training, as in the UK or Japan; formal vocational and technical education and training as a foundation for subsequent on-the-job training, as in the Nordic countries; and the dual system where apprenticeship in industry is supplemented by technical school education, as in Germany [Lauglo 1993].

1.3 So far, there has been no convergence on any one-best mode of vocational and technical education and training. Rather, it has been argued that there should be recognition of each country's need to formulate its own policies with regard to its cultural, economic, and political contexts [Lauglo 1992]. For example, two members of the European Union commented that one country's training system should not be superimposed on another

because of a differing political and educational ethos [Clarke et al.1994; Deissinger 1994]. In many developing countries, the tradition of apprenticeship or strong capacity for in-plant training was lacking [Middleton et al. 1993]. The only available institutional means was the formal secondary education system developed after World War II. Therefore, the range of the secondary school curriculum was diversified to include practical or vocational subjects. The aims of such diversified secondary schools were several: (i) to encourage students to develop a positive attitude toward vocational and technical careers and to enter the labor market directly upon graduation, thereby reducing demand for higher education; (ii) to increase the relevance of graduates' skills to the needs of the labor market; and (iii) to broaden the traditional academic curriculum by including prevocational education. Throughout the 1960s and 1970s, with the support of international aid agencies, many governments adopted the diversified secondary school system -- particularly in Africa and Latin America.

1.4 Subsequent studies, however, revealed that diversification programs did not meet the intended objectives. Problems that commonly face these programs include: (i) high unit costs and low efficiency; (ii) an absence of clarity in aims and objectives; (iii) shortage of qualified teachers; and (iv) the low status of vocational subjects as viewed by the students and the community [Sifuna 1992]. Although properly run diversified secondary schools incurred greater per student recurrent costs than academic schools by two to three times, graduates of diversified schools spent roughly the same amount of time in finding employment and received about the same initial salaries as did graduates of academic schools. And private demand for higher education among graduates of diversified schools remained as high as among graduates of conventional schools. Moreover, there was often only a weak correspondence between the field of further study or employment and the previous vocational training option. Finally, the lack of qualified teachers with relevant work experience and the high costs of procuring equipment and materials for practical training forced the schools to focus more on theory than on practice [Psacharopoulos 1985]. Interestingly, many of the failings of diversified education are the same as those raised by the critics of earlier technical secondary education [Foster 1965].

II. Search for An Alternative Technical Education

2.1 In December 1978, as an alternative model for producing skilled workers and technicians effectively and efficiently, the Mexican government launched a new vocational and technical education system, the Colegio National de Educacion Profesional Tecnica, or CONALEP. This study reviews the context of vocational and technical education prevalent in Mexico in the late 1970s, evaluates the labor market performance of Mexico's CONALEP system in comparison with that of other countries, and identifies some challenges facing the system.

2.2 Since CONALEP was created to address the issues of vocational and technical education of the late 1970s, a review of those issues and problems provide a useful backdrop to understanding the economic and social context within which the new system was introduced. A Government study conducted in 1978 identified three main issues: (i) insufficient educational output; (ii) poor qualities, and (iii) management difficulties, [SEP 1978], which are discussed below.

2.3 Insufficient Educational Output. By the 1970s, nearly three decades of consistently rapid and sustained economic growth (at 6.5 % per year) had placed considerable strain on the Mexican education system to produce adequately trained manpower. In the late 1970s, when industrial development accelerated, spurred by rising earnings from oil exports, Mexico's skilled manpower shortage became acute. The output of middle-level technical education programs was far less than the estimated demand for technical manpower. For example, excluding teacher training graduates, the number of upper-secondary technical education graduates joining the labor force in 1978 was only 70,000, while the estimated demand for skilled workers and lower-level technicians was about 130,000. Moreover, there were no institutionalized in-plant training systems in place in industry. And unlike many other Latin American countries, there were no autonomous training institutions financed by payroll taxes (such as SENAI or SENAC in Brazil and SENA in Colombia) or fiscal

incentive systems to promote enterprise training (as in Chile) [Lee 1983]. Instead, training of skilled and technical manpower in Mexico depended mainly on its middle-level technical education (grades 10-12), which was composed of two programs. One, the diversified technical education program (bachillerato tecnologico), run by the Secretaria de Educacion Publica (SEP), offered a mix of academic and technical education and was supposed to prepare students both to enter the labor market and to continue on to higher education. The other, the exclusively terminal technical education (profesional medio) program, offered mostly by the Technical Education Centers (Centros de Estudios Tecnologicos, or CETs), consisted of two- to three-year courses. These courses were created in 1968 and offered by only 17 centers, 12 of which were in Mexico City. In 1978/79, about 211,000 students were enrolled in the diversified technical education program, and about 87,000 students in the terminal program.

