GRADUATE EDUCATION FOR ECONOMIC DEVELOPMENT: AN EVALUATION OF PATTERNS AND TRENDS OF SPECIALIZATION OF LATIN AMERICAN STUDENTS IN THE UNITED STATES

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CHAPTER I

INTRODUCTION

This study is concerned with the patterns and trends of specialization of Latin American graduate students in United States universities. The major purpose of this study is to discuss and evaluate these patterns and trends in terms of their relevance to their home countries' economic development needs and employment opportunities.

The Problem

The Latin American countries, as most of the developing countries which have been poor and stagnant for centuries, are in a state of revolt against economic backwardness. Industrialization ranks high among the policies which were expected to lead the underdeveloped countries out of their economic, social and political difficulties. However, it has now become evident that increasing physical capital does not help the process of economic development significantly unless it is accompanied by appropriate investment in human capital. Investment in education of all types has been a major source of growth in advanced countries. Deficiencies in the knowledge and skills embodied in human resources seriously limit the productivity of accumulated capital.[1]

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[1] Gerald M. Meier, Leading Issues in Development Economics, New York, 1964, pp. 266-267.

Economic efficiency requires more than physical capital. Natural resources must be located, and all possible production techniques must be considered for their relative efficiency in specific circumstances. Existing market conditions may dictate the most appropriate institutions to boost development efforts, and people with needed skills must be found or trained to staff the institutions which contribute to economic development. Such an effort requires a wide variety of university trained people who have acquired specialized knowledge. As the highest level of formal education, graduate education can make especially important contributions to economic development.

Several studies of economic growth in advanced countries confirm the importance of human resources investment.[2] Harbison and Myers in Education, Manpower and Economic Growth, indicate that for 75 countries there is a strong positive correlation between the development of human resources and the level of per capita income. They document the need of the developing countries for graduate training in technical fields of specialization[3] to be able to adapt scientific and technical discoveries and innovations from the advanced countries to their own economies and industries.

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[2]See, for example, Theodore W. Schultz, "Investment in Human Capital," American Economic Review, March, 1961; Edward F. Denison, "The Sources of Economic Growth in the United States," Supplementary Paper No. 13, "Committee for Economic Growth, and Gaps in Information," Journal of Political Economy, October, 1962; Mary Jean Bowman and C. Arnold Anderson, "The Role of Education in Development," Development of Emerging Countries, An Agenda for Research, The Brookings Institution, Washington, D. C., 1962; Frederick Harbison and Charles A. Myers, Education, Manpower, and Economic Growth: Strategies of Human Resource Development, New York, 1964.

[3]Technical fields of specialization include such fields as agriculture, engineering and natural and physical sciences.

The forces impeding the more rapid development of the Latin American countries however, are cultural, social and political, as well as economic. Their systems of traditions, values, institutions and political power often restrict economic growth. University training, including graduate education in structural fields of specialization,[4] is one of the necessary factors to encourage structural changes in social, economic, political and administrative structures needed for the progress of Latin America.[5]

Most of the research on international education has been done by psychologists, sociologists and education specialists. Despite the awareness of the importance of human resource development and the role of high-level manpower in economic development, little has been done by economists in analyzing the relevance of graduate education abroad for home countries' development needs. Research in this area by Professor John C. Shearer suggests that:

> . . . both for institution building and for nation building in underdeveloped countries an efficient foreign student system based on relevance of selection of students and of programs with respect to home country needs and opportunities can offer great bargains to all concerned.[6]

Shortages of high-level manpower and imbalances in specialization are common throughout Latin America. The ratio of university

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[4]Structural fields of specialization include such fields as economics, humanities, political science, sociology, management, public administration, and education.

[5]John C. Shearer, "International Migration of Talent and the Foreign Students," Proceedings of the Twenty Second Meeting of the Industrial Relations Research Association, 1969, p. 264.

[6]John C. Shearer, Ibid., pp. 268-269.

enrollment to population in Latin America varies considerably from one country to another. It ranges from nearly eight students per 1,000 population in Argentina to countries where the ratio is not even one per thousand.[7] Imbalance in the distribution of students in various fields of specialization is widely found in all the Latin American countries. Statistics on enrollments in Latin American universities show clearly that the traditional careers of law and medicine still attract inordinately high proportions of students. The proportions of students in law and medicine are 20 and 16 percent in Brazil and 17 and 20 percent in Argentina, respectively. Enrollments in agriculture and natural sciences are very low. The proportion of students in agriculture is usually about five percent.[8]

Graduate education in Latin American universities is very scarce because of lack of facilities and either limited or unrealized need for it. Most Latin American graduate students are trained in the United States.[9] Mexico, Brazil, Colombia, Argentina, Chile, Venezuela, and Peru have been consistently the major senders of graduate students to United States universities as shown in Table I. The Institute of International Education (IIE) census[10] for 1969-70 enumerated 5,112

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[7]United Nations, Education, Human Resources and Development in Latin America, ECLA, New York, 1968, p. 108.

[8]United Nations, UNESCO, Statistical Yearbook, New York, 1970.

[9]John C. Shearer, "Intra- and International Movements of High-Level Human Resources," in James Heaphey (ed.), Spatial Dimentions of Development Administration, 1971, p. 205.

[10]Institute of International Education, Open Doors, New York, 1970.

graduate students from 19 Latin American countries, of whom 4,089 were from the above seven countries. These countries are also the largest countries in Latin America in terms of population and gross domestic product. This study, therefore, will be limited to those seven countries.

TABLE I

NUMBER OF LATIN AMERICAN GRADUATE STUDENTS IN THE UNITED STATES, 1965-66 TO 1969-70

Country	1965-66	1966-67	1967-78	1968-69	1969-70
Argentina	315	402	474	556	551
Brazil	283	445	569	677	745
Chile	275	375	420	422	457
Columbia	354	471	499	600	715
Mexico	412	494	582	605	760
Peru	185	252	316	339	367
Venezuela	326	435	424	450	494
Total seven countries	2150	2874	3284	3594	4089
All others	536	685	791	861	1023
Total	2686	3559	4075	4455	5112

Source: Institute of International Education, Open Doors, New York, 1966-1970.

The IIE census data identify five groups of sponsors of the graduate students: the United States government, the home government, United States private organizations, United States colleges and universities and self-supported. Different groups of sponsors often place different emphases on major fields of studies and thereby

differentially affect the patterns of students' specialization and the contribution of graduate education in the United States to economic development of the home countries.

Objectives of the Study

The major objective of this study is to discuss and evaluate the patterns and trends of specialization of the graduate students from selected Latin American countries in United States universities in terms of their relevance to their home countries' employment opportunities and economic development needs. The hypothesis to be tested is that these patterns and trends of specialization reflect the areas in which graduate education can make maximum contribution to home countries' economic development.

The second objective is to compare and contrast the patterns and trends of specialization of graduate students sponsored by different sponsor groups in terms of their relevance to economic development needs and employment opportunities of their home countries. The purpose of these comparisons is to evaluate the contribution of each sponsor group to Latin America's economic development, and to reveal the effects of sponsorship on graduate students specialization.

Methodology

The effectiveness of a certain pattern of specialization depends upon both the needs of the home country for different types of specialties and the opportunities it affords for making use of the education received. The needs represent the country's educational requirements to meet specific social, political and economic goals. Employment

opportunities reflect the demand for given types of education. Employment opportunities may diverge from the optimal needs of economic development, because opportunities are affected by the system of traditions, values and political factors. For example, economic development requires the development of the agricultural sector which requires specialists in agriculture, but existing agrarian systems and institutions usually seriously limit employment opportunities for specialists in agriculture.

Evaluation of patterns of specialization solely in terms of development needs and ignoring market conditions is unrealistic. The existence of many specialists in a field with low employment opportunities results in underutilization of their talents. On the other hand, evaluation in terms only of employment opportunities may not be the most appropriate for economic development. In developing countries, social, political and institutional circumstances that prevent employment opportunities from being identical to development needs are likely to be improving. A skill may create conditions for economic growth which in turn create demand for that skill. That is, skill may be an economic good where supply creates its own demand.[11] Thus, scientists by inducing the government to support research create a situation where many more scientists will be needed.

Consequently, evaluation of patterns of specialization in this study will be in terms both of development needs and of employment opportunities. Indications of both are necessary for this evaluation.

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[11]John Vaizey, "The Labour Market and the Manpower Forecaster--Some Problems," International Labour Review, 1965, p. 354.

Modern economic development theory suggests that the needs of a country for highly qualified specialists depend largely on the level and rate of growth of its economic development. In the early stages of development, when traditions, values and old institutions restrict economic growth, a country especially needs qualified writers, sociologists, politicians, public administrators, economists and specialists in education. Emphasis in higher education, therefore, should be placed on these structural fields of specialization. Long-term economic development with continuous increase in industrialization, urbanization and increasing demand for agricultural products, requires increasing numbers of economists, business managers, engineers, scientists and agricultural specialists.

Examination of the level and trend of development of each selected country and the rates of growth of its industrial sector and its agricultural sector will help identify the relevant professional specialties needed for its economic development in a broad sense. Data from various United Nations publications are utilized in this analysis.

Direct indicators of employment opportunities require data on the demand for and supply of various specialties. Data on demand, as measured by the sum of those employed and the number of job vacancies, are not available. Unreliable data on the supply of high-level manpower by field of specialization are available for only a few specialties in a few of the countries studied. Data on salaries by profession, that would provide a measure of employment opportunities, are also not available.

Therefore, an indirect measure of employment opportunities was developed and utilized. Time series data for the 1950's and 1960's on the distribution of student enrollments and graduates by fields of specialization in Latin American universities were used for this purpose. These data are available for the seven selected countries and show a tremendous increase of university enrollment in the 1960's in all countries. This rapid expansion of university enrollment has been accompanied by changes in the distribution of specializations. This study makes the basic assumption that the underlying causes of such changes in the composition of fields of specialization in higher education are changes in employment opportunities created by the economic development activities and by industrial expansion in the 1960's.

The changes in the proportions of students in various fields of specialization over time will be used as the indicator of changes in opportunities and changes in conditions in the markets for high-level manpower. The basic assumption is that higher proportions of students are enrolling in fields where greater opportunities exist or are expected.

Another indicator of the employment opportunities in the Latin American countries is the brain drain in various professional specialties. A major cause of emigration to the United States from Latin America is the over supply of certain specialties relative to low levels of professional and economic opportunities in the home countries.[12] Lack of professional opportunities include: (1) lack

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[12]Charles V. Kidd, "Migration of Highly Trained Professionals from Latin America to the United States," in The International Migration of High-Level Manpower, The Committee on the International Migration of Talent, New York, 1970, p. 462.

of employment opportunities, (2) low income and (3) underutilization of talent. Lack of opportunities to utilize the advanced training may create frustration and alienation in individuals who may consequently emigrate.

The United States is the only country outside Latin America to which professionals from Latin America migrate in significant numbers. Migration to Europe has been very limited. Data from the Immigration and Naturalization Service, United States Department of Justice, show the numbers of Latin American professionals admitted to the United States with immigrant visas in various fields of specialization. Data on the migration of professionals from Latin America to the United States will provide evidence on employment opportunities conditions in some fields in the home countries relative to the opportunities available abroad.

The patterns and trends of specialization of Latin American graduate students will be analyzed and evaluated with respect both to general indications of development needs for different types of specialties and to employment opportunities in the home countries. For such purposes reliable data on Latin American graduate students in the United States colleges and universities are necessary and are available.

The Institute of International Education conducts an annual census of all foreign students in United States colleges and universities.[13] Unpublished raw data on Latin American graduate students from

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[13]The IIE Census data cover more than 90 percent of all foreign students enrolled in the U. S. colleges and universities. For example, in the 1968-69 survey, 2,835 institutions were surveyed, and 2,168 institutions responded, or 76 percent of the total polled. Foreign

the IIE annual censuses are available for the seven selected countries for five school years, 1965-66 through 1969-70. The data include information about students' field of specialization and sponsor. Using these data, the patterns and trends of specialization of graduate students from each of the seven countries will be identified. These patterns and trends will then be discussed and evaluated in terms of their relevance to the home countries' development needs and employment opportunities.

Within the pattern of specialization of students from all countries combined, in each of the years 1965-66 and 1969-70, sub-patterns of students sponsored by each sponsor group will be identified, discussed and evaluated. Analyses and comparisons between these sub-patterns will reveal the relative contribution of each type of sponsor to the home countries' economic development.

Organization of the Study

Chapter II deals with the functions of professionals in both technical and structural specialties in the economic development process. The analyses will suggest hierarchies of needs for various fields of specialization at different levels of economic development.

Chapter III presents significant economic indicators to identify the levels and trends of development for the seven selected Latin

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students were reported by 1,846 of the institutions responding, representing 85 percent of the respondents. Fifteen percent of the institutions responding, or 322 of them, reported no foreign students in attendance. Information for the surveys is supplied by the individual foreign students through the cooperation of their U. S. colleges and universities.

American countries. The indicators of the level of development which are utilized are per capita gross domestic product, the Harbison-Myers index of human resource development and the percentage of the labor force employed in agriculture. The relative importance, levels and trends of development of the agricultural and industrial sectors are identified through the percentages and trends of gross domestic product produced in agriculture and industry, the rate of growth of industry, and the rate of growth of agriculture. The analysis in Chapters II and III help clarify the development needs for professionals in various fields of specialization in a broad sense.

In Chapter IV employment opportunities in various fields of specialization are analyzed. For this purpose an indicator of employment opportunities will be constructed by using time series data published by the United Nations Educational, Scientific and Cultural Organizations (UNESCO) on enrollments and graduates of students in Latin American universities.

The migration of highly trained professionsls to the developed countries are discussed in Chapter V. Data on the numbers and fields of professionals emigrating from Latin America to the United States collected by the Immigration and Naturalization Service, United States Department of Justice, will identify the immigrating specialties. Large migration of certain specialties may corroborate the low levels of opportunities in the home countries relative to the opportunities available abroad.

Data collected by the Institute of International Education on Latin American graduate students in the United States universities from 1965-66 to 1969-70, their fields of specialization and their sponsors,

are analyzed and evaluated in Chapters VI and VII. The evaluation will be in terms of their relevance to their home countries economic development needs and employment opportunities as indicated in the previous chapters. The analyses in Chapter VI identifies and discusses the patterns and trends in specialization of students from the seven selected countries. Chapter VII presents analyses and evaluation of patterns of specialization of the groups of students sponsored by each type of sponsor. Finally, Chapter VIII presents the summary and conclusions of the study.

CHAPTER II

FUNCTIONS OF TECHNICAL AND STRUCTURAL SPECIALTIES

At any given point in the growth process a country's economy has a particular stock of capital items and labor skills. The technical knowledge available to it is reflected in the capital items and labor skills and in the manner in which production is organized. Other relevant determinants of the productivity of capital and labor are natural resources and social structure. Economic development requires accumulation of technical knowledge and application of modern techniques of production. The social environment in a traditional economy presents serious obstacles to applying new techniques.

Growth of underdeveloped countries requires education at all levels. Educational programs effectively related to growth must be carefully selected and managed. Higher education provides the strategic manpower at the managerial, professional and technical levels. Graduate education provides the most highly qualified specialists.

The rate of modernization of a country is associated with the rate of accumulation of high-level manpower.[1] Professional people must therefore be trained in various fields of specialization at high levels

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[1]Frederick Harbison and Charles A. Myers, Education, Manpower, and Economic Growth: Strategies of Human Resource Development, New York, 1964, p. 14.

of education. They are needed to free the society from its traditional values and social institutions that restrict the incentives for economic development, to introduce new systems of land use, to build the educational system, to introduce new methods of production, to develop new means of communication, to staff new and expanding government services and to carry forward industrialization.

An important decision which confronts all nations is the emphasis on fields of specialization in higher education. The choice between the stressing of higher education on science and technology versus the structural areas of specialization is a difficult one for all underdeveloped nations. The decision should be related to the level of economic development and the type of social environment of the society. In this chapter the functions of "technical" and "structural" specialties, as termed by Shearer,[2] are discussed in relation to levels of economic development. Chapter III is concerned with an explanation of the levels of economic development of the selected Latin American countries. Explanations of the functions of both technical and structural specialties and their relationships to levels of economic development help clarify the relative emphasis on various fields of specialization needed for different levels of economic development.

Functions of Technical Specialties

Economic growth requires continuous technological advance and a steady supply of specialists in technical fields such as engineering,

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[2]John C. Shearer, "International Migration of Talent and the Foreign Student," Proceedings of the Twenty Second Meeting of the Industrial Relations Research Association, 1969, p. 268-269.

natural sciences and agronomy. Accumulation of technical knowledge is necessary to introduce and apply techniques of production imported from developed countries. The most immediate effect of the introduction of new technical knowledge into the production process is that the productivity of the direct inputs, capital and labor, is raised. Thereby a larger output with given quantities of inputs becomes possible, that is, technical efficiency is increased. To isolate the role of applying modern technical knowledge, that is the role of scientific and technical specialties, it is convenient to explain it within the framework of the neo-classical economic development model.

The Neo-Classical Economic Development Model

The neo-classical economic development model consists of a production function that permits substitution between factors of production.[3] It simplifies the economy to one output (Y) and two homogeneous inputs, labor (L), and capital (K).[4] Figure 1 shows the quantity of capital, measured on the vertical axis and the quantity of labor, measured on the horizontal axis. The output, (Y) is measured on curves of isoquants Y_1, Y_2, and Y_3. An isoquant shows the different combinations of the two resources with which a society can produce an

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[3]Robert M. Solow, "A Contribution to the Theory of Economic Growth," Quarterly Journal of Economics, February, 1956, pp. 65-94; T. W. Swan, "Economic Growth and Capital Accumulation," Economic Record, November, 1956, pp. 334-343; and J. E. Meade, A Neo-Classical Theory of Economic Growth, (London, 1962).

[4]Although capital and labor are not homogeneous in reality, the assumption of their homogeniety is relevant in this part of the study in order to isolate the effect of technology on production.

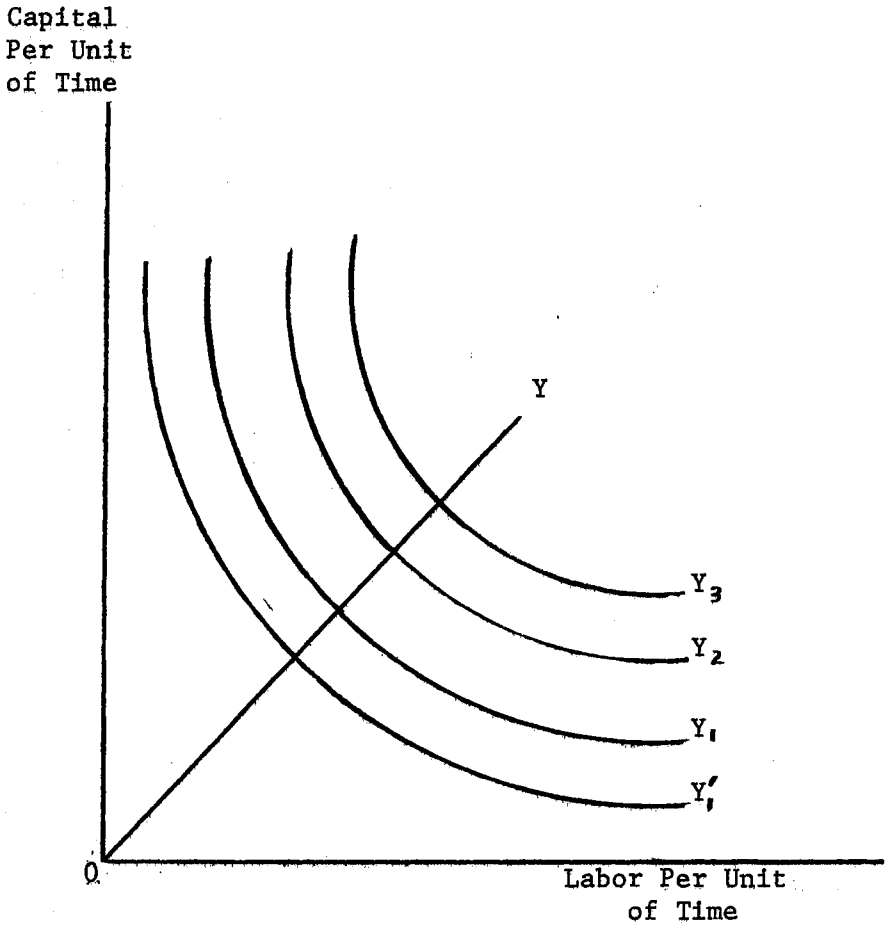

Figure 1. The Neo-Classical Economic Development Model

equal amount of output. Greater amounts of output are represented by higher isoquants. For example, isoquant Y_2 represents a higher level of output than Y_1 and Y_3 higher than Y_2.

Economic growth is represented by an expansion path (O-Y), which is drawn from one iso-quant to the next through points of equal tangency of the relative price ratio of capital and labor to the iso-quants (least cost combinations of capital and labor).

Mathematically, the production function can be written as in (2.1).

$$Y = \gamma K^{\alpha} L^{B} \tag{2.1}$$

Where, Y is the output, K is the capital and L is the labor. Gamma γ is constant with a given state of technology. α and B are exponents which indicate the output elasticities of capital and labor. Increases in output are fully equal to the marginal physical product of the inputs times their respective unit increases as shown in (2.2).

$$\Delta Y = \frac{\partial Y}{\partial K} \cdot \Delta K + \frac{\partial Y}{\partial L} \cdot \Delta L \tag{2.2}$$

The basic formula for the annual rates of economic growth of Y, K and L can be written as (2.3).

$$\frac{\Delta Y}{Y} = \frac{\partial Y}{\partial K} \cdot \frac{K}{Y} \cdot \frac{\Delta K}{K} + \frac{\partial Y}{\partial L} \cdot \frac{L}{Y} \cdot \frac{\Delta L}{L} \tag{2.3}$$

setting

$$\frac{\partial Y}{\partial K} \cdot \frac{K}{Y} = \alpha \text{ and } \frac{\partial Y}{\partial L} \cdot \frac{L}{Y} = B$$

substituting in (2.3) we get (2.4).

$$\frac{\Delta Y}{Y} = \alpha \frac{\Delta K}{K} + B \frac{\Delta L}{L} \tag{2.4}$$

The effect of technical progress on economic growth rates can be explained as follows. Assume that the production function shifts upward

over time due to technical progress. The shift parameter is γ which represents the contribution of technical progress to total output in percentage terms beyond the contribution of capital and labor. The production function can be written as in (2.5).

$$Y = \gamma K^{\alpha} L^{B} \tag{2.5}$$

The production function can be expressed in terms of rates of growth as in (2.6).

$$\frac{\Delta Y}{Y} = \frac{\partial Y}{\partial K}\frac{K}{Y} \cdot \frac{\Delta K}{K} + \frac{\partial Y}{\partial L}\frac{L}{Y} \cdot \frac{\Delta L}{Y} + \frac{\Delta Y'}{Y} \tag{2.6}$$

where $\frac{\Delta Y}{Y}$ is the total annual rate of change in output (Y).

$\frac{\Delta K}{K}$ is the annual rate of change in capital (K).

$\frac{\Delta L}{L}$ is the annual rate of change in labor (L).

$\frac{\Delta Y'}{Y}$ is the annual rate of change in output Y due to technological advance. Equation (2.6) can be rewritten as in (2.7).

$$\frac{\Delta Y}{Y} = \alpha \frac{\Delta K}{K} + B \frac{\Delta L}{L} + \frac{\Delta Y'}{Y} \tag{2.7}$$

Equation (2.7) shows that economic development and growth, according to the neo-classical model, is the marginal product of capital times the proportionate increase in capital, plus the marginal product of labor times the proportionate increase in labor, plus the proportionate increase in output due to technological advance. Technical progress over time can be shown in a diagram as that in Figure 1, by shifting the isoquants toward the origin. Thus production of a given output can be achieved by less quantities of capital and labor.

Continuous economic growth therefore requires continuous technical progress as well as increases in the quantities of capital and labor. Hagen indicates that:

> If there were no advance in technical knowledge, if rising income were gained only by supplying to each worker additional capital embodying techniques previously known - then as population increased and the quality of capital was increased, the two together would run into increasingly scarcity of resources - and diminishing returns to labor and capital (declining marginal productivity) would cause a decline in income at the margin and average income. As labor and capital increased, the decline in marginal productivity would be faster and faster.[5]

Continuous economic growth then, requires continuous technological advance in order to increase the productivity of capital and labor. Accumulation of technical knowledge is necessary to introduce and apply new techniques of production and organize production process. The technology of production will evolve more and more along scientific lines; traditional production methods will give way to new, advanced techniques of production. Industrial advance requires an increasing supply of engineers, scientists, economists and business administrators. Applying new methods of agricultural production will require a significant increase in modern science and technology. This would change considerably the manpower requirements of the agricultural sector.

A growing and expanding industrial sector increases the need for raw materials, energy, transportation, communications, sources of finance, trade and commercial services. Industries tend to become concentrated geographically and on the whole near the consumer markets provided by big cities. This process strongly stimulates urban concentration. The large masses of people attracted to the cities increase the need for all sorts of urban services, such as housing,

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[5]Everett E. Hagen, The Economics of Development, (Homewood, Illinois, 1968), p. 198.

schooling, water supply, electric energy and sewage systems and facilities for distributing foodstuffs.

The rapid advance of the industrial sector, both in absolute terms and in relation to the other sectors of the economy, therefore, produces great stress and tensions throughout the economy, especially on the service sector. Well qualified professionals will be required to deal with the problems of public administration, education, construction and business.

Functions of Structural Specialties

Though technical advance and technical specialties are very important for economic development, they are not the only factors necessary for economic development. Technical progress requires favorable structural factors. Structural factors refer to those social, economic and political factors that bear on the effectiveness with which the economy operates, such as family ties, income distribution, work habits, legal environment, political systems and the attitudes of the people toward work, mobility, savings, investment and applying new technology. These structural factors act in two different ways: they act on the rate of accumulation of capital and technical knowledge, and on the effectiveness with which existing inputs are used. Favorable structural factors would increase the available resources and would increase the efficiency in the utilization of output from already available resources. For example, favorable attitudes toward saving would increase capital accumulation and the attitude toward investment and risk taking would increase the productivity of capital invested.

Raul Prebish, referring to Latin American economic development, stated:

> The social structure prevalent in Latin America constitutes a serious obstacle to technical progress and consequently, to economic and social development . . . Is it suggested that the present system, under which the energies of individual initiatives are cramped by social stratification and privilege, should be kept intact? Or is the way to be cleared for this initiative by the structural reforms referred to, so that the system may acquire the full dynamic force it lacks at the present?[6]

Clifford Geertze indicates that "any society or culture is capable of economic development. The problem is to recognize within each culture those structural factors which impede development and change them to accept it."[7]

To understand the necessity for graduate education in structural specialties, it is important to explore the structural barriers to development. Much of the explanation of underdevelopment is to be found in the social, institutional and political characteristics within which the underdeveloped economy operates.[8] There are unlimited numbers of these noneconomic characteristics.

An underdeveloped country is predominantly traditional. Even though the modern sector is outward looking and responds to the incentives of the market, it is affected to some extent by the values and

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[6]United Nations, Economics and Social Council, Economic Commission for Latin America, Towards a Dynamic Development Policy for Latin America, Santiago, Chile, 1963, pp. 4-5.

[7]Clifford Geertze, Peddlers and Prices: Social Development and Economic Change in Two Indonesian Towns, Chicago, 1963, p. 145.

[8]Everette E. Hagen, The Theory of Social Change: How Economic Growth Begins, (Homewood, Illinois, 1962), pp. 20-22.

traditions of the traditional sector.[9] Typically in Latin America, the traditional sector is static, low in productivity and unresponsive to the stimuli of the market system. A traditional society is made of small agricultural villages that are more or less isolated from each other. A routine has been established in almost all areas of activity. This routine repeats itself without interruption. Consequently, a traditionalistic approach to all social activity in general and to economic activity in particular is established. Included in this tradition are many elements crucial to the general question of economic growth.

Family ties are very strong. This fact has several consequences of importance to the development question.[10] It creates a barrier against mobility of workers as they are most reluctant to leave the areas in which they were born and raised. The strong and extended family ties also mean that each member of the family has a responsibility toward the other members. This is true to the extent that unemployed workers are taken care of by other members of the family. This kind of family social security system acts as a barrier to mobility and to a lesser extent to work effort. Furthermore, the loyalty to the extended family often results in inefficiency. Jobs are often given to relatives regardless of their productivity. Under these conditions, it is more or less accidental if the most able person available is employed in a given job.

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[9] ECLA, United Nations, Social Change and Social Development Policy in Latin America, New York, 1970, pp. 22-24.

[10] Henry J. Bruton, Principles of Development Economics, (Englewood Cliffs, N. J., 1965), Chapters 7 and 13.

The family system is one reason why in these societies, reward is often unrelated to effort. This separation of income from effort is surely one of the most significant social factors accounting for much of the low productivity of workers in the traditional sectors.

In terms of income distribution there is only a very small middle income group. The very rich group is a very small minority of the population, and the very poor group is a huge majority of the population. This situation, which can be explained principally by the land ownership system, tends to discourage work effort in two ways: first, it is almost impossible to move from the poor to the rich class, which discourages the poor class from trying. Second, workers feel that they do not receive their "just" share of the product.[11] Thus, efforts to increase productivity are discouraged. The example often cited is that increases in agricultural productivity are discouraged because so much goes to the landlord, the peasant cultivator finds little left over to reward him for his work effort. This system of income distribution has adverse effects on the individual and the investor, and their capital accumulation habits. A disincentive to save or to accumulate capital exists simply because there seems little purpose for saving.

Technical change is difficult in traditional society. Any new technological process involves in some sense a process of accumulation. Modern techniques require many changes in habits and routines. To incorporate into the economy a new way of conducting the production of an old product or the introduction of a new product requires some adjustment, some modification in traditional activity. Where traditions

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[11] Ibid., p. 111.

are strong and firmly entrenched, the introduction of a new technology is likely to face a very high barrier.[12]

The work habits of the labor force are to some degree affected by traditionalism. The workers' limited horizon both as to time and as to geography means that their understanding of what extra income can do for them is also thereby limited. Workers may therefore tend to work only to the extent necessary to meet the limited needs of which they are aware.[13] These attitudes toward the value of work decrease labor productivity.

The social organization of the underdeveloped country militates against change. The traditional society limits the individual freedom to try new methods, or limits the likelihood of success, i.e., saving usually is used in acquiring land rather than investment in industry. Landlords do not introduce new techniques into the system but rather their efforts are concentrated toward maintaining their strong position in the system. Merchants usually use their capital in trading rather than production. Government bureaucrats are part of the society and are subject to handicaps, pressures, and inhibitions as are individuals in the private sector. Large scale enterprise generally is introduced only by foreign investors.

The ruling class of people in the underdeveloped country concentrates the political power in the hands of a relatively small and conservative elite group. Economic development is difficult where

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[12]Benjamin Higgins, Economic Development (New York, 1968), pp. 251-252.

[13]Ibid., pp. 237 and 263.

education, urbanization and better communication encourage structural changes and are complimentary to economic development. Emphasis on structural specialties is, therefore, of relatively greater importance in the first stages of development, and the technical specialties grow in importance as development progresses.

CHAPTER III

ECONOMIC DEVELOPMENT IN LATIN AMERICAN COUNTRIES

This chapter is concerned with the level of economic development of the seven selected Latin American countries (Mexico, Brazil, Colombia, Argentina, Chile, Venezuela and Peru)[1] and the specialties relevant to these levels. Measures (or indicators) of economic development are developed and used to identify the level of economic development in each country. Each indicator may have a wide margin of error, however, together they provide an indication of the level of economic development. The most relevant economic development indicators for the purpose of this study are (1) per capita gross domestic product, (2) the Harbison-Myers index of human resource development, (3) percentage of labor force engaged in agriculture. The growth rates of gross and per capita domestic product are used to indicate the economic growth rate of the seven countries.

The relative importance, and the level and trends of development of the agricultural and industrial sectors in the selected countries will be identified by (1) gross agricultural production as percentage of gross domestic product, (2) rates of growth of agricultural production, (3) the agrarian systems, (4) manufacturing value added as percentage

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[1] These countries have been consistently the major senders of graduate students to the United States' universities. They are also the largest countries in Latin America in terms of population and gross domestic product.

of gross domestic product, and (5) rate of growth of manufacturing value added. All measures in this chapter will be used to identify the fields of graduate education needed for the seven selected countries.

Economic Development Indicators

Table II presents data on the three economic development indicators utilized to identify the level of economic development of the selected countries, per capita gross domestic product, the Harbison-Myers index of human resource development and the percentage of labor force engaged in agriculture.

Per Capita Gross Domestic Product

Per capita gross domestic product is used by most economists as the basic indicator or measure of the level of economic development. They consider that economic development is an improvement in material well-being as reflected in an increasing flow of goods and services. Per capita gross domestic product for the seven Latin American countries are presented in column (1), Table II. Differences among the seven countries are considerable. The per capita domestic product varied in 1968 from $851 in Argentina to $314 in Brazil. This range of income lies in between those of the developed countries such as the United States and the West European countries with per capita gross domestic product above $1,000 and those of most of the under-developed countries in Africa and South Asia with per capita gross domestic product less than $300.[2]

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[2]United Nations and United States Agency for International Development data.

TABLE II

PER CAPITA GROSS DOMESTIC PRODUCT, INDEX OF HUMAN RESOURCE DEVELOPMENT AND PERCENTAGE OF LABOR FORCE IN AGRICULTURE OF SEVEN LATIN AMERICAN COUNTRIES

Country	(1) Per Capita Gross Domestic Product (1968) U.S. Dollars	(2) Index of Human Resources Development (HM. Index)	(3) Percentage of Labor Force in Agriculture (1967)
Argentina	851	82.0	16.7
Venezuela	765	47.7	30.6
Mexico	631	33.0	50.6
Chile	585	51.2	26.7
Peru	386	30.2	49.9
Colombia	336	22.6	44.4
Brazil	314	20.9	47.8

Source: Column (1) - ECLA, Social Change and Social Development Policy in Latin America, United Nations, New York, 1970, p. 19.
Column (2) - Harbison, F. H. and C. A. Myers, Education, Manpower and Economic Growth, McGraw-Hill Book Company; New York, 1964, p. 33.
Column (3) - Socio-Economic Progress in Latin America, Social Progress Trust Fund Ninth Annual Report, 1969, p. 5.

Index of Human Resource Development (the Harbison-Myers Index)

Harbison and Myers developed a composite index to measure the level of human resource development. They based their measure on the fact that the goals of modern societies are political, cultural, and social as well as economic, and human resource development is a necessary condition for achieving all of them.

> Human resource development, therefore, may be a more realistic and reliable indicator of modernization or development than any other single measure. It is one of the necessary conditions for all kinds of growth, social, political, cultural, or economic.[3]

The index is the arithmetic sum of (1) enrollment at second level of education as a percentage of the age group 15 to 19, adjusted for the length of schooling,[4] and (2) enrollment at the third level of education[5] as a percentage of the age group 20 to 24, multiplied by a weight of five. They ranked the composite indexes of 75 countries into four levels: Level I, underdeveloped; Level II, partially developed; Level III, semi-advanced; and Level IV, advanced.

The index indicates that Argentina was the only Latin American country in Level IV. Chile, Venezuela and Mexico were in Level III and Peru, Colombia and Brazil in Level II. The values of the indexes for these countries are presented in Table II. In other words, Argentina was the most advanced in terms of human resources, followed by Chile,

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[3]Harbison, F. H., and Myers, C. A., Ibid., p. 14.

[4]The data used were for the latest year, ranging from 1958 to 1961.

[5]The data used were for the latest year, ranging from 1958 to 1961.

Venezuela, and Mexico. Peru, Colombia and Brazil had lower levels of development.

A measure of this type, although useful, has certain limitations. The index depends on the enrollment statistics which are a flow rather than a stock of high-level manpower.[6] This brings about problems in comparisons among countries, for the drop-out to graduate ratio varies considerably among countries. For example, a study of the ratio of university graduates to student enrollment per 100,000 inhabitants in 1963 in fifteen countries including Argentina, Mexico, Brazil, and Peru showed that Argentina had the highest rate of drop-outs and the lowest rate of graduates to enrollment, among the 15 countries.[7] The rate of graduates to enrollment varied from 5.5 percent in Argentina to 39 percent in the United Kingdom. Mexico, Brazil, and Peru had ratios of 21 percent, 16 percent and 12 percent respectively.

Percentages of the Active Population Engaged in Agriculture

This measure has high negative correlation with both per capita income and the Harbison-Myers index of human resource development on a world-wide basis,[8] and therefore can provide an indication of the level of development. Reports of the seven countries show the percentage of

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[6]The stock of human capital indicates the level of human resource development which has been achieved by a country; the flow measures the rate of human capital formation over a specific period of time, or it measures the gross or net additions to the stock of human capital.

[7]Organization for Economic Cooperation and Development, Education, Human Resources and Development in Argentina, 1967, pp. 118-119.

[8]Harbison and Myers, Ibid., p. 39.

each country's "active population" engaged in agricultural occupations (Table II).

In Mexico, Peru, Colombia and Brazil, agriculture employs over 40 percent of the active population. In Argentina, Venezuela and Chile the proportion is between 30 and 17 percent. This compares with several industrial countries as follows: United Kingdom, 3.4 percent; United States, 5.5 percent; West Germany, 10.8 percent; and France, 17.6 percent.[9] Thus, the agricultural sectors of the Latin American countries include much higher proportions of the working population than is the case in developed countries.

Growth of Domestic Product

The comparative growth rates of gross and per capita domestic product of the seven selected countries are indicated in Table III. For the period 1961 to 1967, the growth of economic activity measured by average annual growth rate of domestic products shows variation from a minimum of 2.9 percent in Argentina, to a maximum of 6.8 percent in Mexico. Table II shows that all countries except Chile and Peru had higher rates of increase of gross domestic product in 1968 than for the years 1961 through 1967. This may indicate a general trend of more rapid expansion.

Argentina had the lowest rate of overall economic growth during the period 1961-1967. Mexico and Peru maintained the highest average yearly rate of economic growth with approximately 6.8 percent and 6.2 percent,

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[9] Socio-Economic Progress in Latin America, Social Progress Trust Fund Ninth Annual Report, 1969, Inter-American Development Bank, 1970, p. 4.

respectively. Brazil, Chile, Colombia, and Venezuela maintained moderate rates of increase of between 4.5 and 4.9 percent in the same period.

TABLE III

GROWTH RATES OF REAL GROSS DOMESTIC PRODUCT AND PER CAPITA PRODUCT IN SEVEN LATIN AMERICAN COUNTRIES IN SELECTED YEARS

Country	Growth Rates of Gross Domestic Product		Growth Rate of Per Capita Product
	(average 1961-67)	(1968)	(average 1961-69)
Argentina	2.9	4.8	1.9
Brazil	4.7	6.9	1.9
Chile	4.9	2.7	1.7
Colombia	4.7	5.5	1.5
Mexico	6.8	7.0	3.2
Peru	6.2	3.5	2.3
Venezuela	4.5	5.8	1.1
Average of the seven countries	5.0	5.2	1.9

Source: Socio-Economic Progress in Latin America, Social Progress Trust Fund Ninth Annual Report, 1969, Inter-American Development Bank, March, 1970, p. 2.

The rates of growth of gross domestic product have been diluted by substantial accelerations of population growth. The per capita products therefore grew at much lower rates, than did the gross domestic products, as shown in Table III. Mexico was the only country with a

relatively high rate of growth of per capita product (3.2 percent). The rest of the countries had substantially lower rates of growth of approximately two percent or less.

Development in the Agricultural Sector

The agriculture sector is especially vital to the Latin American economies. Its importance is derived from several factors of which the most important are the large proportion of population active in the agricultural sector, the low income of the agricultural population with respect to other sectors of the economy and the importance of agricultural products in the export mix of most of the Latin American countries.

The importance of agriculture in economic growth and development has been stressed by many economists. W. Arthur Lewis states: "it is not profitable to produce a growing volume of manufactures unless agricultural production is growing simultaneously."[10]

Lewis points out the necessity of a balance between agriculture and industrial growth and was among the first to correct the widely held notion that the economic expansion of underdeveloped countries must come through a "big push" on the industrial side alone.

The Agrarian System

Most of the farms in Latin America still operate under the

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[10] W. Arthur Lewis, Economic Development with Unlimited Supplies of Labor, the Manchester School of Economic and Social Studies, Vol. 22, No. 2, 1954.

traditional agricultural structure.[11] The large landowners and their representatives are the richest and most influential members of their communities. The land tenure institutions are a product of the power structure. They bind the workers to the land while conceding them little income and few continuing rights. Tenants and workers on the large estates depend upon the landowners for employment - there being no alternatives - and for a place to live. Wage and rental agreements can be adjusted to suit the landowner's convenience so that all productivity increases and windfall gains return to him.

The large farm owners have financial and commercial activities in the large cities, political responsibilities in the capital and professional and cultural interests far removed from the land. Agriculture as such is often only of secondary interest to them. Typically they maintain residences in the city.

The traditional small farms are characterized by tenure institutions that are scarcely more conducive to development than those found on the big estates. The small farms are generally dependent for their contacts with the outside world upon a small group of town dwelling politicians, landowners, merchants, and secular and esslesiastical officials. As a result, these people have a great deal of power over the small holders. They are seldom interested in jeopardizing their influence by promoting other close contacts with the outside world or by encouraging technical innovation and education that would make the

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[11] Solon L. Barraclough and Arthur L. Domike, "Agrarian Structure in Seven Latin American Countries," in Charles T. Nisbet (ed.) Latin America: Problems in Economic Development (New York, 1969), pp. 91-131.

small holders more independent and mobile. This system renders change and technological improvement unlikely.