2.4 According to the 1978 SEP study, four factors contributed to the shortage of mid-level technical manpower supplied by the Mexican education system. First, the number of applicants to the terminal technical education program was insufficient. In 1978, out of more than 500,000 ninth grade graduates, only about 39,000 (less than 8%) applied for entry into this type of education. Moreover, trends up to 1978 showed a steady decrease in this proportion, as demand for admissions to academic streams increased. The principal reason for these trends was the perception by parents and students that technical and manual jobs, hence technical and vocational training, were "inferior" to professional jobs and academic education. Second, completion rates in terminal education were low, ranging from 12% to 34%. This was largely because many students used the programs as a "waiting bay" prior to retaking entrance examinations for a transfer to other education programs. Third, a low proportion of graduates were joining the labor force. It was estimated that about 60% of graduates from the diversified technical education program decided to proceed to higher education (where tuition and fees were negligible) rather than join the labor force. (For a discussion of the problems associated with this issue at the higher education level, see

Birdsall 1996 and Birdsall and James 1993). Fourth, opportunities for technical education in several regions and states were insufficient, leading to regional imbalances.

2.5 *Poor Qualities.* The quality of middle-level technical education was poor because insufficient emphasis was given to practical know-how and actual applications. In 1978, only 10% of the weekly schedule were allocated to practical applications. Poor quality in practical training resulted from: first, teachers who were academically qualified but lacked practical experience in business and industry; second, insufficient supplies or materials for practical skills training, although equipment was generally not lacking; third, irrelevant and inflexible curricula, which were developed for narrow specializations (more than 80) without appropriate consultation with the productive sectors and which were out of step with the evolving skill profiles in industry; and finally, lack of student support services, such as guidance, counseling, placement, evaluation, and follow-up services.

2.6 *Managerial Difficulties.* The management of middle-level technical education in 1978 proved to be difficult because of the fragmentation of programs (up to 12) and numerous responsible authorities (4 General Directorates and 27 regional authorities). A principal area of difficulty was the increasing control of SEP-run programs by the teachers' union, which had the right to fill up to 50% of all teacher and school administrator vacancies, regardless of minimum qualifications.

2.7 The problems associated with the middle-level technical education in Mexico generally resembled those encountered by the diversified technical education in other parts of the world, and the same criticism could be levied against the system. Based on the findings of the 1978 study, the Government concluded that it would be desirable to create a new system, free from the existing centralized, bureaucratic constraints, to provide substantial numbers of skilled workers and middle-level technicians.

III. Objectives and Special Features of CONALEP

3.1 At the outset, CONALEP aimed to: (i) expand the output of middle-level technical education by creating a large network of terminal training centers (the quantitative targets were to divert approximately 20% (compare to the 1978 rate of 8%) of all ninth-grade graduates into the system and to achieve a 70% completion rate for such students).; (ii) improve the quality of middle-level technical education in close cooperation with the productive sectors by emphasizing a practical curriculum that reflects changing regional and sectoral needs, and by decentralizing training opportunities; and (iii) increase program efficiency by enhancing its public image and achieving higher retention rates.

3.2 *Enrollment.* By 1993/94, with a network of 254 training centers across the country, CONALEP's regular pre-service training program for adolescents (grades 10-12; ages 16-20) showed enrollments of 191,000 in 113 career areas, accounting for 47% of total enrollments (406,000) of the upper-secondary terminal technical education program in Mexico. Compared with 1978, the share of terminal technical education enrollments increased from 8% to 18% of the total upper-secondary education enrollments, accounting for the corresponding decline in the share of the academic (and teacher training) programs from 68% to 59%. There was no change in the share of the diversified technical education enrollments (Table 1). CONALEP alone absorbed 10% of the ninth-grade graduates, compared to 8% in 1978 for all terminal technical education. The number of graduates reached 32,342 in 1993/94.

3.3 Besides this regular, three-year, pre-service program, in 1991 CONALEP began to provide modular pre-service programs, which set no definite period for completing the requirements of the regular programs; instead, modular courses were offered in the evening, so that workers could tailor their training to suit the time available. CONALEP also offers in-service training programs of short duration to upgrade the skills of employed workers, and retraining programs of three to six months each for adults who have had work experience but

are currently unemployed. All these in-service and retraining programs in some 80 career areas are offered under training contracts with private sector enterprises, public corporations, or Government agencies on a cost-recovery basis. In addition, CONALEP offers two specialized training and technical assistance programs: one for adults who live in marginal areas to learn skills for launching self-employment or other income-earning productive activities. This is done using some 60 to 80 mobile training units. The other is for skill upgrading and specialization, as well as technological transfer and development of small- and medium-size firms, using nine Technological Assistance and Service Centers.