To the extent that traditional tenure systems impede full, efficient use of the land, the labor force and capital in agriculture, economic progress is restricted. Both large farms and small farms use resources wastefully. In small holdings labor is wasted by overuse on small pieces of land.

Only a small portion of the land of the large estates has been in cultivation. The remainder is left in native vegetation. Relatively much less labor is used on most large holdings than on small farms. Even while average production per worker is sometimes quite high, production per hectare is low compared to either technical potentials or to outputs achieved on small units. This is so despite the facts that the large holdings contain the best soils and the land most favorably located with regard to roads, markets and water supply and that the owners have ready access to credit and technical assistance.[12]

Measured by commercial standards the management of large land holdings is typically deficient. For example, agronomists estimate that the large-scale producers of cocoa and coffee in Brazil could double production of many existing plantations with only nominal improvements in management and investment. In Argentina new investments on large cattle estate farms are not made even though returns would be increased by 25 to 40 percent, because they require better management than is provided by their absentee owners. In the case studies made in the costal areas of Peru, capital-product ratios of 6.0 were estimated on

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[12] Ibid., pp. 102-105.

large units, indicating very low capital productivity. In the United States the ratio is typically about 2.5.[13]

Except for the recent land reforms in Chile and Peru, Mexico and Venezuela are the only Latin American countries that have effected land reforms on a large scale.[14] Mexico started her land reform in 1917. Venezuela began her land reform in 1958. The rest of the Latin American countries have enacted land reform legislation, but there is a vast gap between promulgation of laws and their meaningful implementation.

Much of the effort to increase efficiency must necessarily be applied after land reform takes place, rather than as a substitute for it. Land reform is a revolutionary measure which passes property and power from one group of the community to another. Vigorous development policies should accompany land reform within agriculture and outside of it. In the agriculture sector a new, flexible and efficient pattern of resource allocation and use must be created.

The Percentage of GDP in Agriculture

Although agriculture employs a high proportion of the work forces (Table II), the data of Table IV indicate the low productivity of agriculture. The agricultural sector represents small percentages of GDP from a minimum of 7.7 in Venzuela to a maximum of 31.4 in Colombia.

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[13] Ibid., p. 104.

[14] Edmundo Flores, "Latin American Land Reform: Meaning and Experience," in Charles T. Nisbet (ed.) Latin America: Problems in Economic Development (New York, 1969), pp. 132-140.

Close to the minimum was Chile (10.5 percent) and close to the maximum was Brazil (26.4 percent).

According to the data of Table IV, Latin American agricultural production has failed to grow at the rate of population expansion in four countries. The rates of growth of population in Brazil, Colombia, Chile and Peru were 3.0, 3.2, 2.5, and 3.1 percent, respectively, while the rates of growth in agricultural products of these four countries were 2.8, 2.3, 2.1 and 0.7 percent. The only countries which had rates of growth in agriculture exceeding 4.0 percent were Mexico (4.7 percent) and Venezuela (5.2 percent). Comparing agricultural production growth with the average growth of GDP of 5.0 percent for the seven countries over the period (Table III) shows agriculture to be a lagging sector in the economy of Latin America.

Data in Table V show that except for Chile and Venezuela, whose major exports are copper and petroleum, respectively, agriculture is of dominant importance for the exports of the rest of the seven Latin American countries. In 1966, agricultural products constituted 92.5 percent of total exports of Argentina, 80.2 percent of Brazil and 75.4 percent of Colombia. Mexico and Peru each had about 51 percent. For the period 1964-1966, meat and meat products and wheat accounted for 44 percent of the exports of Argentina. Coffee accounted for 47 percent and 67 percent of the exports for Brazil and Colombia, respectively. Cotton accounted for 18 percent and 13 percent of the exports of Mexico and Peru, respectively.

The principal means for solving the agricultural problem, defined as low productivity, low income of the agricultural population and poor

TABLE IV

GROSS AGRICULTURAL PRODUCT, RATE OF GROWTH OF AGRICULTURAL PRODUCTION AND AND POPULATION GROWTH RATE OF THE SELECTED COUNTRIES

	Gross Agricultural Product as a Percent of GDP (1968)	Average Annual Rate of Growth of Agricultural Product (1961-68)	Average Population Growth Rates (1961-68)
Argentina	15.5	2.5	1.6
Brazil	26.4	2.8	3.0
Colombia	31.4	2.3	3.2
Chile	10.5	2.1	2.5
Mexico	14.6	4.7	3.4
Peru	18.9	0.7	3.1
Venezuela	7.7	5.2	3.5

Source: Column (1) - ECLA, Social Change and Social Development Policy in Latin America, New York, 1970, p. 19.
Columns (2) and (3) - Socio-Economic Progress in Latin America, Social Progress Trust Fund Ninth Annual Report, 1969, pp. 5 and 10.

TABLE V

TEN AGRICULTURAL COMMODITIES AS PERCENT OF 1964-66 TOTAL EXPORTS

Country	Coffee	Cotton	Meat & Meat Prod.	Wheat	Sugar	Bananas	Corn	Wool	Hides & Skin	Cocoa	Total	Agricultural Prod. as Percentage of Total Exports 1966
Argentina	-	-	24	20	1	-	12	8	4	-	69	92.5
Brazil	47	7	2	-	4	-	1	1	1	3	66	80.2
Chile	-	-	-	-	-	-	-	-	-	-	1	6.4
Colombia	67	2	-	-	-	3	-	-	-	-	72	75.4
Mexico	7	18	2	2	7	-	4	-	-	-	36	51.5
Peru	5	13	-	-	7	-	-	-	-	-	26	51.4
Venezuela	1	-	-	-	-	-	-	-	-	-	1	1.2

Source: Commodity Statistics from U. S. Aid, Economic Data Book, Total Agricultural Export from FAO, Trade Yearbook, Vol. 21, 1967.

export performance, concerns basic structural reform in the agricultural sector; that is, economically planned and managed agrarian reform. In addition, agricultural research, agricultural extension services, and increased use of fertilizers and other agricultural chemicals are necessary. An increased number of agricultural specialists should be trained to contribute to a better knowledge of new crop varieties and agricultural techniques suited to local conditions.

Development in the Industrial Sector

The Percentage of GDP in Industry

Manufacturing in 1968 produced 23.4 percent or about a fourth of Latin America's gross domestic product, compared to a share of 22.4 percent in 1961 (Table VI). These proportions exceed the contribution of the agricultural sector to gross domestic product, which dropped from 18.4 percent in 1961 to 16.6 percent in 1968. The employment structure of the two sectors, however, is quite different, and reflects sharp differences in average labor productivity. Manufacturing accounts for only 14 percent of the labor force with nearly half in handicrafts, while agriculture employs 42 percent of the labor force.[15] Data on the structural changes from 1961 to 1968 and the relative importance of the value added portion of the manufacturing sector within the individual countries of Latin America are presented in Table VI. As this table shows, the most highly industrialized country of Latin

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[15] Socio-Economic Progress in Latin America, Ibid., p. 13.

TABLE VI

MANUFACTURING VALUE ADDED AND PERCENTAGE OF GROSS DOMESTIC PRODUCT IN THE SEVEN LATIN AMERICAN COUNTRIES, 1961 AND 1968

Country	1961 Value of Millions of 1963 U. S. Dollars	1961 % of GDP	1968 Value in Millions of 1968 U. S. Dollars	1968 % of GDP	Rate of Growth of Value Added
Argentina	4,592	35.2	5,471	35.2	2.5
Brazil	4,359	22.8	6,385	25.1	5.6
Chile	575	23.1	863	25.6	6.0
Colombia	744	n.a.	1,048	n.a.	5.0
Mexico	2,712	19.8	4,724	21.2	8.3
Peru	487	18.4	777	20.2	6.9
Venezuela	816	13.1	1,304	14.9	6.9
Seven Countries	14,285		20,572		5.5
Latin America	15,588	22.4	22,513	23.4	5.4

*n.a. - not available

Source: Socio-Economic Progress in Latin America, Social Progress Trust Fund Ninth Annual Report, 1969, Inter-American Development Bank, March, 1970, pp. 15 and 16.

America in structural terms is Argentina, with 35.2 percent of gross domestic product derived from value added by the industrial sector in 1968. Chile is second with 25.6 percent and Brazil is third with 25.1 percent. Mexico is fourth with 21.2 percent and Peru is fifth with 20.2 percent.

However, structural comparisons of this type have certain limitations. They are dependent on the overall levels of development and size and nature of the economy. For example, the disproportionate importance of petroleum in Venezuela, which belongs to the mining sector, reduces the relative importance of the manufacturing sector considerably.

Industrial Production Trends in the 1960's

In the Latin American economies the manufacturing sector, in terms of value added, expanded by 5.5 percent per year from 1961 to 1968 for the seven countries as a whole (Table VI) compared to a growth of gross domestic product of 5.0 percent (Table III). The value of world industrial production, however, expanded at the higher rate of 6.8 percent annually during the same period. On the basis of estimates in constant dollars of 1963, value added generated by the manufacturing sector of Latin American countries in 1961 amounted to U. S. $15.6 billion, and in 1968 to U. S. $22.5 billion.[16]

Compared to the growth of value added of the manufacturing sector of 5.4 percent, value added in mining in Latin America expanded by only

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[16]Ibid., p. 13.

4.2 percent a year, from 1961 to 1968, but value added by the generation of electricity rose by 8.7 percent, the highest rate of growth of all the economic sectors. Value added by construction activity also increased more rapidly than that added by manufacturing, at a rate of 5.7 percent a year.[17]

Except for Argentina and Colombia, the rate of growth of value added by industrial production was higher than that indicated by the regional average (5.4 percent). Mexico, Peru and Venezuela achieved higher rates of industrial growth in terms of value added than did the world as a whole (6.8 percent) in the same period (1961-1968). Further development of industrial sector can be achieved in Latin America by well administered industrial planning, which needs increasing numbers of specialists in business administration and all fields of engineering.

In conclusion, the above analysis of Latin America's economic development indicates that the seven countries are in intermediate stages of development, in terms of per capita income, human resource development, and predominance of agriculture in the economy. Nevertheless, there are major variations among the seven largest Latin American countries in terms of their economic development. Argentina is the most advanced country in terms of per capita gross domestic product, human resource development and industrialization. Next to Argentina in economic development are Venezuela, Chile, and Mexico. Peru, Colombia and Brazil are the least developed of the seven countries. In terms of rates of growth of domestic product Argentina has recently

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[17] Ibid., pp. 13-14.

experienced the lowest rates of growth of gross domestic products and of manufacturing value added. The other six countries had higher rates of growth of both domestic product and manufacturing value added in the 1960's.

In each of the seven Latin American countries some industries are well developed, particularly in Argentina, Chile, Mexico and Brazil. In addition, Venezuela has a large and technologically sophisticated petroleum industry. The rates of growth of the industrial sectors in the seven countries are much higher than those of the agricultural sectors. The agricultural sectors are lagging in the seven countries. Agricultural production has failed to grow at the rate of population expansion. Generally, the reason lies in the traditional agrarian systems that restrict the application of technology in agriculture.

For the levels of development of the selected Latin American countries, graduate education is needed in both the structural and technical areas of study. Graduate education in structural fields of specialization, particularly social sciences and education is necessary to accelerate the rates of economic development of the seven countries since structural barriers to economic development tend to exist throughout the underdevelopment stages, as explained in Chapter II.

The technical specialties are needed to apply and innovate new techniques of production and to carry forward modernization of agriculture and industrialization. Graduate education in agricultural fields is needed specially for Mexico and Venezuela which have had large scale agrarian reforms. It is also needed for Argentina, Brazil, Colombia and Peru, which depend heavily on agricultural products for their exports.

Graduate education in business administration and all fields of engineering are needed for all countries; expecially for Argentina, Venezuela, Mexico and Chile who are relatively advanced in industrialization. The increasing needs for public service which accompany industrialization and urbanization require the training of specialists in various fields including education, engineering and public administration.

CHAPTER IV

EMPLOYMENT OPPORTUNITIES IN FIELDS OF SPECIALIZATION

The purpose of this chapter is to estimate the employment opportunities in various professions in the seven Latin American countries. Wherever ample opportunities exist for a field of specialization there is a good chance that professionals in such a field will be highly useful to their country. Conversely, shortages of employment opportunities in fields indicate oversupply of professionals in those fields relative to demand.

The best direct measure of employment opportunities in a particular country requires data on the demand and supply of various professionals. Reliable data on demand are not available for any of the Latin American countries. Inaccurate data on the supply of high-level manpower are available for only a few professions in a few countries.[1]

Therefore, some indirect measure of employment opportunities is necessary. One such can be developed from time series data on Latin American University student enrollment and graduates and their distribution among various specialties. The proportion of students in a field of specialization at a particular time can be explained by both the

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[1] These generalizations derive from personal discussion with Professor John C. Shearer, who for many years has worked with these data for various Latin American countries.

level of opportunity in that field and the degree of status of that profession. In the past the second factor was the main determinant of enrollment distribution. Higher proportions of students were enrolled in professions with high status, such as medicine and law. Low proportions of students were enrolled in fields with low status, such as education and physical and natural sciences.

In the economic development process industrialization, urbanization, and the middle class expand rapidly. These seven Latin American countries have experienced industrial expansion in the 1960's. Population increased at an average of about three percent a year. The middle class increased considerably in both absolute and relative terms. The tertiary sector is expanding. In Latin America, the middle class, for structural reasons, relies heavily on education as the key for favorable employment opportunities. The development activities have opened many opportunities to university graduates in both the industrial sector and the service sector. For these reasons, university enrollment increased tremendously in the 1960's to meet the growing demand for high-level manpower.

Economic development activities create changes in employment opportunities. Students, especially those from the middle class, enroll in fields where greater opportunities exist or are expected. Therefore, changes in the proportions of students in various fields of specialization over time can be used as an indicator of the changes in opportunities and changes in conditions in the market for high-level manpower. The assumption is that the greater the increase in the existing level of opportunities in a particular field, the faster the proportional increase of students in that field.

Summary statistics on trends in enrollment in Latin American universities for the seven selected countries are presented in Table VII, and illustrated in Figures 2 to 5. These data are based on detailed data for each country which are presented in Appendix A. During the first six years of the 1960's, enrollment almost doubled in Colombia, Chile, Brazil, Venezuela and Peru, and increased about 50 percent in Mexico and Argentina.

Such tremendous increases have been concurrent with changes in the distribution of students' specialization. Until 1960, medicine and law were preferred occupations in most of the Latin American countries. Engineering became an important specialization only in the late fifties. Enrollment in engineering ranked third and often exceeded law in the sixties. Tremendous changes in enrollment proportions are found in some fields of specialization from one year to the next and can be explained by variation in placing the same subfields of study under the same headings of major fields. For example, education often included subfields of humanities. Data on graduates are used to clarify trends whenever enrollment data are not adequate.

Trends in Enrollment in Major Fields of Specialization

Medicine and Law

In 1957, medicine accounted for 50 percent of the graduates in Colombia, 41 percent in Argentina, 35 percent in Chile and 34 percent in Venezuela. In the same year law graduates accounted for 21 percent of the graduates in Brazil, 14 percent in Colombia, 13 percent in both Argentina and Peru (Appendix A).

TABLE VII

PERCENTAGE DISTRIBUTION OF STUDENT ENROLLMENT IN DOMESTIC UNIVERSITIES BY FIELD OF SPECIALIZATION IN SEVEN LATIN AMERICAN COUNTRIES FOR SELECTED YEARS

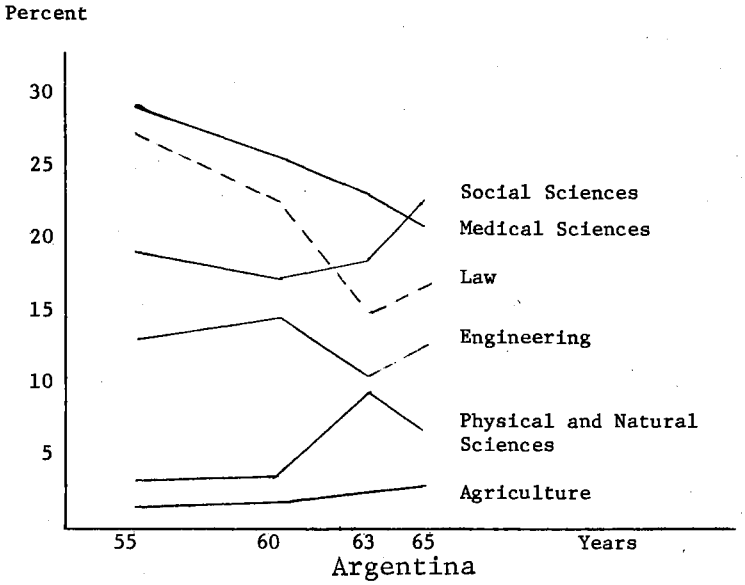
Country	Years	Humanities	Education	Fine Arts	Law	Social Sciences	Natural Sciences	Engineering	Medical Sciences	Agriculture	Non-Specified
Argentina	1955	2.6	0.2	4.9	26.8	19.1	3.2	12.9	28.7	1.5	4.7
	1960	7.5	1.4	6.4	22.2	16.9	3.7	14.5	25.5	1.8	---
	1963	*	16.0***	6.6	14.6	18.3	8.9	10.6	22.9	2.1	---
	1965	*	15.5	5.6	16.6	22.3	6.7	12.5	20.5	2.4	---
Brazil	1954		18.2	4.8	27.2	8.8	0.6	11.2	26.3	2.9	0.1
	1960	10.2	5.8	5.0	25.1	15.0	3.6	11.6	20.8	2.9	---
	1964	5.5	5.0	1.8	21.8	22.2	6.8	16.3	17.7	2.7	0.3
	1965	11.0	5.8	3.2	21.4	19.4	4.4	14.2	16.4	3.9	0.2
	1966		26.7**	2.6	20.2	16.2		14.8	15.6	3.9	---
Chile	1949	*	25.8	6.7	22.8	2.5	5.0	9.5	21.8	6.0	---
	1957	2.9	25.8	5.1	16.3	9.5	2.9	18.6	15.0	3.8	---
	1960	3.8	27.5	5.5	10.8	10.7	4.1	20.4	12.4	4.8	---
	1961	4.1	27.4	5.2	10.8	10.5	5.5	20.2	12.2	4.3	---
	1963**	2.6	30.0	6.4	10.2	16.9	0.8**	12.3***	16.6	3.4	---
	1965**	2.4	26.4	6.2	9.4	13.9	0.8	11.7***	15.2	3.0	8.7
	1967	5.0	34.5	5.1	7.6	3.6***	4.6***	22.7	12.0	3.9	.1
Colombia	1955	2.5	2.4	1.6	18.7	4.4	5.0	24.0	33.3	3.4	4.9
	1960	4.8	1.6	10.5	17.6	9.9	6.9	23.9	18.1	6.5	.1
	1963	7.2	4.9	9.3	13.5	14.8	4.2	23.6	14.3	8.1	---
	1964	8.1	7.3	8.7	12.6	13.9	8.3	20.6	13.1	7.4	---
	1965	8.4	5.3	9.9	11.8	14.6	5.2	25.2	12.8	8.0	---
	1966	5.1	10.3	5.8	10.4	17.3	2.4	24.3	13.2	7.4	3.9
Mexico	1961	3.8	4.8	8.8	13.1	21.6	5.7	19.8	19.0	3.0	0.5
	1963	2.5	6.1	5.3	13.0	24.3	7.1	20.7	18.9	1.3***	---
	1965	12.2	0.3***	5.3	12.5	24.6	8.6	17.3	15.4	3.2	0.8
	1966	6.6***	1.7	4.4	12.4	25.7	11.6	18.8	15.3	3.0	---
Peru	1957	19.3	5.4	0.7	10.4	12.3	20.7	11.3	15.6	4.6	---
	1959	17.0	6.3	0.7	11.2	15.6	18.0	12.9	14.8	3.7	---
	1963	17.0	20.0***	1.2	7.9	18.7	5.9***	9.0	11.0	6.6	---

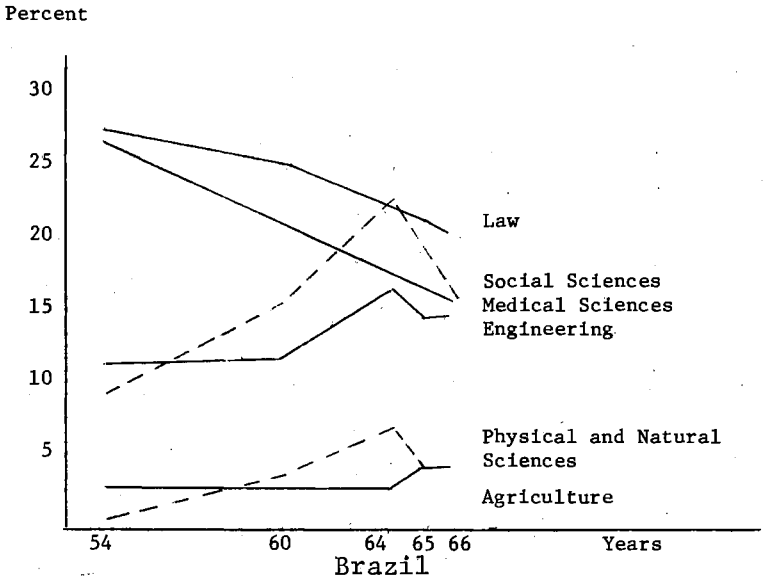
TABLE VII, Continued

	Years	Humanities	Education	Fine Arts	Law	Social Sciences	Natural Sciences	Engineering	Medical Sciences	Agriculture	Non-Specified
Venezuela	1950	2.0	6.5	0.0	13.6	5.0	27.8		39.8	5.3	---
	1956	4.1	4.0	3.4***	12.2	15.0	2.2	18.0	35.9	2.4***	---
	1960	8.3	8.2	3.2	15.2	21.1	1.7	17.6	19.4***	4.2	1.2
	1964	6.8	10.8		15.7	19.2	4.0***	14.0	18.7	6.4	1.4
	1968	6.7	13.3		12.6	22.0	2.9	13.6	16.9	6.0	3.0

* Education included humanities.
** University of Chile only in years 1963 and 1965.
*** Tremendous changes in proportions of enrollment from one year to the next may be explained by variation in placing the same branches of study under the same headings.