3.4 Currently, CONALEP is the backbone of Mexico's skills training structure and has become the major training contractor. For example, its share of labor retraining contracts with the Secretariat of Labor is about 50%; it also has signed more than 1,500 agreements with the productive sector to provide training or other forms of technical assistance. Since the focus of this paper is on the regular, three-year, upper-secondary technical education program, Table 2 summarizes only the type and magnitude of other programs [CONALEP 1996].

3.5 *Special Features.* CONALEP's regular, three-year, pre-service training program differs from other technical education and training programs in the following ways. *First*, CONALEP's semi-autonomy and its decentralized administration enable it to respond to the changing needs of its clients (i.e., entrepreneurs in manufacturing and service sectors) and encourage their participation. The National Director of CONALEP is supervised by the Governing Board only on policy matters. Its 14-member Board of Governors includes not only seven representatives of the Government (including the Secretary of Education, who presides over the Board, the Subsecretary of Technical Education, and representatives from the Secretariats of Industry and Commerce, and Finance), but also seven industrial leaders serving staggered terms. Moreover, operational decisions, including curriculum adaptation, are delegated to local training centers. At each center level, industrial academic groups are installed to advise on course content matters; and each center and most states have a special

coordination committee (Comite de Vinculacion) to advise and assist in setting priorities for training programs to be offered by CONALEP. The committee increases the roles of enterprises in the planning and development of CONALEP's training programs and curricula, thus making them responsive to the demand of the labor market, which is CONALEP's primordial strength.

3.6 The *second* special feature is that CONALEP's curriculum has a practical orientation (20% general theory, 20% technical theory, and 60% technical practice) with strong emphasis on evaluation, "hands-on" experience, follow-up, and feedback. This curriculum is developed through iterative interaction between the planning and coordination processes. The planning processes start with the econometric studies of the recent and prospective economic activities for 73 sectors, using national account tables and survey data, and identifying the states, regions, and entities which would play significant roles in the sectors. The econometric studies are followed by estimation of the employment level, identification of the need for technical manpower, and quantification of the educational supply of the trained persons for each sectors at national, state, and regional levels. The results of the planning processes are reiterated and checked by the coordination processes, which include extensive consultations with enterprises, public organizations, and non-governmental organizations through coordination committees established at different levels of government. At the request of the prospective clients, and after checking the supply capacity of existing educational facilities, CONALEP may start preparing a new specialty or course by creating an academic group, which is composed of client sector representatives and CONALEP specialists. The academic group establishes an occupational profile, a list of prospective employers, and the content of the specialty in terms of knowledge, skills, aptitudes, and attitudes. Likewise, existing specialties and courses are constantly evaluated through the coordination committee for modification or cancellation. CONALEP currently offers 13 groups of specialties: primary sector, electricity, electronic, information technology, automechanics, metalurgy and chemistry, adminstration and accounting, public accounting, executive assistance, health, hotels and food services, installation and maintenance, and others.

3.7 The *third* special feature is that its training programs are terminal (not for progression to higher education) and are job market oriented. Those graduates who want to proceed to higher education must first take further studies in academic or technical secondary schools. This unequivocal objective of the CONALEP program is sharply different from the dual objectives of the diversified technical education program.

3.8 The *fourth* feature is that CONALEP's unique, multimedia promotional activities successfully enhance the program's public image, thus attracting qualified students, and encouraging significant financial support from the private sector (such support amounted to about US$13 million in 1990 or about 14% of total recurrent expenditures.).

3.9 The *fifth* feature is that its students pay a tuition relatively higher than that of other streams of the education system (as much as 12% of direct recurrent training costs in 1991); thus, students are motivated to work hard and remain in the program.

4.0 The *sixth and final* feature, but no less important, is that its technical instructors are seconded from industry and paid to teach exclusively on a part-time basis (typically 12-14 hours/week, with a maximum permissible of 20 hours/week) each semester, and cannot belong to the teachers' union. This prevents management-labor relation problems since CONALEP is not the primary employer of the instructors. And this arrangement helps lower CONALEP's training costs, enables the instructional programs to focus on practice, keeping pace with the skills profile of industry, and facilitates placement of graduates. Use of highly proficient technicians and supervisors as instructors of practical skills training is a customary practice in many OECD countries; however, it represents an innovation in many developing countries. Because of the dearth of such manpower in industry, policy-makers in developing countries often chose to train the new breed of college-educated engineers as technical training instructors by imparting practical skills in an accelerated way. However, such practice has not been successful, partly because practical skills acquirement needs a longer

time, and partly because of the historically low status accorded to manual work. Preparation in instructional methodology of CONALEP instructors is carried out through its own instructor training unit. The instructor training program consists of both regularly scheduled short pre-service courses on methodology and ad hoc, in-service courses in various subjects. The pre-service courses consist of 54 hours of pedagogical preparation, including 14 hours of practice teaching. The minimum required in-service training consists of 64 hours of human relations, instructional methodology, modular curriculum preparation, and shop-work organization and management. Additionally, optional in-service courses of up to 130 hours are provided for the upgrading of specialized technical skills. About 14,000 instructors were employed during 1993/94, and all received on average 1.8 courses per instructor, with an average course length of 20 hours. The training unit is composed of qualified and experienced professional teacher trainers, who are assisted by qualified part-time trainers.