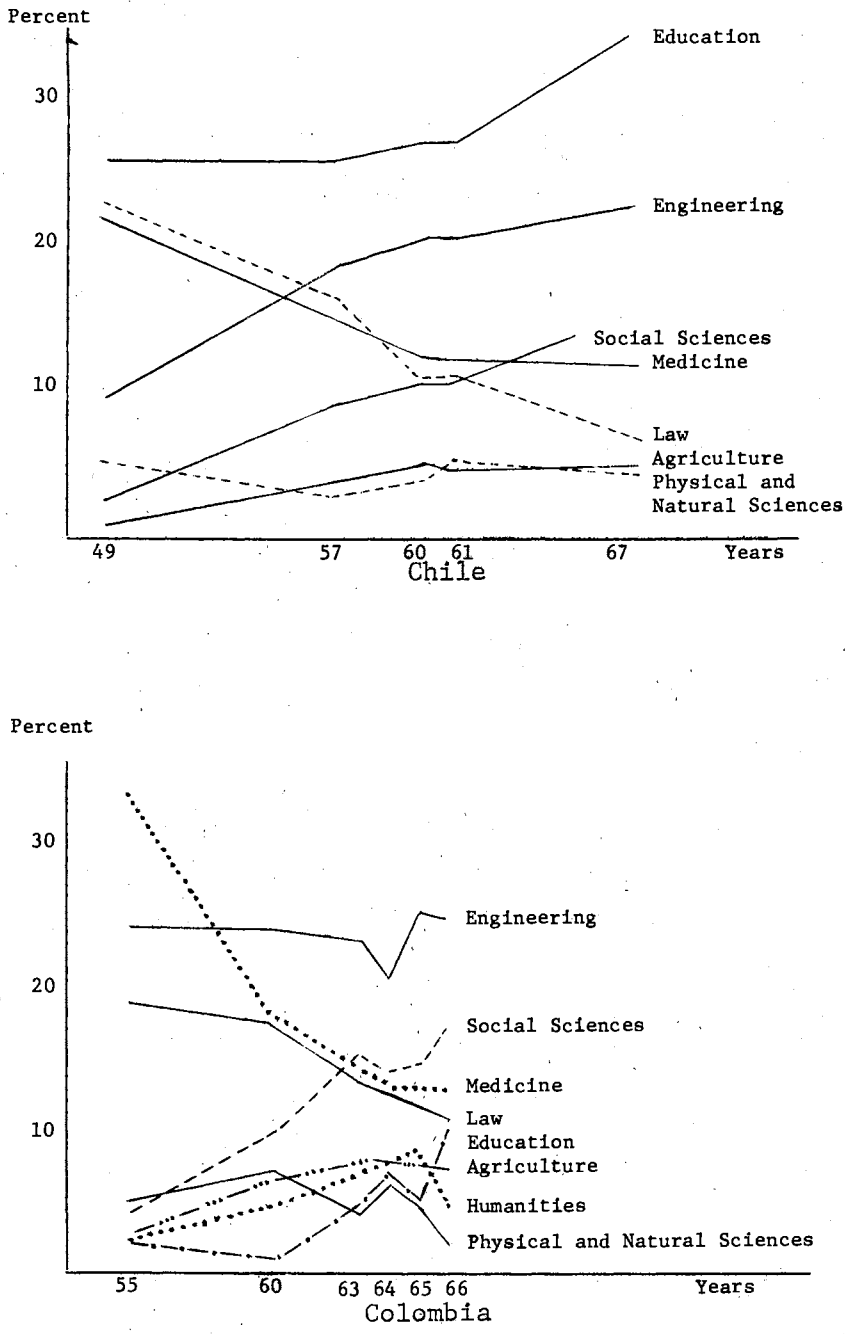
Source: Calculated from data taken from United Nations, UNESCO, Statistical Yearbook, 1965-69.





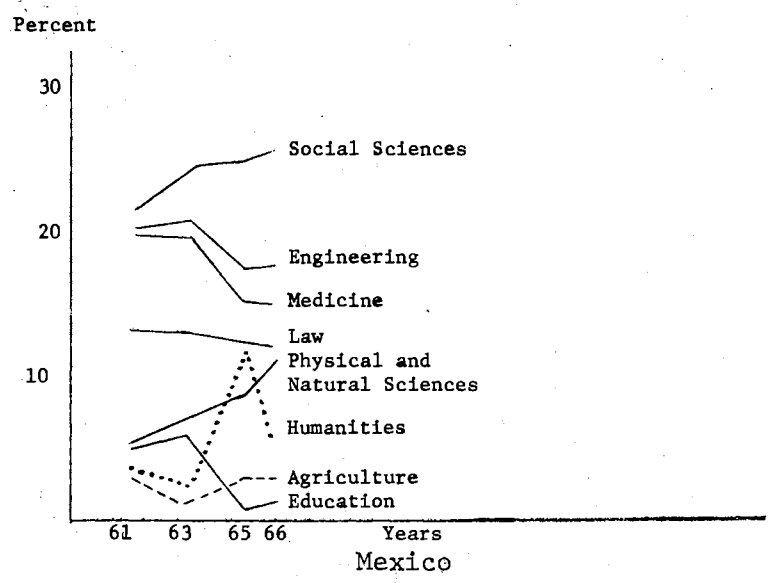
Source: Data taken from Table VII.

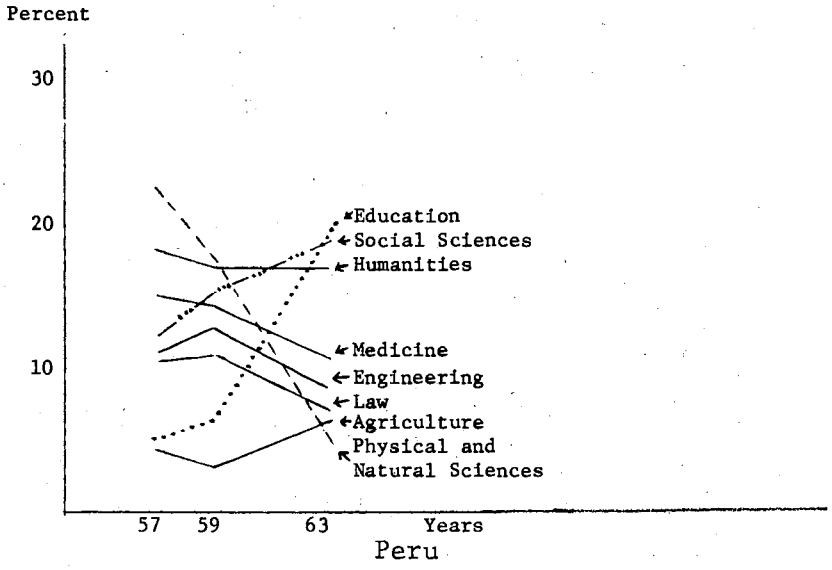
Figure 2. Trends of University Enrollment by Fields of Specialization in Argentina and Brazil



Source: Data taken from Table VII.

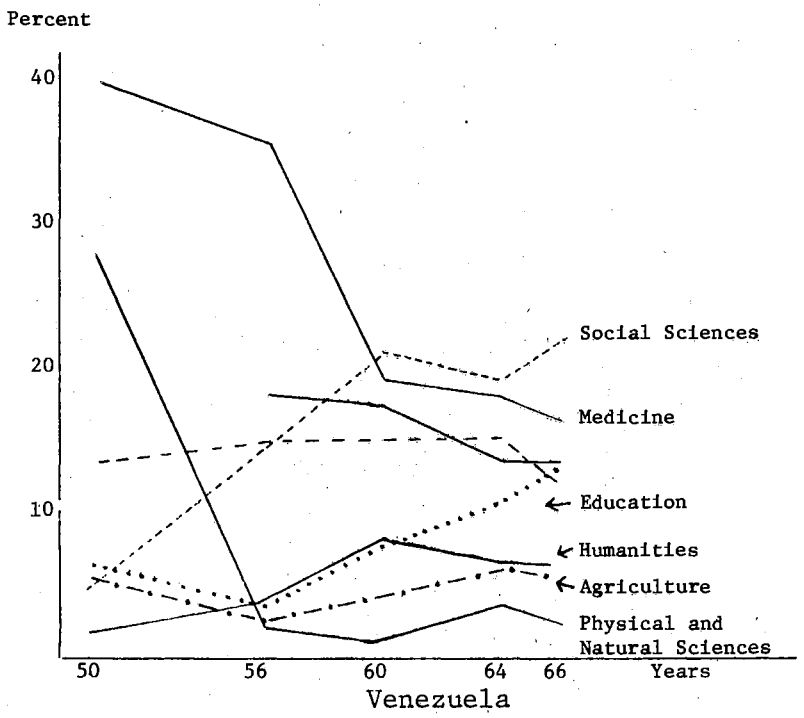
Figure 3. Trends of University Enrollment by Fields of Specialization in Chile and Colombia





Source: Data taken from Table VII.

Figure 4. Trends of University Enrollment by Fields of Specialization in Mexico and Peru



Source: Data taken from Table VII.

Figure 5. Trends of University Enrollment by Fields of Specialization in Venezuela

The enrollment statistics show heavy concentrations of study until 1960 in the two fields of medicine and law. The students enrolled in medicine accounted for inordinately high proportions of students. Medicine ranked first in three countries. Venezuela, Colombia, and Argentina had the highest proportions, with 36 percent in 1956, 33 percent in 1955 and 29 percent in 1955, respectively. In 1955, law constituted 27 percent of enrollments in both Argentina and Brazil, and 19 percent in Colombia.

The prevailing trend in the 1960's was to lower proportions of medicine and law students. The medicine proportion declined in Argentina from 26 percent to 21 percent between 1960 and 1965, in Brazil from 21 percent in 1960 to 16 percent in 1966, in Colombia from 18 percent in 1960 to 13 percent in 1966, in Mexico from 19 percent in 1960 to 15 percent in 1966 and in Peru from 15 percent in 1959 to 11 percent in 1963.

The proportion of law students declined in Argentina from 22 percent in 1960 to 17 percent in 1965, in Brazil from 25 percent in 1960 to 20 percent in 1966, in Colombia from 18 percent in 1960 to 10 percent in 1966, in Chile from 11 percent in 1960 to 8 percent in 1967 and in Peru from 11 percent in 1959 to 8 percent in 1963.

Engineering

Most of the rapid increases in the engineering proportions took place in the 1950's. The number of engineering students in Chile increased from 907 in 1949 to 5,499 in 1960, or from 9.5 percent to 20.4 percent of the total university enrollment in Chile. In Colombia, the

number increased from 1,553 in 1950 to 5,422 in 1960, or from 15.5 percent to 24 percent of total enrollment. In Venezuela, the number increased from zero in 1950 to 4,648 in 1960 or from zero percent to 18 percent. Industrialization and expansion of public services, especially in Argentina, Chile, Mexico and Venezuela, explain the growth in demand for engineering.

Engineering continued to be a popular profession in the 1960's. In the 1960's, the number of students in engineering continued to increase and constituted a high proportion of total students enrolled; however, the change in the proportion was much smaller than that in the 1950's. In some countries such as Mexico, Colombia, Chile and Brazil, the share has been almost constant. In Peru, Venezuela and Argentina, the share has been declining slightly.

It should not be concluded from the trends in enrollment that there are enough or surpluses of all types of engineers. There may be many civil engineers but shortages of other types such as industrial, mechanical and electronic engineers. Civil engineering was the first engineering specialty to be taught in Latin American universities, and therefore, the stock of civil engineers is relatively large.

In Argentina, of the 16,669 engineering degrees granted from 1901 to 1966 slightly over 9,000 or 54 percent were in civil engineering. The next largest branches were electromechanical, with 11.7 percent; industrial with 7.7 percent; and chemical with 5.4 percent.[2] As

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[2]Morris A. Horowitz, "High-Level Manpower in the Economic Development of Argentina," in Frederick Harbison and Charles A. Myers (ed.), Manpower and Education, New York, 1965, pp. 4-7.

industrialization advances, there is a growing interest in engineering careers. Engineering fields are now more popular in Latin America than are the traditional professions of medicine and law.

Education

University enrollment in education was expanding in Latin American countries due to the growing awareness of the importance of the preparation of secondary school teachers, and due to the expansion of the middle class and of educational services. In 1967, Chile had the highest proportions of students enrolling in education with 19,467 students or 34.5 percent. The proportions of student enrollment in education increased in the 1960's in all the countries except Mexico. In Colombia, the proportion increased from 1.6 percent in 1960 to 10.3 percent in 1966; in Venezuela, from 8.2 percent in 1960 to 13.3 percent in 1966; in Peru, from 6.5 percent in 1959 to 20 percent in 1963. Mexico was the only exception; the proportion dropped from 4.8 percent in 1961 to 1.7 percent in 1966.

Social Sciences

Large proportions of the social sciences students specialize in economics.[3] The demand created by economic activities and by industrial expansion has given status to economics as a preparation for managerial positions. Employment opportunities for other social scientists remain

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[3]United Nations, Education, Human Resources and Development in Latin America; Economic Commission for Latin America, New York, 1968.

limited, which explains why few students seek an education in such fields as sociology and political science.

The proportions of students enrolling in social science increased in the 1960's in Argentina, Colombia, Mexico and Peru and to a lesser extent in Brasil, Chile and Venezuela. The social science proportion of graduates ranked highest in Venezuela and was equal to the law graduates in Brazil. This large supply of social scientists explains the slow growth of enrollment in social science in these two countries.

Humanities

Humanities constituted relatively low proportions of graduates with a maximum of 12 percent in Brazil in 1964 and a minimum of two percent in Chile in 1963 (Appendix A). There were no consistent patterns of university enrollments in humanities. Enrollment proportions fluctuated around a stable average for every country. For example, in Brazil the enrollment proportion in humanities was 10.2 percent in 1960, decreased to 5.5 percent in 1964 and increased to 11 percent in 1965. In Colombia, enrollment in humanities was 4.8 percent in 1960, increased to 8.1 percent in 1964 and decreased to 5.1 percent in 1966.

Physical and Natural Sciences

Generally, the proportions of students in physical and natural sciences were low in all the seven countries. The proportions of enrollment in the 1960's reached a maximum of 11.6 percent in Mexico in 1966 and a minimum of 0.8 percent in Chile in 1963 and 1965.

The general trend in proportions of enrollment in physical and natural sciences was stable. Exceptions are the increasing trend in

Mexico from 5.7 percent in 1961 to 11.6 percent in 1966; and in Argentina from 3.7 percent in 1960 to 6.7 percent in 1965. In Peru, the proportion of students enrolled in physical and natural sciences dropped from 18 percent in 1959 to 5.9 percent in 1963, and in Colombia from 6.9 percent in 1960 to 2.4 percent in 1966.

The low proportions of enrollments in physical and natural sciences can be explained largely by the limited research facilities and the lack of financial assistance for research from non-governmental economic units. There are only a few firms large enough to be able to set aside significant sums for research. Those firms are usually subsidiaries of bigger foreign companies which prefer to do their research work outside Latin America. In addition, the idea of helping finance research that is not intended to produce immediate results is alien to the private entrepreneur in Latin America. This leaves only the universities and the state as possible sponsors of research. The idea that the universities should sponsor research is not of long standing in the Latin American countries, but the concept of the state as sponsor is even newer.[4]

Agriculture

Enrollments in agriculture, including veterinary medicine, were low in the seven countries in the 1960's. However, there was a general trend of increasing proportions of enrollment in agriculture. The average proportion of students in agriculture increased in the 1960's from 3.8 percent to 4.9 percent.

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[4] Ibid.

Argentina had the lowest proportion of enrollment in agriculture (1.8 percent in 1960 and 2.4 percent in 1965) and Colombia had the highest proportion (6.5 percent in 1960 and 7.4 percent in 1966). Peru and Venezuela had the highest rate of increase in agricultural enrollment, from 3.7 percent in 1957 to 6.6 percent in 1963 and from 4.2 percent in 1960 to 6.0 percent in 1966, respectively. This increasing trend in enrollment in agriculture indicates a slow improvement in employment opportunities for agriculture graduates.

Determinants of Career Preferences

The prevailing trends in all the seven Latin American countries seem to be towards a reduction in the proportions of law and medicine students and increase in enrollment of social sciences and education. Enrollments in the fields of physical and natural sciences and agriculture were still lagging. The determinants of such changes in enrollment patterns are the changes in both the employment opportunities and the values of the society.

Employment Opportunities

Employment opportunities in various specialties are a major factor in explaining the trends in proportions of students in different areas of study. The opportunities for professionals in agriculture and veterinary medicine are rather poor and so are the proportions of students in agriculture. Both the opportunities and proportions of students in agriculture are increasing at a slow rate. The demand for education graduates is increasing and so is the enrollment in education.

The large increase in enrollment in social sciences is due to increasing demand for social scientists, particularly economists.

The declining proportions of medical sciences and law are related to the large supply of physicians and lawyers relative to the demand for their services. The low stable enrollment in physical and natural sciences can be explained by the continuation of limited employment opportunities for them.

Values and Structural Factors

Traditionally, the society's values have an important role in determining career preferences and enrollment patterns. The distribution of university enrollment has been largely determined by a system of values with respect to the occupational heirarchy which influences the prestige enjoyed by each occupation. Until 1950, law and medicine had the highest occupational status of all fields of specialization and enrollments in these two fields were inordinately high.

In the past, the high enrollment in law was related to the fact that many law graduates entered politics on a full-time or part-time basis at the federal, provincial, or local level, and many others entered business in various executive and administrative positions.[5] The political and administrative opportunities have been declining for lawyers and increasing for engineers and economists.[6] This contributes to the decrease in the proportions of law students and for the

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[5]Horowitz, p. 14.

[6]United Nations, p. 115.

proportional increase in the proportions of engineering and economics students.

Industrialization and economic development in Latin America have weakened the old traditions with respect to employment opportunities available for each field of specialization. For example, specialists are now needed to fill job vacancies in economics, business administration and public administration instead of their being filled by law graduates. These factors have affected the distribution of university enrollment. In the determination of patterns of specialization in Latin American universities employment opportunities are becoming more and more important and the old value system is declining.

However, the remaining old values plus other structural factors keep employment opportunities from being appropriate to economic development needs. The result is low opportunities in important fields for economic development such as agriculture, physical and natural sciences, sociology, political science and public administration.

CHAPTER V

MIGRATION OF PROFESSIONALS FROM LATIN AMERICAN COUNTRIES

The migration of professionals such as physicians, engineers, scientists, and others with university training from a less developed country to a more advanced one is known as the "brain drain". Although the brain drain from the underdeveloped countries to the advanced countries is the result of many factors, the most important factor is the lack of professional opportunities in the underdeveloped countries. Professor John C. Shearer states:

> The brain drain aspects of the international migration of talent, . . . result from the decisions of the migrants and often reflect an oversupply of certain kinds of professions relative to attractive opportunities at home.[1]

Similarly, Charles V. Kidd stated: "The major cause of migration to the United States from Latin America is the low level of professional and economic opportunity in the home countries."[2]

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[1]John C. Shearer, "International Migration of Talent and the Foreign Student," Proceedings of the 22nd Meeting of the Industrial Relations Research Association, 1969, p. 26.

[2]Charles V. Kidd, "Migration of Highly Trained Professionals from Latin America to the United States," The International Migration of High-Level Manpower, New York, 1970, p. 462.

Professionals from Latin America have migrated in significant numbers to the United States.[3] Migration elsewhere outside Latin America has been very limited. The data on the numbers of Latin American professionals who emigrated to the United States, therefore, can be used as an approximation of the total numbers of Latin American professionals emigrating. The purpose of this chapter is to use the data on migration of professionals from the seven Latin American countries to the United States to provide evidence on employment opportunities in some fields in the Latin American countries relative to the opportunities available abroad.