IV. Evaluation of Labor Market Performance

4.1 The relative effectiveness and efficiency of the CONALEP program and other secondary education programs (i.e., academic, diversified technical, and terminal education) would be best evaluated by analyzing the rates of return to these programs. A recent review of the studies on the rates of return concludes that the social rates of return to vocational secondary education are not lower than those to academic secondary education [Bennell 1996]. However, vocational secondary education has a broad range of modes and programs, and past studies do not shed any light on the relative effectiveness or efficiency among them. Moreover, because of the short history of the CONALEP program, its graduates have not yet gone through a whole cycle of work life in the labor market, and a life-time earnings profile cannot be constructed for the rates-of-return analysis. Therefore, this paper assesses the relative effectiveness and efficiency of the CONALEP program by evaluating the labor market performance of its graduates in comparison with those of alternative educational programs at secondary level in Mexico.

4.2 *Data.* This evaluation is based on the graduate tracer survey conducted in February 1994 on the basis of a random sample of 1,400 former CONALEP students who graduated between June 1991 and June 1993, and on other national surveys that cover two large comparison groups. The surveyed CONALEP graduates were selected to represent the profile of the graduates in each of the three years in terms of all 13 major occupational groups of training and 6 geographical regions of the country. However, the sample is dominated by 1992 graduates composing 50% of the sample; 1991 and 1993 graduates each occupy 25%. Altogether the sample represents 1.46% of the total CONALEP graduates (95,769) in those three years.

4.3 Two comparison groups are used: comparison group I is all 1991 graduates from upper-secondary diversified technical education programs; this group's labor force participation and employment performance in January 1994 are compared with those of the CONALEP graduates of both 1991 only and 1991-93 combined. Comparison group II comprises the employed workers aged 20 to 24, as reported in the National Urban Employment Survey (ENEU) data of January 1994. The ENEU sample represents about 2.3% of 16 million workers in 36 urban areas and covers all workers with different educational background. Therefore, the earnings performance of the employed workers aged 20-24 with different educational background (i.e., lower-secondary education; and upper-secondary academic, diversified technical, and terminal technical education) in January 1994 is compared with that of the CONALEP graduates of both 1991 only and 1991-93 combined. The 20-24 year old cohort was chosen, because of a large number of old-age students at the upper-secondary education level. The majority of the 1991-93 graduates from the CONALEP and other upper-secondary schools belonged to this age cohort in 1994. While comparison group II was based on a randomly selected sample survey, comparison group I was created from a mail survey of all graduates, with a 45% response rate, and therefore was likely to be biased toward those who were either employed, studying, or having a higher level of earnings.

4.4 *Labor Force Participation.* The 1991 CONALEP graduates' labor force participation rate (89.8%) was much higher than the participation rate of comparison group I (29.2%) (Table 3). Of those CONALEP graduates who did not participate in the labor force, 2.5% were studying and 5.9% were at home (the majority of them female). Among comparison group I, 33.2% were engaged in further study, reflecting the divided objectives of the diversified technical education program. Another 28% of the comparison group I failed to specify their economic status. They were most likely unemployed, because those who responded as labor force participants were all employed workers.

4.5 *Employment.* CONALEP graduates found jobs faster than graduates of diversified technical secondary education programs. By January 1994, about 91% of CONALEP graduates were employed, and 9% unemployed. This latter figure is higher than the unemployment figure for comparison group I, but about 28% of the comparison group I who failed to report their labor force status were most likely unemployed (or out of the labor force). Among those employed CONALEP graduates of 1991, about 62% found jobs in less than three months and 84% six months after the graduation (Table 4). These placement rates compare favorably at 59% and 83%, respectively, for comparison group I on the basis of only those who responded to the survey [COSNET 1994]. CONALEP's placement rates also compare favorably with 69% in West Germany six months after completing apprenticeship [Herget 1987]. At graduation, 34.4 % of CONALEP students were already employed. About half the graduates reported that they had worked one time or another before graduation. On average, a graduate took 4.4 months to find a job. Those who had been working before graduation found a job in a shorter time (by 1.2 months); however, the difference gradually declines among graduates of more recent years, possibly because of the improving labor market situation. (The difference was 1.8 months for 1991 graduates; 0.9 months for 1992 graduates; and 0.5 months for 1993 graduates.)