Lack of Professional Opportunities

Lack of professional opportunities includes factors such as: (1) lack of employment opportunities, (2) low income, and (3) underutilization of talent.

Lack of Employment Opportunities

The first factor which contributes to the migration of professionals is the lack of employment opportunities in the home countries. The seven Latin American countries face the problem of not being able to create sufficient numbers of jobs for their increasing numbers of university graduates in some fields. The analysis in Chapter IV indicates that there were large supplies of professionals in fields of specialization such as medicine, civil engineering, law and physical

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[3] John C. Shearer, "Intra- and International Movements of High-Level Human Resources," in James Heaphey (ed.), Spatial Dimentions of Development Administration, 1971, pp. 194-195.

natural sciences, compared with the opportunities available for them. The surplus of professionals in their home countries has led to significant migration abroad and usually to the United States. This surplus in some fields of specialization comes from the imbalance in specialization and the rapid expansion of university education.

The economic conditions in these countries offer few outlets for training and employment of the products of the primary and secondary schools which lead after a time lag to a corresponding flood of students seeking admission into the universities, since they have few alternatives. Second, in the home countries, there is still the illusion that a university degree will bring its holder the "middle class" standard of living associated with the educated elite of the past. Thus, the demand for expansion of the universities is basically the demand of a growing section of the community to try to obtain a level of income several times higher than the per capita income of the country as a whole.

In contrast, the existence, during the 1950's and 1960's, of attractive unfilled job vacancies in the United States has been an encouraging factor for migration of Latin American professionals into the United States. The expansion of the universities and of government financed research programs in the United States attracted large numbers of professionals from Latin American countries during the 1950's and 1960's.

Low Income

One of the most important factors in migration is low income. According to Charles V. Kidd:

> The highly important factor of income can be illustrated by the case of physicians in Colombia. Many physicians in the major cities have a difficult time making a living. The absolute minimum income required by a young bachelor physician is 5,000 pesos a month . . . The equivalent of an annual income of between $4,000 and $5,000 in the United States. An offer of a position in the government service at a salary of 9,000 pesos per month would produce an avalanche of applicants. Medical services are of course, urgently needed in rural areas, but a physician who moves to the countryside sentences his family to cultural exile and poverty.
>
> The professional salary structure in Colombia is strongly influenced by the government salary structure, since a high proportion of the demand for professionally trained people arises from the government activities. No government employees may be paid more than a minister, and ministers receive a salary of 6,600 pesos a month . . . the rough equivalent of an annual income of $5,000 in the United States. This, then, is the top income to which professionals in government service may aspire. . . The case of Colombia is duplicated, with minor variations, in many Latin American countries.[3]

The large salary differentials which exist between the United States and the Latin American countries, combined with job vacancies in the United States led to the heavy migration of Latin American professionals to the United States in the 1960's.

Underutilization of Talents

Underutilization of talents can be the result of lack of facilities or poor professional environment. Many of the professionals in underdeveloped countries, especially those trained abroad, are too highly academically trained or too highly specialized for their home countries' development needs. These individuals are usually underutilized in their home countries.

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[3]Kidd, p. 463.

Poor professional environment includes favoritism, excessive reliance upon seniority and tradition, antiquated promotion policies, overstaffing, immobility of labor and racial and political factors. All of these factors lead to underutilization of talents. Underutilization involves stifling of ambitions, which results in continued loss of opportunity for self-fulfillment. Lack of facilities and poor professional environment prevent full utilization of talents and force many professionals to migrate.

Migration of Professionals by Occupation

Tables VIII, IX and X present data on migration of professionals in specific fields in selected years. Table XI presents data on migration of professionals in a wider range of specialization in 1967 in absolute numbers and percentage-wise.

Physicians

The total number of immigrating physicans from the seven Latin American countries combined ranked first among all professions. As shown in Table VIII, about 400 physicians per year migrated from the seven Latin American countries to the United States during the period 1962-1968. The number of immigrant physicians exceeded the number of immigrants in any other profession for four countries: Argentina, Colombia, Mexico, and Peru. The proportions of migrating physicians were more than 44 percent of the total number of immigrating professionals from these four countries, as shown in Table XI. The number of immigrating physicians from Brazil, Chile and Venezuela ranked second

after engineering. The proportion of immigrating physicians from the seven countries was 43.3 percent of total immigrating professionals.

TABLE VIII

PHYSICIANS FROM THE LATIN AMERICAN COUNTRIES ADMITTED TO THE UNITED STATES WITH IMMIGRANT VISAS, 1962-1968

Country	1962	1963	1964	1965	1966	1967	1968
Totals	349	389	483	412	415	392	331
Mexico	70	97	77	110	119	86	55
Argentina	94	116	151	140	115	126	95
Brazil	24	29	26	37	33	19	18
Chile	5	8	15	8	11	3	16
Colombia	75	90	158	82	80	116	116
Peru	43	22	32	25	46	27	17
Venezuela	38	27	24	10	11	15	14

Source: U. S. Department of Justice, Immigration and Naturalization Service, in The International Migration of High-Level Manpower, The Committee on the International Migration of Talent, New York, 1970, p. 488.

This large migration of physicans indicates surpluses of physicians or poor professional opportunities for them in their home countries which corroborate the analysis of Chapter IV where in university enrollment data was used as a market indicator. Most of the physicians in Latin America are clustered in big cities, which makes the supply of physicians large in cities, and lowers their income. Most of the immigrant physicians come from these cities.

TABLE IX

ENGINEERS FROM THE SEVEN COUNTRIES ADMITTED TO THE UNITED STATES WITH IMMIGRATION VISAS, 1965 AND 1968

Country	Total		Civil		Electrical		Mechanical		Other	
	1965	1968	1965	1968	1965	1968	1965	1968	1965	1968
Mexico	57	51	13	5	14	5	7	9	23	30
Argentina	88	93	12	6	5	23	10	20	61	44
Brazil	37	54	6	6	5	6	7	9	19	24
Chile	29	32	7	11	2	4	3	2	17	15
Colombia	70	110	12	20	10	15	6	14	42	61
Peru	17	29	3	7	2	5	3	8	9	9
Venezuela	24	43	4	2	2	6	2	16	16	19
Total	322	412	57	57	40	66	38	78	187	202

Source: U. S. Department of Justice, Immigration and Naturalization Service, in the International Migration of High-Level Manpower, The Committee on the International Migration of Talent, New York, 1970, p. 498.

TABLE X

PHYSICAL AND NATURAL SCIENTISTS AND AGRICULTURAL SCIENTISTS FROM LATIN AMERICA ADMITTED TO THE UNITED STATES WITH IMMIGRANT VISAS, 1965-1968

Specialty	1965	1966	1967	1968
Physical and Natural Sciences	143	128	166	201
Agricultural Sciences	50	57	39	39
Total	193	185	205	240

Source: U. S. Department of Justice, Immigration and Naturalization Service, in the International Migration of High-Level Manpower, The Committee on the International Migration of Talent, New York, 1970, p. 496.

TABLE XI

IMMIGRANTS ADMITTED TO THE UNITED STATES AS PROFESSIONALS FROM THE SEVEN LATIN AMERICAN COUNTRIES, 1967

	Total	Physicians	Vet. Med.	Engineers	Phys.& Nat. Scientists	Agri. Scientists	Social Scientists			Lawyers
							Total	Econ	Other	
Argentina	268	126	1	90	36	1	7	4	3	7
Brazil	95	19	-	54	14	-	4	4	-	4
Chile	30	3	2	20	2	2	-	-	-	1
Colombia	213	116	2	73	13	1	5	4	1	3
Mexico	195	86	6	60	18	12	6	5	1	7
Peru	54	27	1	22	3	-	1	1	-	-
Venezuela	50	15	-	22	9	-	3	-	3	1
Total	905	392	12	341	95	16	26	18	8	23
Distribution of Professional Immigrants (Percentage)										
Argentina		47.0	0.4	33.6	13.4	0.4	2.6			2.6
Brazil		20.0	0.0	56.9	14.7	0.0	4.2			4.2
Chile		10.0	6.7	66.7	6.7	6.7	0.0			3.3
Colombia		54.0	0.9	34.3	6.1	0.5	2.4			1.4
Mexico		44.1	3.1	30.8	9.2	6.2	3.1			3.6
Peru		50.0	1.9	40.7	5.6	0.0	1.9			0.0
Venezuela		30.0	0.0	44.0	18.0	0.0	6.0			2.0
Percent of Total	100	43.3	1.3	37.7	10.5	1.7	2.9			2.5

Source: Department of Justice, Immigration and Naturalization Service, Annual Indicator of In-migration into the United States of Aliens in Professional and Related Occupations, Fiscal Year, 1967, June, 1968.

Engineers

The total number of immigrating engineers from the seven Latin American countries ranked second after physicians. Table XI shows that the total immigrated engineers in 1967 varied from 30.8 percent of all number of professionals in Mexico to 66.7 percent in Chile, with a seven-country proportion of 37.7 percent. The losses of engineers of these countries are evidence of the large stock of engineers compared with the low level of employment opportunities in their home countries.

The data on migrated engineers from the seven countries in the years 1965 and 1968 are disaggregated to civil, electrical, mechanical and other engineers (Table IX). In 1965, the number of Latin American civil engineers admitted with immigrant visas to the United States was 57, which was more than any other type of engineers. The number of electrical engineers was 40 and the number of mechanical engineers was 38. In 1968, the numbers of each of electrical engineers (66) and mechanical engineers (78) surpassed that of civil engineers (57). All other types of engineers increased from 187 in 1965 to 202 in 1968. This is the result of (1) the increasing numbers of graduates in engineering fields other than civil in the home countries; (2) the large increase in numbers of Latin American engineers pursuing graduate studies in the United States in engineering fields other than civil engineers, as will be shown in Chapter VI; (3) a relatively low level of industrial expansion compared to the high level of specialization of those with graduate studies in the United States, which often contributes to the brain drain; and (4) the relative economic and professional advantages of electrical and mechanical engineers in the United States.

Physical and Natural Scientists

Although the number of physical and natural scientists is limited in Latin America, as the enrollment data in Chapter IV indicate, the number of migrating physical and natural scientists from Latin America to the United States ranked third after physicians and engineers. The number of immigrating natural scientists from Latin America to the United States were 143 in 1965, and 201 in 1968 (Table X). In 1967, the proportions of natural scientists to total migrating professionals from the seven countries varied from 18 percent in Venezuela to 5.6 percent in Peru with a proportion of 10.5 percent for the seven countries combined (Table XI).

Although the percentage of migrating scientists is low compared to those of medicine and engineering, the migration of scientists means the loss of a significant proportion of the total number in the Latin American countries. The number of scientists produced in their home countries is relatively small and constituted less than five percent of total Latin American university graduates (Appendix A).

This large migration of physical and natural scientists reflects the poor economic and professional environment in their home countries. Positions for scientists are restricted in Latin America almost entirely to teaching in the universities. Research is still very limited in Latin American countries. Scientists do not yet have the recognition and prestige accorded to physicians and engineers. Thus, scientists have strong motives to migrate to the United States where income and working conditions are better. In addition, the large proportions of Latin American graduate students sponsored by various groups to pursue graduate studies in physical and natural sciences in the United States,

as will be shown in Chapter VI, and whose training is often more highly specialized than is needed in their home countries, contribute to the large proportion of migrating natural scientists.

This large migration of physical and natural scientists is consistent with the stable proportion of enrollment of Latin American students in physical and natural science fields in their home countries' universities which indicated poor professional opportunities of physical and natural scientists in Latin American countries in the 1960's (Chapter IV).

Agricultural Scientists

The proportions and the absolute numbers of agricultural scientists migrating to the United States were very small. In 1967 only 16 or 1.7 percent, of a total of 905 Latin American professional immigrants were specialists in agriculture (Table XI), 12 of them coming from Mexico. The other four were from Argentina, Chile and Colombia.

Table XI shows the number of immigrating agricultural scientists from all Latin American countries to the United States in the years 1965-1968. In 1965, the number was 50 agricultural scientists, or approximately 25 percent of all scientists, and declined to 39 or 16 percent in 1968. The downward trend is consistent with the slow upward trend of enrollment of Latin American students in agricultural fields in their home countries' universities which indicated modest improvement in the opportunities of agricultural scientists in the Latin American countries in the 1960's.

Veterinary Medicine

Table XI shows that the number of immigrants specialized in veterinary medicine from the seven countries in 1967 was very small, only 12, of which six were from Mexico. The proportion of total number of professional immigrants was only 1.3 percent.

Social Scientists

The social sciences' share of the migration of professionals from the seven Latin American countries to the United States was only 2.9 percent in 1967 (Table XI). Eighteen (or 70 percent) of the 26 immigrating social scientists in the same year were economists. Taking into consideration the high proportion of social science graduates from Latin American universities, about 13 percent in 1967 (Appendix A), the proportion of immigrating social scientists is low and indicates relatively favorable employment opportunities in the home countries. This confirms the analysis of Chapter IV which indicates a relatively favorable trend for employment opportunities for social scientists in all the seven countries.

Lawyers

Although the supply of lawyers is large in Latin America, as the enrollment data in Chapter IV indicated, the number of migrating lawyers from Latin America to the United States is very limited. In 1967, only 23 lawyers emigrated from the seven Latin American countries to the United States. The reason lies in the fact that the type of training of lawyers in Latin America is different from that in the

United States, which makes the employment opportunities for Latin American lawyers in the United States very poor.

In summary, the migration of professionals in most fields from Latin America is mainly the result of poor professional opportunities in those fields in the home countries. Low professional opportunities include (1) lack of employment opportunities, (2) low income, and (3) underutilization of talents.

When compared with the analysis of Chapter IV, the migration of professionals from the seven Latin American countries to the United States has provided corroborating evidence on professional opportunities in most fields of specialization in the home countries. Both this chapter and Chapter IV indicate large supply relative to demand, or poor professional opportunities, in the fields of medicine, engineering, especially civil engineering, and physical and natural sciences. The brain drain or the migration of Latin American professionals was concentrated in these fields. Enrollment data of Chapter IV showed either declining or stable trends. Large declines in the home countries' university enrollment in medicine and slight declines in engineering and physical and natural sciences confirm the large supply of professionals in these fields relative to demand.

Both Chapters IV and V indicated that relatively favorable employment opportunities in Latin American countries existed in the fields of social sciences and to a lesser degree in agriculture. Migration of professionals in these fields was small. The Latin American university enrollments were increasing at rapid rates in social sciences and slowly in agriculture. The data on the brain drain, therefore, provides generally confirming evidence on levels of employment opportunities in Latin

American countries. The data on migration corroborates the existence of surplus of Latin American professionals in some fields of specialization.

CHAPTER VI

PATTERNS AND TRENDS OF GRADUATE STUDENT SPECIALIZATION

The analyses in the preceding chapters suggest the economic development needs and employment opportunities for various fields of specialization in the seven Latin American countries. In this chapter the patterns and trends of specialization in the United States' universities of graduate students from the seven countries are identified. Discussion and evaluation of these patterns and trends are in terms of their relevance to the home countries' development needs and employment opportunities.

Data from the Institute of International Education annual censuses on enrollments of Latin American graduate students in United States colleges and universities for each of the years 1965-66 to 1969-70 are used in the analyses of this chapter and are presented in Appendix B. The data are tabulated by 11 fields of specialization and some selected subfields for each country and for each of the five years. To simplify the patterns and trends of enrollment, Table XII presents summary data of 1965-1966 and 1969-1970 which include the numbers and proportions of enrollment only in the 11 major fields. In both the appendix and the table, the data are presented first for all the seven countries combined, then for each of the seven selected countries.

TABLE XII

PATTERNS OF SPECIALIZATION OF GRADUATE STUDENTS
FROM THE SEVEN LATIN AMERICAN COUNTRIES,
1965-66 and 1969-70

Country	Field of Specialization	1965-66 Number	1965-66 Percent	1969-70 Number	1969-70 Percent
The Seven Countries Combined	Agriculture	192	8.5	297	7.4
	Business	142	6.3	389	9.7
	Education	91	4.0	208	5.2
	Engineering	459	20.3	920	22.9
	Fine Arts	27	1.2	136	3.4
	Humanities	225	9.9	351	8.7
	Medicine	108	4.8	172	4.3
	Veterinary Medicine	16	0.7	29	0.7
	Physical and Natural Sciences	479	21.1	800	19.9
	Social Sciences	502	22.1	657	16.4
	Law	26	1.2	55	1.4
	Total	2267		4014	
Argentina	Agriculture	15	4.4	19	3.5
	Business	21	6.2	45	8.3
	Education	5	1.5	17	3.1
	Engineering	41	12.0	64	11.8
	Fine Arts	4	1.2	22	4.1
	Humanities	60	17.2	83	15.3
	Medicine	26	7.6	19	3.5
	Veterinary Medicine	1	0.3	4	0.7
	Physical and Natural Sciences	49	14.4	148	27.4
	Social Sciences	97	27.6	113	20.9
	Law	4	1.2	10	1.9
	Total	341		541	
Brazil	Agriculture	21	5.3	71	9.6
	Business	24	6.0	65	8.8
	Education	24	6.0	35	4.7
	Engineering	75	18.8	174	23.6
	Fine Arts	6	1.5	20	2.7
	Humanities	56	14.0	65	8.8
	Medicine	9	2.3	20	2.7
	Veterinary Medicine	2	0.5	1	0.1
	Physical and Natural Sciences	67	16.8	137	18.5
	Social Sciences	110	27.5	137	18.5
	Law	6	1.5	14	1.9
	Total	400		739	

TABLE XII (Continued)

Country	Field of Specialization	1965-66 Number	1965-66 Percent	1969-70 Number	1969-70 Percent
Chile	Agriculture	18	6.8	48	10.6
	Business	15	5.7	72	6.0
	Education	17	6.4	37	8.2
	Engineering	54	20.4	95	21.0
	Fine Arts	4	1.5	25	5.5
	Humanities	22	8.3	47	10.4
	Medicine	10	3.8	10	2.2
	Veterinary Medicine	3	1.1	2	0.4
	Physical and Natural Sciences	68	25.7	92	20.4
	Social Sciences	51	19.3	66	14.6
	Law	3	1.1	3	0.6
	Total	265		452	
Colombia	Agriculture	30	8.2	63	8.9
	Business	19	5.2	61	8.6
	Education	9	1.0	58	8.2
	Engineering	96	26.2	185	26.1
	Fine Arts	5	1.2	18	2.5
	Humanities	33	9.0	35	4.9
	Medicine	19	5.2	27	3.8
	Veterinary Medicine	4	1.1	12	1.7
	Physical and Natural Sciences	60	16.4	117	16.5
	Social Sciences	86	23.4	130	18.3
	Law	6	1.7	4	0.6
	Total	367		710	
Mexico	Agriculture	55	13.4	47	6.3
	Business	29	7.1	110	14.6
	Education	5	1.2	24	3.2
	Engineering	73	17.8	182	24.2
	Fine Arts	3	1.2	22	2.9
	Humanities	29	7.1	80	10.6
	Medicine	15	3.7	47	6.3
	Veterinary Medicine	4	1.0	3	0.4
	Physical and Natural Sciences	123	29.9	139	18.5
	Social Sciences	68	16.6	83	17.0
	Law	5	1.2	15	2.0
	Total	411		752	

TABLE XII (Continued)

Country	Field of Specialization	1965-66 Number	1965-66 Percent	1969-70 Number	1969-70 Percent
Peru	Agriculture	28	15.3	32	8.8
	Business	11	6.0	42	11.6
	Education	2	1.1	20	5.5
	Engineering	35	19.1	78	21.6
	Fine Arts	2	1.1	8	2.2
	Humanities	10	5.5	21	5.8
	Medicine	8	4.4	17	4.7
	Veterinary Medicine	2	1.1	4	1.1
	Physical and Natural Sciences	51	27.9	71	19.6
	Social Sciences	33	18.0	65	18.0
	Law	1	0.6	4	1.1
	Total	183		362	
Venezuela	Agriculture	25	7.7	55	11.2
	Business	23	7.1	39	7.9
	Education	29	8.9	17	4.9
	Engineering	85	26.2	142	28.8
	Fine Arts	5	1.5	21	4.3
	Humanities	15	4.6	20	4.1
	Medicine	21	6.4	32	6.5
	Veterinary Medicine	0	0	3	0.6
	Physical and Natural Sciences	61	18.8	96	19.5
	Social Sciences	60	18.5	63	12.8
	Law	1	0.3	5	1.0
	Total	325		493	

Graduate education of Latin American students in the United States expanded consistently during the five-year period. The total number of graduate students from the seven countries increased from 2,267 in 1965-66 to 4,014 in 1969-70, an increase of 77 percent during the five years (Table XII).

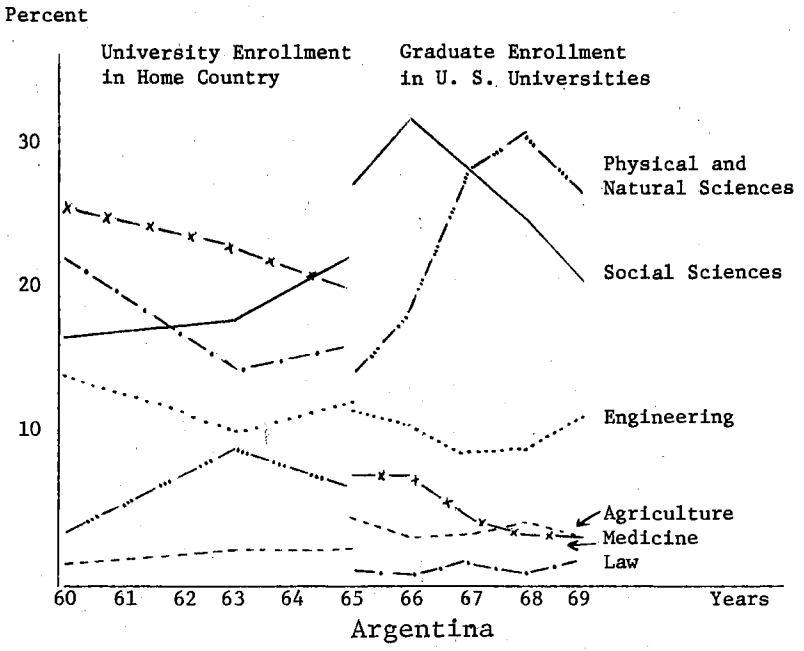
There were major changes in the pattern of specialization of Latin American graduate students over the five-year period. In 1965-66,

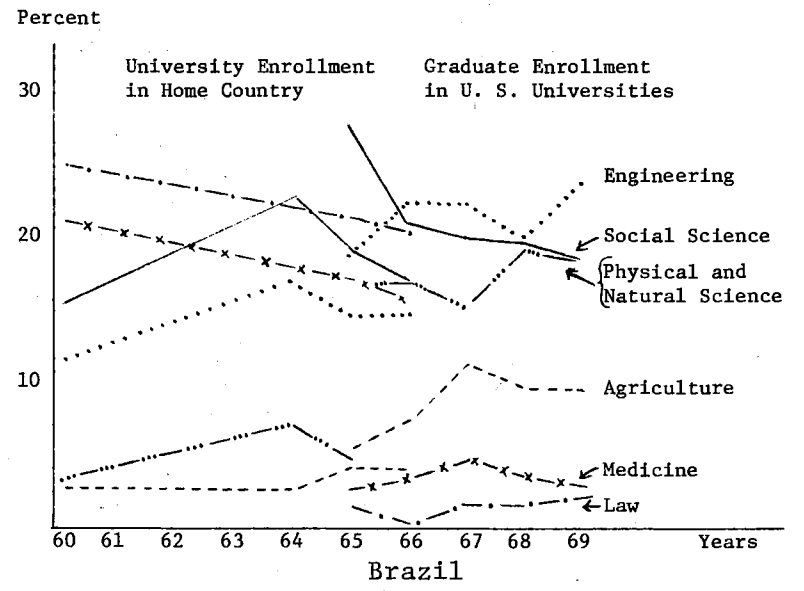
social sciences had the highest number of students with 22.1 percent of the total enrollment from the seven countries. Physical and natural sciences ranked second with 21.1 percent, engineering third with 20.3 percent, and humanities fourth with 9.9 percent. Agriculture, business and education constituted smaller enrollments of 8.5 percent, 6.3 percent and 4.0 percent, respectively.

This pattern has changed significantly over the five-year period. There was a decline in the share of social sciences to 16.4 percent in 1969-70, which fell to third rank, after engineering (22.9 percent) and engineering enrollment exceeded that of physical and natural sciences. In the last year, 1969-70, engineering enrollment surpassed that of physical and natural sciences due to both an increase in engineering enrollment and no increase in natural science enrollment.

In the five-year period there were increases in the proportions of business (6.3 percent to 9.7 percent), education (4.0 percent to 5.2 percent) and fine arts enrollment (1.2 percent to 3.4 percent). The proportion of medical students has been declining since 1966-67 (from 5.9 percent in 1966-67 to 4.3 percent in 1969-70) and the proportion of humanities began to decline after 1967-68 (10.0 percent in 1967-68 to 8.7 percent in 1969-70), Appendix B. In 1969-70, the enrollment in business (9.7 percent) exceeded that of humanities (8.7 percent) and the enrollment in education (5.2 percent) exceeded that of medicine (4.3 percent).

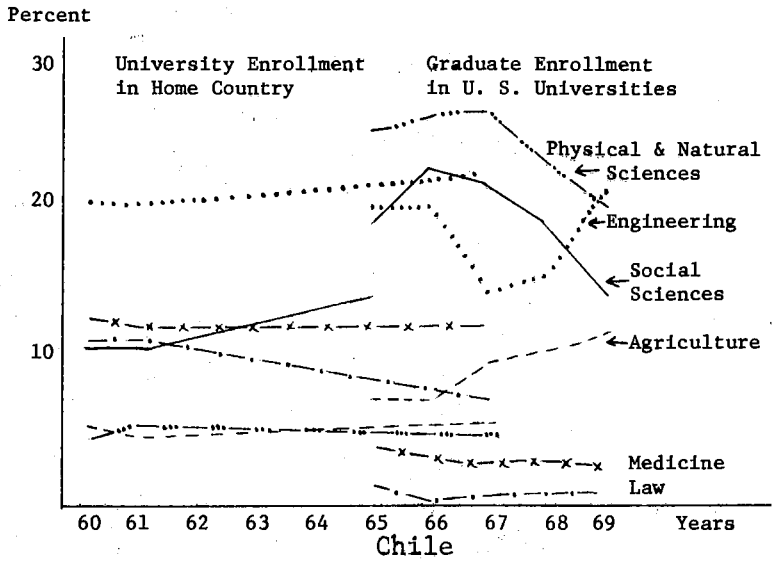
Figures 6 through 9 present graphical illustration of Latin American graduate enrollment trends in selected fields of specialization (data from Table XII) compared with employment opportunities in home

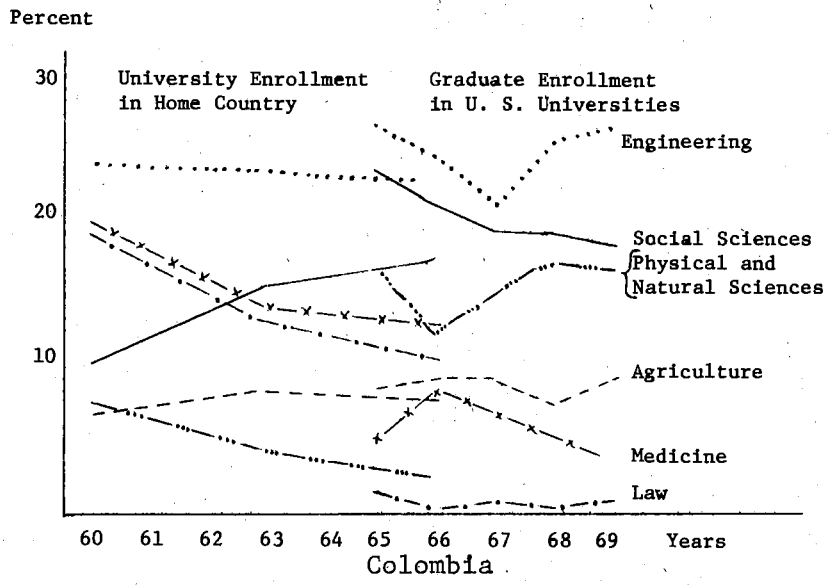




Source: Data from Tables VII and XII.

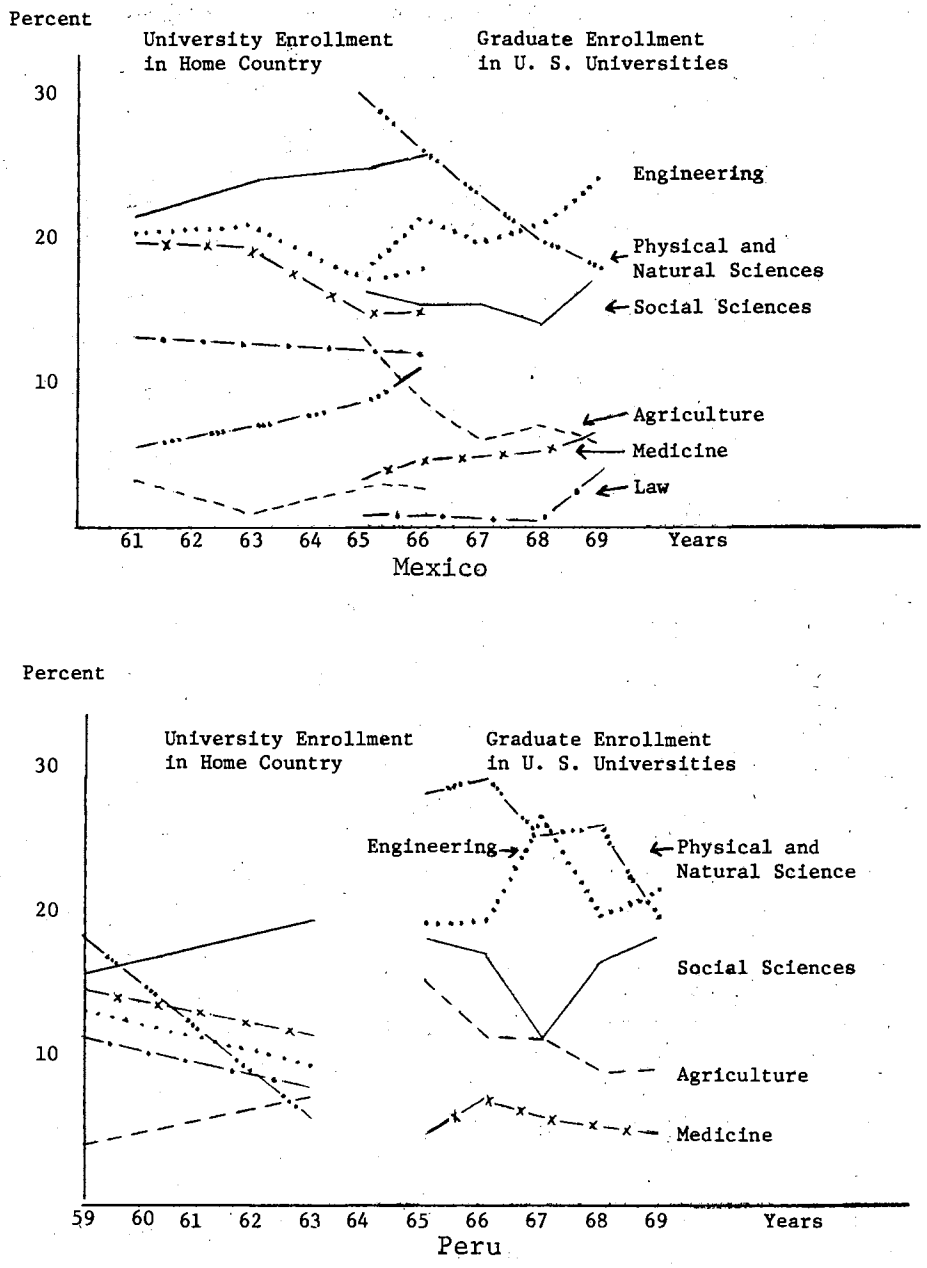
Figure 6. Trends of Graduate Enrollment of Argentinean and Brazilian Students in Selected Fields of Specialization in United States Universities Compared with Employment Opportunities in Home Countries Measured by Trends in University Enrollment in Home Countries





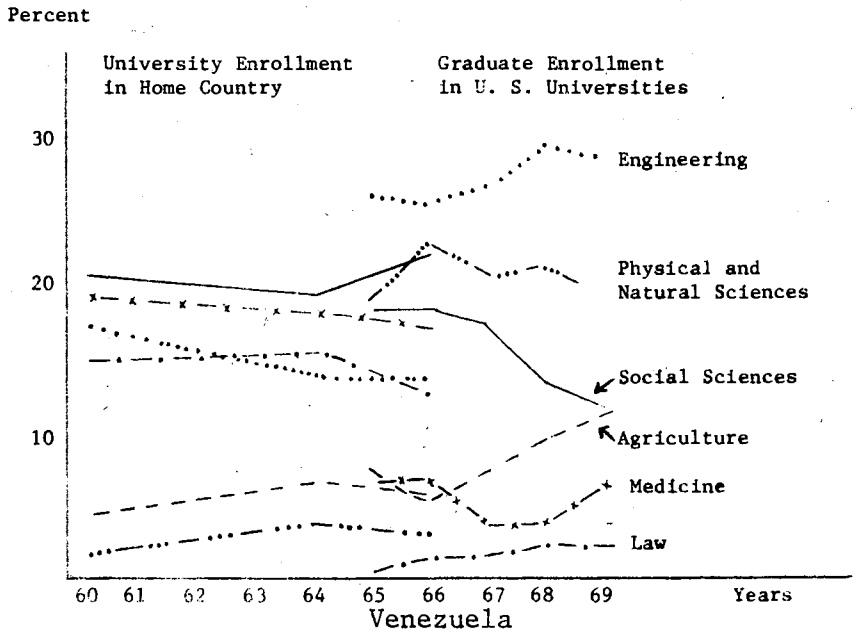
Source: Data from Tables VII and XII.

Figure 7. Trends of Graduate Enrollment of Chilean and Colombian Students in Selected Fields of Specialization in United States Universities Compared with Employment Opportunities in Home Countries Measured by Trends in University Enrollment in Home Countries



Source: Data from Tables VII and XII.

Figure 8. Trends of Graduate Student Enrollment of Mexican and Peruvian Students in Selected Fields of Specialization in United States Universities Compared with Employment Opportunities in Home Countries Measured by Trends in University Enrollment in Home Countries



Source: Data from Tables VII and XII

Figure 9. Trends of Graduate Enrollment of Venezuelan Students in Selected Fields of Specialization in United States Universities Compared with Employment Opportunities in Home Countries Measured by Trends in University Enrollment in Home Countries

countries measured by trends in university enrollment in home countries (data from Chapter IV). The purpose of these figures is to clarify the relevance of the patterns and trends of specialization of Latin American graduate students to the employment opportunities in their home countries.[1] For example, the figures show clearly the irrelevance of the high proportion of graduate students in the fields of physical and natural sciences to the low opportunities in these fields in the home countries indicated by persistent small proportions of students in physical and natural sciences in Latin American universities.

Agriculture

In 1965-66, agriculture constituted a relatively small over-all proportion of the graduate enrollment (8.5 percent) with significant variations among countries (Table XII). The proportion varied from 4.4 percent for Argentina to 13.4 percent for Mexico. In 1969-70, the enrollment in agriculture varied from 19 students for Argentina (3.5 percent) to 55 students or 11.2 percent for Venezuela. As shown in Appendix B, most of the graduate students in agriculture specialized in agronomy, animal husbandry, horticulture and soils.

Although the total number of agriculture enrollments increased from 192 in 1965-66 to 297 in 1969-70, there was no prevailing trend in agricultural enrollment for all the seven countries in the five-year

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[1]The overlaps in the figures of Brazil, Chile, Colombia, Mexico and Venezuela and the gap in the figure of Peru between curves of university enrollment in the home countries and graduate enrollment in United States universities are due to difference in years covered while data on graduate enrollment cover from 1965-66 to 1969-70, for all countries. The years covered for enrollment in home countries universities varied widely.

period. The agriculture share increased for Brazil, Chile and Venezuela, declined for Mexico and Peru and was almost constant for Argentina and Colombia.

Graduate students in agronomy outnumbered those in any other agricultural field in 1965-66, except for Argentina and Chile. The enrollments in animal husbandry and soil increased in the five-year period so that the number of students in animal husbandry surpassed that in agronomy for Mexico, Peru, Argentina, and Chile (Appendix B).

Enrollment in agriculture seems rather small for the economic development needs indicated in Chapter II. However, taking into consideration the limited opportunities for employment in agriculture in the home countries, the graduate enrollment in agriculture at the present time might be satisfactory, except for Argentina and Mexico. Argentina and Mexico are the only two countries where proportions of students in agriculture were much lower than those in humanities in 1969-70. It is considered small for Mexico where agriculture reform has been occuring for six decades. The proportion of agricultural students for Mexico actually declined from 13.4 percent in 1965-66 to 6.3 percent in 1969-70.

Business

Throughout the five-year period, 98 percent of the business students specialized in business administration, including marketing and management. The remaining two percent were in accounting (Appendix B). Enrollment in business increased rapidly in the five-year period for all seven countries in both absolute numbers and percentage-wise. Enrollment data for all seven countries combined showed an increase in business

enrollment from 142 (6.3 percent) in 1965-66 to 389 (9.7 percent) in 1969-70. For Mexico, the number of students in business increased from 29 or 7.1 percent to 110 or 14.6 percent of total graduate enrollment during that five-year period. For Argentina, the number increased from 21 students (6.2 percent) in 1965-66 to 45 (8.3 percent) in 1969-70. For Peru, the number increased from 11 (6.0 percent) to 42 (11.6 percent) during the same period. This trend reflects the increasing demand by industry in the home countries for business administration and the increasing employment opportunities for graduates of this field.

Education

The number of graduate students from the seven countries combined in education increased rapidly between 1965-66 and 1969-70, increasing from 91 students to 208 (129 percent).

The proportion of graduate students enrolled in education was low for five of the seven countries. Only Chile and Colombia had over five percent of their total graduate enrollment in education in the last four years. In 1969-70, the proportion increased for Argentina, Mexico, Chile, Colombia and Peru; and declined for Brazil and Venezuela. The decline for Venezuela was also in absolute number, from 37 in 1966-67 or 8.6 percent of total enrollment of Venezuelan students to 17 students or 4.9 percent in 1969-70.

This increase in education enrollment is consistent with the increasing needs for education services and the increase in employment opportunities in the home countries, as indicated in Chapters II, III and IV. Enrollment in education is still low, especially for Mexico,

and Argentina where the proportion of enrollment in education were only 3.1 percent and 3.2 percent, respectively. The low level of employment opportunities for education specialists in the home countries may justify the low graduate enrollment in education.

Engineering

The number of students in engineering for the seven countries more than doubled between 1965-66 and 1969-70, from 459 or 20.3 percent to 920 or 22.9 percent. The number of students enrolled in engineering in 1969-70 was larger than the number enrolled in any other field.

The enrollment in engineering ranked highest in 1969-70 for all the countries except Argentina. The percentage increased in the five-year period for Brazil, Mexico, Peru and Venezuela; and remained stable for Argentina, Chile and Colombia. For example, the enrollment in engineering increased for Brazil from 75 students (18.8 percent) in 1965-66 to 174 students (23.6 percent) in 1969-70; for Mexico from 73 students (17.8 percent) in 1965-66 to 182 (24.2 percent) in 1969-70. Colombia maintained a high enrollment in engineering of about 26 percent during the five-year period, approximately the same as the percentage of the undergraduates enrolled in engineering in Colombian universities. Chile also had a high proportion, 20 percent. Argentina's emphasis on humanities and social sciences helps explain the relatively small share of enrollment in engineering of about 12 percent.

Because the profession of engineering includes a variety of branches, each having a high degree of specialization, data on enrollment in engineering is disagragated into the most important sub-fields of specialization (Appendix B). Of the 459 graduate students of the

seven countries in engineering in 1965-66, the number in civil engineering was the largest, 124 students or 27 percent of total enrollment in engineering. While this number increased to 138 in 1969-70, the percentage declined to 15 percent. The next largest branch was electrical engineering with 20 percent in 1965-66 which became the largest branch in 1969-70 but constituted only 18 percent of total enrollment in engineering.

Industrial engineering ranked third with about 12 percent, mechanical engineering with 9 percent and chemical with 10 percent in 1965-66. All others such as textile, petroleum, electronic, and mining totaled 96 in 1965-66 or 21 percent and increased to 326 students or 35 percent in 1969-70. In the five-year period, enrollments in each of electrical, industrial, mechanical and chemical engineering doubled while the enrollment of civil engineers increased by only 11 percent. The enrollment in all others increased rapidly (by 240 percent). The increase in enrollment in new branches of engineering was in fields such as petroleum, textile, mining and electronic engineering.

These rapid increases in enrollment in all types of engineering other than civil engineering, reflect the increase in industrialization and the increasing needs for highly specialized engineers and the increase in employment opportunities for these fields.

Physical and Natural Sciences

For all the seven countries, the percentage of graduate students in physical and natural sciences was high. In 1967-68, the proportion was over 20 percent for five countries (Argentina, Mexico, Chile, Peru and

Venezuela), and over 15 percent for the other two countries (Brazil and Colombia). Considering the low level of employment opportunities for physical and natural scientists in Latin America, the level of research, and level of development in the industrial sectors in the home countries, the proportion of graduate students in physical and natural sciences was very high relative to both home countries' development needs and employment opportunities. The data on the migration of scientists in Chapter V corraborates the existence of surpluses of Latin American scientists in the physical and natural sciences.