4.6 *Employment Status.* There was no substantial difference in the status of employment between CONALEP graduates and comparison group I. The majority of CONALEP

graduates worked as wage earners (78% vs. 79% among the comparison group I). While piece-rate workers were higher among CONALEP graduates (5.4% vs. 3.4%), this proportion declines as graduates gain more work experience (5.4% for 1991 graduates compared with 10.1% for 1993 graduates) (Table 4). In time, piece-rate workers apparently moved to the more stable wage worker status.

4.7 *Congruency.* Among the employed CONALEP graduates, 65% reported they were working in the occupational category congruent with their field of training (Table 4). Moreover, some 70% of employed graduates consistently reported that CONALEP training was "very useful" or "useful" in their current occupation. This high rate of congruency is comparable to the 78% among apprentices in Germany, but significantly higher than 43% among upper-secondary technical school graduates in Japan [Inoue 1985].

4.8 *Average Earnings.* In 1994, CONALEP graduates received on average higher earnings than both lower-secondary school graduates and upper-secondary general and diversified (bachillerato) school graduates in comparison group II (aged 20-24). 1991 CONALEP graduates' earnings were 2.72 times the minimum wage, and were 31% higher than those of lower-secondary school graduates (2.07 times the minimum wage), and 12% higher than those of upper-secondary general and diversified school graduates (2.44 times the minimum wage) (Table 5). 1991 CONALEP graduates' earnings were virtually at the same level as those of other terminal technical upper-secondary school graduates of 1991 (2.70 times the minimum wage). Although 1992 and 1993 CONALEP graduates'earnings were lower than those of other terminal technical secondary school graduates in comparison group II, workers in comparison group II were mostly 1991 graduates and were generally one or two years older than 1992-1993 CONALEP graduates. So, with more job experience, 1992-1993 CONALEP graduates could be expected to catch up with the earnings level of comparison group II with the same type of education. Six months after graduation, the earnings of 1993 CONALEP cohorts were 1.86 times the minimum wage; however, the earnings of 1992 graduates were raised by 42%, and those of 1991 graduates 3% more. The

fact that CONALEP graduates' earnings increased at such a fast rate could reflect the high productivity and earnings potential of its graduates [INEGI 1994].

4.9 In summary, CONALEP was able to increase the proportion of ninth-grade graduates articulating to terminal technical secondary education from 8% in 1978 to 17% in 1993, quite close to its target of 20%. CONALEP graduates' labor market performance measured by labor force participation, employment rates, congruency between training and employment, and levels of earnings exceed that of all other technical education streams. As the largest and most effective technical education and training system in the country, CONALEP was assigned the primary role of meeting the manpower requirements of Mexico's 1989-94 National Development Plan.

V. Future Challenges

5.1 *Terminal Education.* Despite its effective labor market performance, CONALEP also has been criticized and faces the challenge of adjusting to future needs. The most frequent criticism is that its program is a dead-end program with narrow specialization, and that it is inefficient given its high dropout rates. However, the suggestion that CONALEP operates dead-end educational programs, thus depriving students of opportunities for higher education, is not justified. CONALEP graduates can pursue higher education once they obtain a minimum of general education credits after graduation, and there is an equivalency system that links the CONALEP curriculum with upper-secondary general education. Importantly, lower-secondary school enrollment rates hover only around 60%, while almost half of upper-secondary school students drop out during the three-year cycle in Mexico. Thus, based on CONALEP graduates' performance in the labor market, it is not unrealistic to allocate some 20% of total places at the upper-secondary education level for students who desire to join the labor force immediately after upper-secondary schooling. This is the practice followed in many advanced countries, where a higher proportion is assigned to such a program [Tabbron and Yang 1997]. What should be strengthened in such a program is student vocational guidance and counseling services. Recently, CONALEP made efforts to increase the number

of teaching hours in general subjects, so that its graduates may have the dual option of either proceeding to higher education or entering the labor market upon graduation. These efforts could be counterproductive, in that there would be hardly any difference between the diversified technical upper-secondary program and the terminal technical program. Then, CONALEP would likely receive the same criticism that diversified technical secondary schools in Mexico and elsewhere did in the past.