The proportion of physical and natural science students was high throughout the five years, and increased for Argentina and Brazil, each of which had less than 17 percent in 1965-66. The proportion declined in 1969-70, particularly for Peru, where enrollment in physical and natural sciences declined from 28.0 percent in 1965-66 to 19.6 percent in 1969-70. For all seven countries combined, the proportion declined only in the last year from 22.2 percent in 1968-69 to 19.9 percent in 1969-70. Further declines in physical and natural sciences enrollment were probably desirable, especially for Argentina where the enrollment was inordinately high (27.4 percent).

Social Sciences

Social sciences include many fields of specialization necessary for development, for example, economics, political science, public administration, sociology and psychology. The percentage of students in social sciences has declined for all seven countries. In 1965-66 and 1966-67 the proportion was over 20 percent for four countries, Argentina, Brazil, Chile, and Colombia and over 15 percent for Mexico, Peru and

Venezuela. In 1969-70, the proportion declined to a range of 15 to 20 percent for Brazil, Colombia and Peru; and to 15 percent or under for Chile, Mexico and Venezuela. Argentina was the only country with over 20 percent of total enrollment in social sciences.

Social science enrollment of graduate students from the seven countries combined constitued 16.6 percent of total graduate enrollment in 1969-70. Comparing this proportion to physical and natural science students in the same year (20 percent) or engineering (22.2 percent), the numbers of social sciences students seem to be inadequate in recent years, particularly in the social science fields other than economics where the proportion of enrollment was relatively high.

Economics and agricultural economics combined constituted about 50 percent of the total enrollment of graduate students in social sciences from the seven countries throughout the five years. The economics share declined in the five-year period from about 35 percent of social science students in 1965-66 to about 32 percent in 1969-70. The agricultural economics share increased from 13 percent to 17 percent during the same period. The total number of economics students increased in the five years from 177 to 212, or by 20 percent, less than the 31 percent increase in all social science students in the five-year period. Agricultural economics students increased from 66 to 110 or by 67 percent, which was a higher rate of increase than that for all of the social sciences.

The number of economics students began to decline in the last two years of the five-year period except for Argentina where the number of economics students declined steadily from 46 students in 1965-66 to 19

in 1969-70, and for Brazil where the enrollment in economics increased throughout the period from 30 students in 1965-66 to 55 in 1969-70. Enrollment in agricultural economics was smaller than that in economics except in Argentina, where the number of agricultural economics students surpassed those in economics in 1968-69 and 1969-70.

The high overall proportion in economics and small proportion in agricultural economics can probably be explained by the favorable employment opportunities for economics graduates in industry and business and the limited employment opportunities in agriculture. However, there was a large increase in enrollment in agricultural economics in the five-year period which reflects the increasing employment opportunities for agriculture.

Enrollment in industrial and labor relations was very low. There was only one graduate student in this field from Brazil in 1965-66 and none from the other countries. In 1967-68, there were four students: two from Venezuela, one from Chile and one from Mexico. In 1969-70, the number declined again to two students. This is a very small number compared to the needs for well-trained people in industrial and labor relations. With reference to Peru, William Foote Whyte states:

> At the present time there seems a more pressing need for skilled administrators and well-trained specialists in industrial relations. The growth of organizations necessarily produces human problems that cannot be resolved by traditional methods, thus creating a need for skilled administrators, the growth of unions and their growing militancy creates the need for well trained industrial relations men.[2]

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[2]William Foote Whyte, "High-Level Manpower for Peru," in F. Harbison and C. Myers, (eds.), Manpower and Education, New York, 1964, p. 48.

Political science students from the seven countries combined represented only about six percent of the total social science students throughout the five-year period. The number of political science students for each country in any of the five years varied from one to ten students except for Brazil where the number was 17 in the last three years of the five years. An explanation of low enrollment in political science may be that employment opportunities in politics are not restricted to those trained in political science but are open to many other specialties, particularly law, engineering, economics and business and public administration. However, development requires more specialists in political science to build and improve the political systems, which encourage industrialization, mass education, technological change, and modernization of society.

Public administration also constituted a low percentage of total social science enrollment. Enrollment of students in public administration from the seven countries declined from 37 in 1965-66 or seven percent of social science to 20 students in 1969-70 or three percent. For Venezuela the number declined from 14 in 1965-66 to two in 1969-70. For Colombia the number declined from five in 1965-66 to two in 1969-70.

Despite the complicated social problems of Latin America and the need for psychologists and sociologists to deal with these problems, as suggested in Chapter II, the enrollments in psychology and sociology, especially rural sociology, were very low. This can be explained by the low employment opportunities in these fields in the home countries. However, the numbers and percentages of enrollment in these two fields have been increasing. The enrollment in psychology doubled in the

five-year period and the share increased from 7.2 percent of all enrollment in social science to 10.5 percent. In sociology the enrollment exceeded that of psychology but increased at a slower rate. The proportion of sociology increased from 10.6 percent of total enrollment in social science in 1965-66 to 13.4 percent in 1969-70.

Medical Sciences

The IIE data on medical sciences includes general medicine, dentistry, pharmacy and public health but do not include internships and residencies. Medical sciences are fields where graduate education is not so important for a developing country. Latin American graduate students in medical sciences constitute only a small percentage of the total number of graduate students in any year. The proportion of medical students is usually less than five percent.

Veterinary Medicine

Veterinary medicine students represent very small proportions of total graduate students of any country throughout the five-year period. The proportion of veterinary medicine was usually a fraction of one percent. Argentina, which depends largely on meat for export earnings, had only one graduate student in veterinary medicine in each of 1965-66, 1966-67 and 1967-68. In 1969-70, that number increased to four students, still less than one percent of total graduate enrollment.

Humanities

The proportions of students in humanities appear appropriate except for Argentina, Mexico and Chile. Argentina had the highest

percentage of students in humanities (15.3 percent in 1969-70). Mexico and Chile were next (10.6 percent and 10.4 percent in 1969-70, respectively). The rest of the seven countries had a relatively low proportion which varied from 8.8 in Brazil to 4.1 in Venezuela in 1969-70.

For each of Argentina, Brazil and Colombia, there was a declining trend in proportion of humanities students over the five-year period. For Argentina, the proportion declined from 17.6 percent to 15.3 percent. For Brazil, the proportion declined from 14 percent to 8.8 percent and for Colombia, the decline was from 9.0 percent to 4.5 percent.

Law

In contrast to the high enrollment in law among undergraduate students in Latin American universities, the number of students enrolled in law for graduate studies in United States universities is very small (Figures 6-9), only 26 students in 1965-66 or 1.2 percent of total graduate enrollment. This number increased to 55 students in 1969-70, or 1.4 percent. This small proportion of graduate enrollment in law is satisfactory for economic development needs.

Fine Arts

The level and proportions of enrollment in fine arts has been consistently increasing for all the seven countries. In 1965-66, the average proportion of enrollment in fine arts was 1.3 percent. In 1969-70, the average increased to 3.4 percent.

In summary, throughout the five-year period, enrollment of Latin American graduate students in the United States was concentrated in technical fields of specialization, mainly engineering and physical and natural sciences. Enrollment in structural fields of specialization were generally small. This pattern of specialization may not be the best for economic development needs or employment opportunities in the home countries. A balanced pattern of specialization among structural and technical fields is essential for economic development of Latin America, as explained in Chapters II and III. Employment opportunities in Latin America are poor in the physical and natural sciences and improving for social sciences and business, as shown in Chapters IV and V.

The considerable overall expansion of graduate enrollment has been accompanied by major changes in the patterns of specialization. Changes favorable to economic development include the increases in enrollment proportions in business and education. Both fields are essential for economic development needs and reflect increasing employment opportunities in the home countries. The proportion of civil engineering has been declining and those of other fields of engineering have been increasing, which is appropriate to the increasing emphasis on industrialization relative to the further development of infrastructures.

Enrollments in agriculture and veterinary medicine are insufficient for economic development needs, but may be satisfactory for employment opportunities in the home countries. However, agricultural enrollment was becoming more balanced among sub-fields of agriculture.

Enrollments in social sciences were small for economic development needs, especially in fields other than economics. Further, the

proportion of social science enrollment of the seven countries combined declined in the five-year period. Enrollments in psychology and sociology were very small but increased at a slow rate. Limited employment opportunities explain the small enrollment in social science fields other than economics.

CHAPTER VII

EFFECTS OF SPONSORSHIPS ON PATTERNS AND TRENDS OF SPECIALIZATION

The purpose of this chapter is to identify, discuss and evaluate specialization patterns and trends of Latin American graduate students sponsored by different sponsor groups. The contributions of sponsor groups to Latin America's economic development are evaluated in terms of their relevance to the home countries development needs and employment opportunities.

The sponsors of the graduate students from Latin America as identified by the IIE census data are: the United States government, the home governments, United States private organizations, United States colleges and universities and self-supported students. The numbers of graduate students for 1965-66 and 1969-70 and the percentages classified according to sponsor groups are presented in Table XIII.

Distribution of Graduate Students By Sponsor Group

Noticeable trends are the increase in the number and percentage of self-supported, the decline of number and percentage of students totally supported by United States private organizations, and the increase in percentage of students sponsored by combinations of sponsors. The number of self-supported was 257 (13.9 percent) in 1965-66, and

increased to 610 (22 percent) in 1969-70. The number of students supported by United States private organizations declined from 506 (27.7 percent) in 1965-66 to 460 (16.9 percent) in 1969-70. The proportion of students sponsored by combinations of sponsors increased from 32.6 percent in 1965-66 to 39.9 percent in 1969-70.

TABLE XIII

DISTRIBUTION OF GRADUATE STUDENTS BY SPONSOR GROUPS IN 1965-66 AND 1969-70

Sponsor Groups	1965-66		1969-70	
	Number	Percent	Number	Percent
U. S. Government	177	9.6	195	7.0
Home Government	192	10.4	237	8.5
U. S. Colleges and Universities	110	6.0	160	5.8
U. S. Private Organizations	506	27.5	469	16.9
Self-Supported	257	13.9	610	21.9
Combinations of Sponsors	601	32.6	1108	39.9
Total Specifying Sponsor	1843		2779	
Total Not Specifying Sponsor	424		1235	

The number of students supported totally by the United States government, home governments and United States colleges and universities

has increased slowly relative to the increase in total number of graduate students from the seven countries. Therefore, the proportion of students supported totally by each of these three groups declined between 1965-66 and 1969-70.

Sponsor Groups and Student Specialization

To evaluate the contribution of each sponsor group to Latin America's economic development, sub-patterns of students from the seven countries combined for each sponsor group are presented in Appendix C for the years 1965-66 and 1969-70. The data is tabulated by fields and subfields of specialization. Summary statistics on these patterns are presented in Table XIV and include only the major fields. Each sub-pattern is discussed and evaluated in terms of the relevance of the home countries. Another measure used for this discussion and evaluation is an evaluation index developed by Professor Shearer. The discussion and evaluation of specialization patterns of students solely supported by each of the five sponsor groups are presented first, followed by an analysis of students supported by combinations of groups.

Shearer's Index

Shearer has devised two parallel indexes based on the nature of fields of specialization in graduate studies. He terms them the "technical" index and the "structural" index.

> Each index incorporates all of the 94 fields of specialization identified by the IIE, weighted according to their apparent relevance to that particular index. Whereas the technical index gives greatest weight to agriculture, engineering, physical sciences and education, the structural

TABLE XIV

SUMMARY TABLE FOR SPECIALIZATION PATTERNS OF GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES BY SPONSOR GROUPS IN 1965-66 AND 1969-70

	Total in Specified Fields		Total Who Specified Sponsor		U. S. Gov't		Home Gov't		U. S. Univ.		U. S. Priv. Organ.		Self	
	65-66	69-70	65-66	69-70	65-66	69-70	65-66	69-70	65-66	69-70	69-70	69-70	65-66	69-70
Agriculture	252	297	176	252	10.7	20.5	10.4	17.3	7.3	10.0	14.6	10.7	9.7	5.7
Business	142	389	112	283	11.3	9.2	4.7	5.1	3.6	0	3.2	6.0	10.5	18.7
Education	91	208	77	162	5.7	7.7	3.7	3.0	0	0.6	4.0	7.7	4.7	7.1
Engineering	459	920	375	564	12.7	13.3	29.7	30.0	25.5	23.1	18.6	23.7	19.1	16.1
Fine Arts	27	920	27	88	0	1.5	1.7	1.7	1.8	1.9	1.6	1.3	2.3	5.9
Humanities	225	136	187	259	7.9	4.6	1.0	2.1	12.7	11.3	8.3	6.6	15.2	12.8
Medicine	108	351	64	101	1.7	1.0	4.7	4.2	2.7	2.5	2.8	3.8	3.1	8.9
Vet. Medicine	16	172	14	15	1.1	2.6	1.0	0.8	0	0	1.0	0.9	0.8	0
Phys. & Nat. Sciences	479	29	389	556	14.9	14.9	27.6	24.5	30.0	38.8	23.1	21.3	11.3	8.4
Soc. Sciences	502	800	437	481	34.5	24.1	15.6	11.4	16.7	11.0	22.5	18.1	23.4	15.4
Law	26	665	12	18	0	0.5	0	0	0	0	.4	0	0	1.1
Total	2267	4014	1870	2779	100	100	100	100	100	100	100	100	100	100

> index gives greatest weight to the specialties most concerned with the structure of society, such as the social sciences and most of the humanities.[1]

For each of the years 1965-66 and 1969-70, both indexes, technical and structural, were calculated for all students supported by each of the five sources of support. Two corresponding other indexes were calculated for the sum of students totally and partially supported by each sponsor group for each of the two years. The index numbers are presented in Table XV.

United States Government

The major purpose of the United States government sponsorship to Latin American students in the United States universities is to help the development of the Latin American countries through education. The main source of this sponsorship is the Agency for International Development (AID) of the United States Department of State which grants fellowships to foreign students to study in United States colleges and universities. Other United States government programs include the Fulbright-Hays Act, Public Law 87-256, the Mutual Education and Cultural Exchange Act of 1961, and the Development Fellowship Program.

Social sciences had the greatest number of students sponsored by the United States Government (34.5 percent) in 1965-66 (Table XIV). This proportion declined significantly but was still the highest in 1969-70 (24.0 percent). Approximately 50 percent of the social science students

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[1] John C. Shearer, "International Migration of Talent and the Foreign Student," Proceedings of the Twenty-Second Meeting of the Industrial Relations Research Association, 1969, pp. 264-265. For details see John C. Shearer, "Intra- and International Movements of High-Level Human Resources," in James Heaphey (ed.), Spatial Dimensions of Development Administration, 1971, pp. 206-207.

TABLE XV

TECHNICAL AND STRUCTURAL INDEXES FOR ALL GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES, BY SPONSOR GROUP, 1965-66 AND 1969-70

Sponsor Group	1965-66		1969-70	
	Technical Index	Structural Index	Technical Index	Structural Index
U. S. Government Totally	59.8	53.1	66.0	44.0
U. S. Government Totally and Partially	56.1	50.6	62.2	41.4
Home Government	69.5	24.6	73.5	19.3
Home Government and Others	69.3	23.6	72.7	21.7
U. S. Universities	53.0	30.5	60.0	21.1
U. S. Universities and Others	51.0	31.3	56.8	32.4
U. S. Private Organizations	60.2	36.0	66.3	35.0
U. S. Private Organizations and Others	59.6	36.7	60.3	42.2
Self-Supported	52.9	52.6	53.8	51.4
Self-Supported and Others	53.0	47.0	53.6	48.0

sponsored by the United States government in both years were studying economics. In 1965-66, there was only one student in agricultural economics; this number increased to seven in 1969-70. Adding agricultural economics to economics, they together constituted approximately 70 percent of the social science students from the seven countries sponsored by the United States government in 1969-70 (Appendix C).

The number of agricultural students sponsored by the United States government doubled from 1965-66 (19) to 1969-70 (40), and the agricultural share of total graduate students supported by the United States government doubled from 10.7 percent to 20.5 percent. Study emphasis shifted from agronomy to a more balanced pattern among the sub-fields of agriculture such as animal husbandry, soils, and horticulture (Appendix C).

Physical and natural sciences ranked third, with 14.9 percent of the total students in both years. The share of students supported by the United States government in engineering (12.4 percent in 1965-66 and 13.3 percent in 1969-70) is less than that in physical and natural sciences. In 1969-70, United States government support of students in some other fields were: education (7.7 percent) and business (9.2 percent). Less attention was given to humanities (4.6 percent) and medicine (1 percent).

This pattern of specialization is reflected in a high structural index of 53.1 in 1965-66 (Table XV) which ranked the United States government first among all sponsor groups. In the five-year period, the structural index declined to second place (44.0) after self-supported in 1969-70 and the technical index increased from 59.1 to 66.0, indicating increasing concentration of students in technical fields.

The pattern of specialization of students supported by the United States government is generally relevant to both the development needs and employment opportunities in the home countries. The emphasis on social sciences and agriculture is especially important for economic development needs. The relatively low number supported in engineering, humanities and medicine are appropriate to the employment opportunities as there are surpluses of these specialties in the home countries (Chapters IV and V).

Home Country Governments

In contrast to the relatively heavy emphasis by the United States government on structural specialties, most of the home countries placed relatively greater emphasis on technical fields of study such as engineering, physical and natural sciences and agriculture. This difference in emphasis on different fields can by clearly shown by using Shearer's index. In 1965-66, while the structural index and the technical index for United States government were 53.1 and 59.8, those for home governments were 24.6 and 69.5, respectively. The structural index for the home government was the lowest of all sponsor groups and the technical index was the highest. In 1969-70, further concentration of students sponsored by their home governments in technical fields is indicated by the increase in the technical index to 73.5 and a decline in the structural index to 21.7.

The participation of each of the seven governments in financing graduate students varies considerably. For example, out of a total of 195 students supported by home governments in 1969-70, Venezuela's

government supported 119 students while the Peruvian government supported only 12 students.

In both 1965-66 and 1969-70, the proportion of students in engineering supported by the seven home governments combined was approximately 30 percent. The proportion in natural sciences was 27.6 percent in 1965-66 and 24.5 percent in 1969-70. The proportion in agriculture increased from 10.4 percent in 1965-66 to 17.3 percent in 1969-70.

The increase in agriculture was accompanied by a shift in concentration of students from emphasis on agronomy in 1965-66 to a more balanced distribution among the agricultural fields in 1969-70. In engineering, concentration of students shifted from emphasis on civil engineering to emphasis on electrical, chemical and other highly specialized fields of engineering such as textile, mining, petroleum and electronic. The proportion of students in civil engineering declined from 28 percent of the total engineering students supported by the home governments in 1965-66 to 11 percent in 1969-70. The support of chemical engineering students increased from 1.8 percent to 14 percent and the support of all textile, mining, petroleum and electronic engineering students increased from seven percent to 62 percent. These trends in distribution of both agriculture and engineering students are relevant to economic development needs and employment opportunities in the home countries.

Little attention is given by the home governments to education and social sciences. There were only 27 social science students with home country support in 1965-66 and 30 in 1969-70. Two-thirds of social

The emphasis by most students sponsor groups, especially home governments, United States universities and United States private organizations, on technical fields of specialization rather than on structural helps explain the concentration of enrollment of Latin American graduate students in technical fields of specialization. Only the United States government gave high priority to social sciences. Th self-supported students and the United States government are the main sources of support for students in business administration.

Better patterns of specialization, that is, more related to Latin America's economic development needs and employment opportunities in th home countries, require much smaller proportions of students in physica and natural sciences and larger proportions in fields such as education sociology, psychology, public administration, political science and industrial and labor relations. A continuous increase in agricultural fields and veterinary medicine is also recommended.

Such changes in the patterns of specialization require the efforts of the sponsor groups concerned with Latin America's graduate students' education for economic development of the home countries, particularly the home governments, the United States government, and the United States private organizations. It is their responsibility to take steps to maximize the benefit of graduate education to the Latin American countries. Through studies of the professional market, the stage of development of each country and its needs for professionals, they can select and adapt policies to supply Latin America with the needed professionals.

In the fields of study where the development needs diverge widely from the employment opportunities, it is mainly the responsibility of

the Latin American governments to adapt policies to close the gap between the employment opportunities and development needs. For example, supporting research would increase the employment opportunitie in the scientific fields such as agriculture and physical and natural sciences. Encouraging agricultural reforms would increase the employment opportunities for agriculture, veterinary medicine and agricultural economics specialists. Encouraging social reforms would require the increase in employment of sociologists and psychologists. It is only when the employment opportunities coincide with the needs and the patterns of graduate training correspond to them, that United States graduate education can make maximum contribution to Latin American development.

sciences students sponsored by their governments studied economics and agricultural economics. Taking into consideration the structural problems of the Latin American countries and the low level of opportunities in science, the concentration on technical and scientific fields of specialization would not seem the best for maximum benefit of graduate education for economic development. The reluctance of the hom governments to support graduate education in structural fields of specialization may be explained by the interest of most home government in keeping the existing social and political structures as explained in Chapter II.