5.2 On the one hand, the diversified technical education program incurs about twice the per student costs than the general education program, but there is no evidence of superior achievements by its graduates at higher education level. On the other hand, its graduates show poorer labor market performance than the graduates of the terminal technical education program, which defrayed about the same level of per student recurrent cost. Thus, the Government in Mexico, along with many other countries, might try to expand the opportunities for general secondary education absorbing a substantial number of future students to be enrolled in the diversified technical education program, and integrate all diversified and terminal technical education programs into one technical education program, plus providing opportunities for some students to proceed to polytechnic higher education institutes, as in the Malaysian technical education reform in 1988. This policy would not only address the terminal characteristic of CONALEP's program, but also help rationalize the diversified technical upper-secondary education program, which suffers from unclear objectives, high unit costs, and high inefficiency. In Malaysia, technical secondary education students are divided into vocational and skills streams at the end of the first year of upper-secondary technical education, depending upon their achievement and aptitude. Vocational stream students pursue courses with greater emphasis on general subjects, while skill stream students pursue courses with more practical work to acquire proficiency in occupational skills. Vocational stream students will be allowed to take higher education at the Polytechnics, while skill stream students are expected to enter the labor force with Government's skills certification [Wilson 1991].This policy is also consistent with the trends observed in OECD countries, which provide a long-term perspective for many developing

countries. In these countries, blurring of boundaries has occurred between the previously distinct academic, technical, and vocational streams. Technologies of information and control have moved these streams closer to the science varieties of the academic streams [OECD 1989].

5.3 *Curriculum Breadth.* If the criticism against CONALEP is on its narrow specialization, it is well justified. CONALEP used to offer more than 100 narrow specialization, but has reduced them to some 60 career areas. But it should be further sharply reduced as the Mexican economy changes. Government policy on the breadth of the curriculum at the secondary technical education level should consider two factors: the time horizon of educational investments, and the future skills profiles of industry.

5.4 If the technical education curriculum is narrow in tendum with the current skill requirements of a specific occupation, initial training costs would be much higher than the cost of the general education program. Graduates would earn correspondingly higher wages than general education graduates in the short- run. However, they would lose their competitive advantage in the long-run because of the difficulties in adapting to future changes in skill requirements and would need to undergo longer or more frequent in-service training or retraining during their work life. However, if the technical education curriculum is broad and general, initial training costs would be low, and technical education graduates would not enjoy much wage advantage over general education program graduates in the short-run. However, in time technical education graduates would be able to adjust to changing occupational skill profiles more easily and would not need to incur heavy or frequent in-service training or retraining costs over their work life. Choosing the right investment and curriculum would depend on the life-time profile of training costs and earnings, and a cost-benefit analysis would need to be undertaken. [Lee 1981].

5.5 The trade-off between the wage advantage at the initial stage of a worker's career and the costs of adjustment to changing occupational skills profile during the later stages would

not be so complex if there is no crossover between the two life-long earnings curves of the graduates of technical and general education programs. An empirical study of the Mexican labor market indicates that the two earnings curves do cross each other during their working life, as depicted in Figure 1[Gill 1992]. This means that technical education graduates do enjoy wage advantages initially, but beyond a critical point, loses their advantages over general education graduates for the rest of their work life.

5.6 To bridge the wage gap for the rest of their careers, especially when the crossover takes place at an early stage of the work life, technical education graduates' ability to adjust to changing occupational skills profiles will need to be strengthened. One way is to prepare workers to be "trainable" instead of merely "specialized," or train workers in broader skills rather than in a narrow specialization.

5.7 The high social cost of narrowly entrenched specialization is well demonstrated in the starkly higher unemployment rates among vocational and apprentice secondary school graduates than among general secondary school graduates in Hungary, Poland, and other countries of the Former Soviet Union (FSU) [Fretwell and Jackman 1994]. There were over 800 occupational specialties in vocational schools in the FSU in 1989 [Heyneman 1997].

5.8 *Efficiency in Student Flows.* Efficiency of CONALEP graduates' transition to job markets (external efficiency) has already been shown at high, but efficiency in student flows within the program (internal efficiency) still needs improvement. The completion rate for the student cohort graduating in 1990 was 52%, which represents a significant increase over the level 10 years ago, estimated at about 31%. The improvement of student-flows in the CONALEP system has, however, proven to be as difficult an issue as in the rest of the Mexican educational system. Indeed, the academic secondary education stream has about the same level of efficiency. The completion rate at the primary education level (grades 1-6) was only 57% in 1991, and the repetition rate at the lower-secondary education level (grades 7-9) stood as high as 28%. The shortcoming in the student-flow performance may partly be rooted

in the economic and cultural attitudes of the population and partly in the systemic problems of the educational system as a whole. The critical point is the end of the first semester, when about 40% of the initial enrollment drops out, mostly to switch back to the academic stream.

5.9 CONALEP already has taken several measures to increase its internal efficiency. Among the changes already instituted are a more thorough screening and aptitude testing of applicants to avoid mismatches, plus compensatory education, especially in mathematics, before school begins. Also, close monitoring and guidance are employed with training centers that perform poorly. In future, given that the dropout problem is likely to persist (albeit at a reduced level), CONALEP should launch a special study to further analyze the problem of student flows and to follow up the academic or employment record of dropouts as part of its graduates tracer studies. And student support services, such as guidance, counseling, and scholarship program, will need to be strengthened.

VI. Conclusion

6.1 In response to the numerous and strong critics against the traditional technical secondary education, the Mexican government introduced an alternative technical education system, CONALEP. At a level of per student recurrent costs similar to that of the properly run traditional technical education program, CONALEP has proven more effective in the Mexican labor market. In addition, it has had spill-over effects on the rest of the technical education system by stimulating them to be more efficient and adapt to changing economic and social situation. It is difficult to discern the factors responsible for the relative success with differing degrees of contribution, but it is safe to conclude that the special features of CONALEP as a whole made it possible -- an autonomous national organizational structure, decentralized operations, strong links to industry, use of industry-experienced instructors, terminal program with modest cost recovery and highly practical courses. To remain effective continuously in the context of global liberalization and rapidly changing technology requirements of the Mexican economy, however, this alternative form of technical secondary

education faces new challenges, notably adjustment of its curriculum to the changing market circumstances and improvement of its external and internal efficiency.

6.2 The alternative mode of Mexican technical education may well be applied to other countries. However, some characteristics of the Mexican environment must be considered before replicating the CONALEP experience to other countries. For example, Mexico is a middle-income country with a sufficiently large and dynamic industrial and services base, which generates substantial demand for technical skills and can supply a sufficient number of proficient technicians and engineers to serve as instructors of practical skills. Mexico also has an adequate level of basic education; thus students generally come to CONALEP prepared with the basic learning skills necessary for mid-level technical skills training. Despite these caveats, however, the CONALEP system has established an effective technical education mode for meeting the specific demands of the labor market and the target group in developing countries.

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Table 1: Enrollments in Upper-Secondary Education Programs ('000)

Types of Upper-Secondary Education	1978/79 Enrollment	%	1993/94 Enrollment	%
Academic and Teacher	640	68	1,307	59
Diversified Technical	211	23	530	23
Terminal Technical	87	9	406	18
CONALEP	N.A.	-	191	-
Others	87	-	215	-
Total	938	100	2,233	100

Table 2 :CONALEP's Other Training Programs: 1994

Programs	Enrollments/Graduates ('000)	No. of Courses Offered
Modular Training	9	156
In-Service Training	11	656
Retraining	38	1,375
Marginal Areas Training	120	2,242
Technological Assistance	3	284

Table 3 : Labor Force Participation: 1994

Participation Rate (%)	CONALEP	Comparison Group I
Labor Force	89.8 (89.0)	29.2
Further Study	2.5 (3.2)	33.2
Staying at Home	5.9 (4.9)	-
Other	1.8 (2.9)	9.5
Not Specified	-	28.0
Total	100.0 (100.0)	100.0

Numbers in parenthesis are for 1991-93 graduates; others are for 1991 graduates only.

Figure 1: Male Earnings Profile by Type of Education (Grades 10-12) in Mexico: 1988

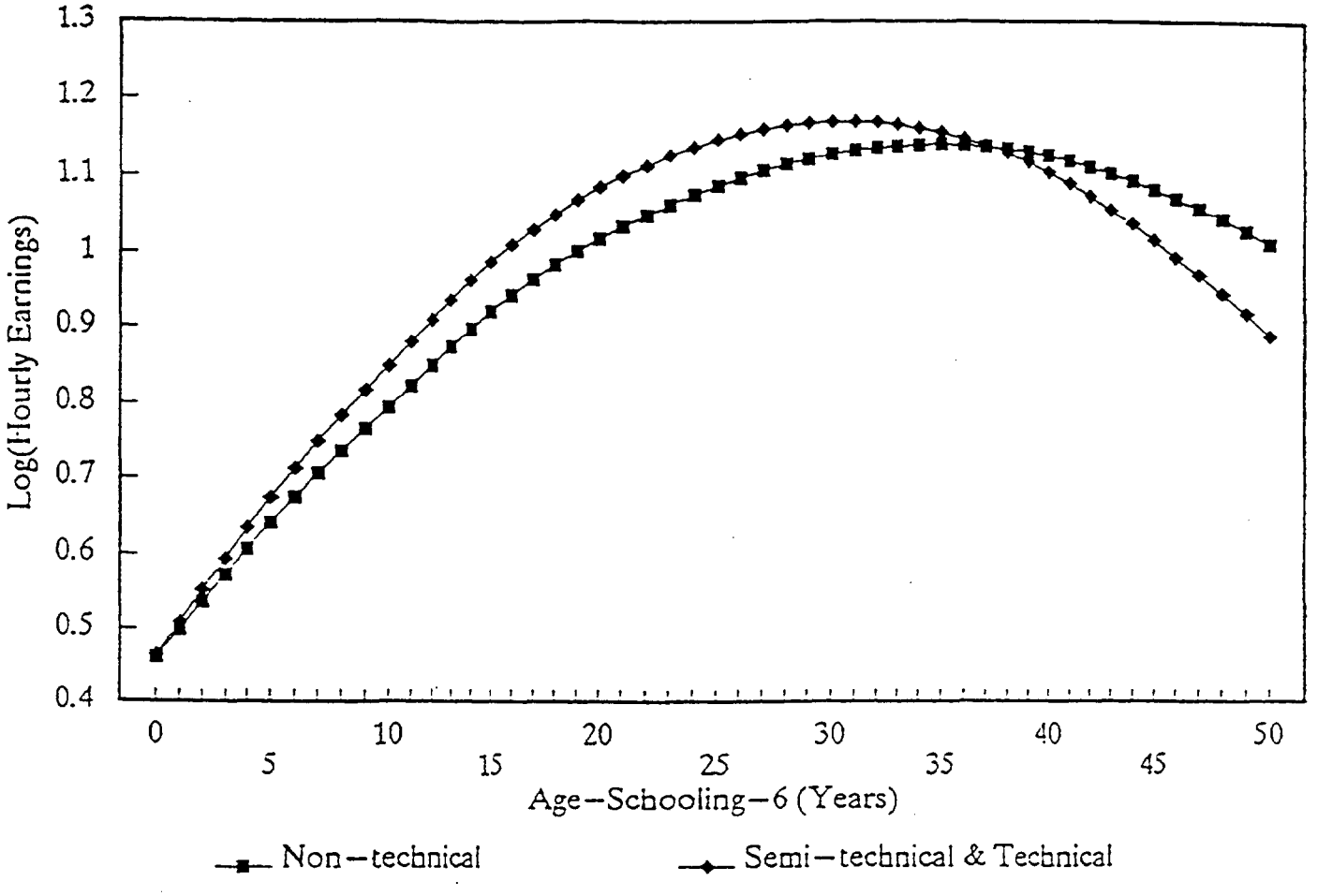

Table 4: Placement Record: 1994

	CONALEP	Comparison Group I
Placement Rate (%)		
Unemployed	9.0 (14.4)	- *
Employed	91.0 (85.6)	29.2
Time to Find First Job (%)		
<3 months	62.3 (62.0)	59.2
3 - 6 months	21.7 (24.6)	23.4
7-12 months	14.8 (13.4)	17.4
Status of Employment (%)		
Self-Employed	8.7 (6.0)	5.3
Piece-Rate Workers	5.4 (7.7)	3.4
Wage Earners	78.0 (78.1)	79.4
Congruency between Job and Training (%)		
Very Related	39.0 (38.4)	-
More or Less Related	25.8 (26.3)	-
Little Related	17.4 (14.5)	-
No Relations	17.8 (20.8)	-

* Note the large number of "Not Specified" for this Group in Table 3.
Numbers in parenthesis are for 1991-93 graduates; others are for 1991 graduates only.

Table 5: Average Earnings: 1994

	Earnings in Multiples of the Minimum Wages	
	CONALEP	Comparison Group II
1991 Graduates	2.72	N.A.
1992 Graduates	2.64	N.A.
1993 Graduates	1.86	N.A.
1991-93 Graduates	2.45	N.A.
Lower-Secondary Graduates	N.A.	2.07
General and Diversified Upper-Secondary Graduates	N.A.	2.44
Terminal Technical Upper-Secondary Graduates	N.A.	2.70

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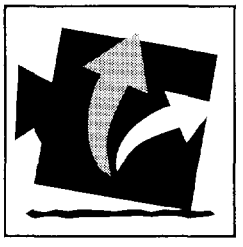

Summary Findings

Many developing countries have relied on the varied forms of diversified secondary technical education as the main venue for training skilled workers and mid-level technicians. But there have been numerous and strong critics against this mode of technical education. As an alternative, the Mexican Government established the CONALEP system in the late 1970s. This study tests the viability of the system by evaluating CONALEP graduates' labor market performance in comparison with other forms of education. It also supplements the scant literature on the transition from technical education to work and on the use of technical skills. Through innovations — inter alia, an autonomous national organizational structure, decentralized operations, strong links to industry, use of industry-experienced instructors, terminal program with modest cost recovery, and highly practical courses — CONALEP has forged an effective technical secondary education system aimed at the Mexican labor market with substantial spill-over effects. Although it is a Mexican program, the special features of the CONALEP system bear policy implications for other countries as well. With globalization and rapidly changing technology requirements of the Mexican economy, however, this alternative form of technical secondary education faces new challenges, notably adjustment of its curriculum to changing market circumstances and improvement of its external and internal efficiency.

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