United States Colleges and Universities

United States colleges and universities support foreign graduate students mainly by graduate assistantships without reference to the economic development needs or opportunities of the home countries. The data show that the Latin American graduate students supported by United States colleges and universities are concentrated in the technical fields of specialization. This high concentration of students in technical specialties is shown by a high technical index of 60.0 and a very low structural index of 21.1 in 1969-70.

Physical and natural sciences ranked highest with a share of 38.8 percent of Latin American students totally supported by all United States colleges and universities in 1969-70. Engineering constituted 25.5 percent in 1965-66 and 23.1 percent in 1969-70. The share of agriculture increased from 7.3 percent in 1965-66 to 10 percent in 1969-70. Social sciences had only 11.4 percent in 1965-66, increasing to 15.7 percent in 1969-70. This high concentration of students in

technical fields, especially physical and natural sciences, is unrealistic in view of the Latin American countries' development needs and employment opportunities. This concentration of support in technical fields derives mainly from the Federally supported research and development programs, particularly in physical and natural sciences and engineering. A large proportion of the scientists and engineers in such programs are high-quality foreigners,[2] often as a consequence of the support by United States colleges and universities of foreign graduate students in technical fields.

United States Private Organizations

United States private organizations, such as the Rockefeller Foundation, Ford Foundation and the Kellogg Foundation, grant fellowships to foreign students to study in the United States and elsewhere. Although United States private organizations support Latin American graduate students in all fields of specialization, the specific aim of the most of these fellowships is to further the development of the underdeveloped countries. For example, the Rockefeller Foundation offers University Development Program fellowships for training prospective staff members for the Latin American universities.

Engineering had the largest share of such support with 23.7 percer in 1969-70 compared to only 18.6 percent in 1965-66. The increase in the engineering share was accompanied by a proportional decline in the

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[2]House of Representatives, Committee on Government Operations, The Brain Drain into the United States of Scientists, Engineers and Physicians, A Staff Study for the Research and Technical Programs, Washington, 1967, pp. 10-12.

shares of physical and natural sciences. The physical and natural sciences have declined from 23.1 percent in 1965-66 to 21.3 percent in 1969-70. The number of social sciences students declined from 114 (22.5 percent) in 1965-66 to 85 (18.1 percent) in 1969-70. About 55 percent of these students specialized in economics and agricultural economics. The change in the natural sciences proportion seems to be i the right direction with respect to home countries needs and employment opportunities while the change in social sciences proportion is irrelevant, especially for the needs.

In 1965-66, many of the students in agriculture were supported by private organizations while little attention was given to agriculture by all other sponsor groups. Seventy-four students, or 42.1 percent, o the total of 176 agriculture students with stated sponsors were supported solely by a United States private organization in 1965-66. The 74 students represented 14.6 percent of the total students sponsored by United States private organizations in 1965-66. This proportion declined to 10.7 percent in 1969-70, and the number of agricultural students was only 50, or 20 percent, of the total of 252 Latin American graduate students in agriculture.

The proportions of students supported by United States private organizations in business, education and engineering increased in the five-year period. The proportions in business increased from 3.2 percent in 1965-66 to 6 percent in 1969-70, and the proportion in educatio increased from 4 percent in 1965-66 to 7.7 percent in 1969-70. In engineering, the proportion increased from 18.6 percent in 1965-66 to 23.7 percent in 1969-70.

Graduate students in veterinary medicine are mostly supported by the private organizations and the United States government and the number of students was very small. Only five students in 1965-66 and four in 1969-70 were supported solely by United States private organizations.

Generally, the United States private organizations emphasize the technical fields of specialization needed for economic development. A further reduction in the natural sciences proportion and an increase in the social sciences students in fields other than economics would make a better pattern of specialization for economic development and employment opportunities.

Self-Supported

Self-supported students have increased over the five-year period from 257 students, or 13.9 percent of total Latin American students, to 610 students, or 21.9 percent of total. Concentrations of study of self-supported students were in business, economics, humanities and engineering. Self-supported students usually come from the wealthy classes of the home countries and their studies often reflect the objective of acquiring status in addition to preparing for a career.

In contrast to all other sponsor groups in supporting high proportions of students in natural sciences and small proportions in business, humanities, and fine arts, the self-supported students represented small proportions of students in physical and natural sciences (11.3 percent in 1965-66 and 8.4 percent in 1969-70). High proportions of self-supported students were in business (10.5 percent

in 1965-66 and 18.7 percent in 1969-70) and humanities (15.2 percent in 1965-66 and 5.9 percent in 1969-70).

In 1969-70, the 114 self-supported students in business represented 40.3 percent of the total Latin American students in business. The number of self-supported students in fine arts represented 41.0 percent of total Latin American students in fine arts, and the number of students in humanities represented 30.0 percent of the total students in humanities.

In the five-year period, trends in distribution of self-supported students included increases in the proportion of students in business (10.5 percent to 18.7 percent), fine arts (2.3 percent to 5.9 percent), and medicine (3.1 percent to 8.9 percent). Only the change in business is relevant to the increase in industrialization. The increases in business, fine arts and medicine proportions were accompanied by declines in proportions of students in agriculture (9.7 percent to 5.7 percent), engineering (19.1 percent to 16.1 percent), humanities (15.2 percent to 12.8 percent), physical and natural sciences (11.3 percent tc 8.4 percent), and social sciences (23.4 percent to 15.4 percent). The declines in shares of physical and natural sciences are favorable to development needs and employment opportunities, while the declines in social sciences proportion seem to be irrelevant.

Combinations of Source of Support

The above analysis was confined to the students totally supported by one source. Students supported by more than one source constituted 40 percent of total students in 1969-70. To explore the pattern of specialization of partially supported students and the effect on the

total support by each sponsor group, it is convenient to explain it solely in terms of Shearer's index (Table XV).

When adding the partially supported students to totally supported students by the United States government, home governments and self-supported, the technical and structural indexes did not change significantly in each of the years 1965-66 and 1969-70. Therefore, the emphasis of these sponsor groups are approximately the same for partially supported students as for totally supported students. For example, adding partially supported students and totally supported by home governments, the technical index was still much higher than the structural index, which clearly indicates heavy emphasis on technical fields of specialization by home governments, whether their sponsorship be sole or in combination with other sponsors.

The United States government supported, both totally and partially relatively high proportions of students in structural fields of specialization. However, there was a trend of increasing concentration in technical fields. Self-supported students, both totally and partially, had a stable pattern of specialization over the five-year period with a relative high proportion in structural fields and a small proportion in technical fields.

In 1965-66, for each of the United States universities and United States private organizations, there were no significant differences in the technical and structural indexes of the totally supported students and the totally and partially supported combined. In 1969-70, the technical indexes of totally and partially supported students combined was much less than those totally supported by these two sponsor groups.

The structural index was much higher, indicating that both United State universities and United States private organizations partially supporte more students in structural fields in 1969-70 than in 1965-66.

In summary, different sponsor groups place different emphasis on fields of specialization of Latin American graduate students. The United States government has emphasized economics, agriculture and business. Both the home governments and United States universities had high proportions of students in engineering and natural sciences. Home countries governments supported high proportions of students in agricul ture in 1969-70. United States private organizations emphasized studie in engineering, agriculture, economics and natural sciences. The self-supported students were concentrated in the fields of business, economics, engineering and humanities.

Specialization patterns of students' sponsors have provided explanation to the patterns of specialization of Latin American graduat students analyzed in Chapter VI. The high proportion of enrollment in technical fields may be explained by the emphasis by most sponsor groups, especially the home governments, United States colleges and universities and United States private organizations, in such fields as engineering and physical and natural sciences. The new emphasis on business administration is largely related to the increased enrollment of self-supported students and students supported by United States government and United States private organization.

Enrollment in social sciences is declining because none of the sponsor groups, except the United States government, gives high priority to social science students, especially in fields other than economics. Enrollment in agriculture has been low but has begun to

increase, and is better balanced among agricultural fields because sponsors, particularly private organizations, the United States government and home countries' governments, now give greater emphasis to all agricultural fields.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

The major objective of the study is to discuss and evaluate the patterns and trends of specialization of graduate students from selecte Latin American countries in United States universities in terms of thei relevance to their home countries' economic development needs and employment opportunities. The second objective is to compare and contrast the contribution of each of the graduate students sponsor groups to the home countries economic development and their effect on students specialization.

Graduate education was identified as the highest level of formal education to provide the most highly qualified specialists at the managerial, professional and technical levels. Professional people mus be trained in various fields of specialization at higher levels of education in both the technical and structural fields of specialization The choice between the stressing of technology and the structural areas of specialization should relate to the level of economic development an the type of social environment of the society.

The functions of technical and structural specialties were discussed in relation to levels of economic development. Specialties i technical fields are related to the introduction and application of new techniques of production. Introduction of new technical knowledge

increases the productivity of capital and labor resulting in a larger output with given quantities of inputs. Continuous economic growth requires continuous technical progress in order to increase the productivity of capital and labor.

Industrial advance, therefore, requires an increasing supply of engineers, scientists, economists and business administrators. Agricul ture development requires a significant increase in modern science and technology and requires highly trained specialists in agriculture. Urbanization increases the needs for services. Well-qualified profes- sionals will be needed in such areas as public administration, educatio construction and business.

Economic development of a society and continuous technical progres require favorable structural factors. Structural factors refer to those social, economic and political factors that bear on the effective ness with which the economy operates, such as family ties, income distribution, work habits, legal environment, political systems and the attitudes of the people toward work, mobility, saving, investment and application of new technology. The basic function of professional specialists in structural fields, such as economists, sociologists, psychologists and political scientists, is to recognize and analyze those structural factors which impede development and to change them.

As an economy moves toward industrialization and development, the structural factors become less obstructive. Industrialization, educa- tion, urbanization and better communication encourage structural change and are complementary to economic development. Emphasis on structural specialties is, therefore, of relatively greater importance in the firs

stages of development, and the technical specialties grow in importance as development progresses.

Mexico, Brazil, Colombia, Argentina, Chile, Venezuela and Peru were the seven selected Latin American countries for this study. Their levels of development were measured to identify the relevant professional specialties needed for their development. The measures used were: (1) per capita income, (2) index of human resource development, (3) percentage of labor force engaged in agriculture, and (4) growth of domestic product. Other measures were used to identify the relative importance and the level and trends of development of agricultural and industrial sectors in the selected countries.

These measures of development indicated that the seven countries are in intermediate stages of development with some variation among the countries. All have passed the extremely underdeveloped stages but are still less developed than advanced countries. Argentina had the highest level of development and the lowest growth rates. Colombia, Peru and Brazil are less developed than are Argentina, Venezuela, Chile and Mexico.

The rates of growth of the industrial sectors in the seven countries are much higher than those of the agricultural sectors. The agricultural sectors are lagging in the seven countries. The traditional agrarian systems restrict the application of technology and the development of agriculture.

For these levels of development in the Latin American countries graduate education is needed in both the technical and structural areas of study. Considerable graduate education in civil, electrical and mechanical engineering is needed by all the seven countries. Specialtie

in other fields of engineering are especially needed by Argentina, Venezuela, Mexico and Chile. In agricultural fields, graduate educatio is needed especially by Mexico and Venezuela, which have been accomplis ing major agrarian reforms.

Graduate education in structural fields of specialization, particularly social sciences, education, and business administration, i needed by all the seven countries to deal with the existing social and structural problems and to accelerate the rates of economic development

For lack of direct measures, the employment opportunities in the home countries were measured by two indirect indicators (1) time series data in the 1950's and 1960's on the distributions of student enrollments and graduates by fields of specialization in Latin American universities, and (2) the data on the migration to the United States by the various professional specialties of Latin Americans.

This study made the basic assumption that the underlying causes of changes in the composition of fields of specialization in higher education are changes in employment opportunities created by the economic development activities and, especially, industrial expansion in the 1960's. Therefore, changes in the proportions of students in various fields of specialization over time was used as indicators of changes in opportunities.

The United States is the only country to which professionals from Latin America migrate in significant numbers. The major causes of emigration to the United States from Latin America are the over supply of certain specialties relative to the low level of professional and economic opportunities in the home countries.

Both measures indicate a large supply relative to demand (or poor professional opportunities) in the fields of medicine, engineering (especially civil engineering), and physical and natural sciences. There were large declines in the enrollments of law and medicine; the proportions of enrollments in fields of engineering and physical and natural sciences were either constant over time or slightly declined in the 1960's. Civil engineering constituted approximately 50 percent of total engineering graduates. Data on the brain drain confirm the poor professional opportunities for physicians, engineers, and physical and natural sciences as immigrants in these fields constituted high proportions of total professional immigrants from Latin America. The data on migration of lawyers failed to confirm the surplus of lawyers in Latin America. The large difference in the type of law training needed in the United States from that in Latin America makes the employment opportunities for Latin American lawyers in the United States very poor.

Both measures also indicated relatively favorable employment opportunities in Latin America in the fields of social sciences and education and to a lesser degree in agriculture and veterinary medicine The proportions of enrollments in the social sciences, education, agriculture and veterinary medicine increased in the 1960's. The numbers of migrating professionals in these fields were very small.

The patterns and trends of specialization of Latin American graduate students in United States universities were identified by using data from the Institute of International Education annual censuses for each of the years 1965-66 through 1969-70. Graduate education of Latin American students in the United States expanded constantly during the five-year period. The total number of graduate students from the seven

countries increased from 2,267 in 1965-66 to 4,014 in 1969-70. This increase was accompanied by significant changes in patterns of specialization of graduate students.

In 1965-66, the social sciences had the highest number of students with 22.1 percent of the total enrollment from the seven countries. Th physical and natural sciences ranked second with 21.1 percent, engineering third with 20.3 percent, and humanities fourth with 9.9 percent. Agriculture, business and education constituted smaller enrollments with 8.5 percent, 6.3 percent and 4.0 percent, respectively.

During the five-year period, there was a decline in the share of social sciences to 16.4 percent in 1969-70, which fell to third rank after engineering (22.9 percent) and physical and natural sciences (19.9). Until 1968-69, physical and natural sciences enrollment exceeded that of engineering. In the last year, 1969-70, engineering enrollment surpassed that of physical and natural sciences.

There were increases in the proportions in business (6.3 percent t 9.7 percent), education (4.0 percent to 5.2 percent), and fine arts enrollments (1.2 percent to 3.4 percent). The proportion of medical students has been declining since 1966-67 (from 5.9 percent to 4.3 percent in 1969-70) and the proportion in humanities began to decline afte 1967-68 (10.0 percent in 1967-68 to 8.7 percent in 1969-70). In 1969-70, the enrollment in business (9.7 percent) exceeded that in humanitie (8.7 percent) and the enrollment in education (5.2 percent) exceeded that in medicine (4.3 percent).

Agriculture constituted a relatively small proportion of graduate enrollments, with much variation among countries. Argentina, Mexico

and Brazil had the smallest proportions in agriculture. Enrollment in agriculture was concentrated in agronomy in 1965-66. The enrollment in other agricultural fields increased in the five-year period. Enrollmen in agriculture seems rather small relative to the economic development needs, but may be appropriate for the limited opportunities in agriculture in the home countries. Exceptions are Argentina, where the propor tion of agricultural students has remained very low, and Mexico where, despite massive agrarian reform, a low proportion persists.

Enrollment in business increased rapidly in the five-year period for all seven countries, especially for Mexico and Peru, in both absolu numbers and percentage-wise. This is appropriate for the increasing needs of industry in the home countries for business administration specialists and the increasing employment opportunities for graduates in this field. Mexico and Peru had the highest rates of growth of gros domestic product, and the highest rates of increase in proportion of graduate enrollment in business. The proportion of business students for Chile is rather small relative to the level of development.

Although the number of graduate students from the seven countries combined in education increased rapidly (129 percent), the proportion of graduate students enrollment in education was still low for five of the seven countries. Only Chile and Colombia had over five percent of the total students in education. The level of enrollment in education is low relative to development needs, especially for Mexico, Brazil, Venezuela and Argentina, but the increase in education enrollment is consistent with the increase in employment opportunities in education i the home countries.

student enrollment were in social sciences. Comparing this proportion to physical sciences students in the same year (20 percent) or engineering (22.2 percent), the numbers of social sciences students seem to be inadequate for development needs. This is particularly true in Chile and Venezuela, which have the smallest proportions of social sciences students (14.6 percent and 12.8 percent, respectively). Economics students constitute approximately 50 percent of total social sciences enrollment. Enrollments in psychology and sociology were very small and increased at a slow rate. Limited employment opportunities justify the small enrollments in such fields.

The graduate students from Latin America are identified by the IIE data by five sponsor groups: the United States government, the home governments, United States private organizations, United States college and universities and self-supported students. In the five-year period, the number of self-supported students increased (13.9 percent to 22 per cent) and the number of totally supported by private organizations declined (27.7 percent to 16.9 percent). The number and percentage of students supported by combination of sponsors increased (32.6 percent to 39.9 percent).

Different sponsor groups place different emphasis on fields of specialization. To evaluate the contribution of each sponsor group to Latin America's economic development, sub-patterns of students from the seven countries combined for each sponsor group were discussed and evaluated. An evaluation index developed by Professor Shearer was also used in this analyses.

The United States government has emphasized social sciences, agriculture and business. Social sciences had the greatest concentrati

of students (34.5 percent) in 1965-66. This proportion declined significantly but was still the highest in 1969-70 (24.0 percent). Economics and agricultural economics represent 70 percent of all social science students. Agriculture's share doubled in the five-year period. The emphasis on social sciences and agriculture is especially important for economic development needs. The relative low proportion in engineering, humanities and medicine are relevant to the employment opportunities as there were surpluses in these specialties in the home countries.

Both the home governments and the United States universities had high proportions of graduate students in engineering and physical sciences. In 1969-70, engineering represented 23.1 percent and physica sciences represented 38.8 percent of total students supported totally b United States universities. For students supported totally by home governments, engineering represented 30.0 percent of students and physical and natural sciences 24.5 percent. The numbers of agricultura students supported by the home governments increased in the five-year period. Education and social sciences continued to represent small proportions of students supported by home governments and United States universities.

The high concentration of students supported by home governments and United States colleges and universities in technical fields of specialization seems poorly correlated with Latin America's economic development needs or employment opportunities. The structural problems of Latin America and the low level of opportunities in physical and natural sciences suggest the need for higher proportions of students

in social sciences and smaller proportions in physical and natural sciences.

Support by United States private organizations has emphasized studies in engineering, agriculture, economics and natural sciences. In the five-year period, the engineering share increased from 18.6 percent to 23.7 percent, while physical sciences and social sciences declined from 32.1 percent to 21.3 percent and from 22.5 percent to 18.1 percent respectively.

United States private organizations supported high proportions of students in agriculture. In 1965-66, 42 percent of agricultural students were supported by United States private organizations. The proportions of students in business, education and engineering increase in the five-year period. A reduction in natural sciences proportion an an increase in social sciences students are recommended for a better pattern of specialization.

The self-supported students represented high proportions of students in business, humanities and fine arts and very small proportions of students in physical and natural sciences. In 1969-70, the self-supported students represented 40 percent of total students in business, 41 percent of humanities students, which reflect their interest in status as well as career.

The pattern of partially supported students was similar to that of totally supported students in both periods (1965-66 and 1969-70), excep for the existence of a higher percentage of students in structural fields partially supported by United States universities and United States private organizations in 1969-70.

Economic Committee for Latin America. Social Change and Social Development Policy in Latin America. United Nations. New York: 1970.

Fein, Rashi. "Educational Patterns in Southern Migration." The Southern Economic Journal. XXXII, No. 1, Part II (July, 1965), pp. 106-124.

Firth, Raymond. General Working Paper. UNESCO Expert Working Group on Social Prerequisites to Economic Growth. UNESCO/SSWP, March, 1963.

Form, H. William and C. Delbert Miller. Industry, Labor and Community. New York: Harper and Brothers, 1960.

Greetz, Clifford. Peddlers and Prices: Social Development and Economic Change in Two Indonesian Towns. Chicago: 1963.

Grubel, Herbert. "The International Flow of Human Capital, the Brain Drain." American Economic Review. LVI, No. 2 (May, 1966), pp. 268-274.

_____. "The Immigration of Scientists and Engineers to the United States." The Journal of Political Economy. LXXIV, No. 4 (August, 1966), pp. 368-378.

Hagen, E. Everett. The Economics of Development. Homewood, Illinois: Richard D. Irwin, 1968.

_____. The Theory of Social Change: How Economic Growth Begins. Homewood, Illinois: 1962.

Hailstones, J. H., L. B. Matrin and V. V. Mastorianna. Contemporary Economic Problems and Issues. Cincinnati, Ohio: South-Western Publishing Company, 1970.

Harbison, Frederick. Educational Planning and Human Resource Development. UNESCO, Industrial Institute for Educational Planning, 1967.

Harbison, Frederick and Charles A. Myers. Education, Manpower, and Economic Growth, Strategies of Human Resource Development. New York: 1964.

Horowitz, A. Morris. "High-Level Manpower in the Economic Development of Argentina." In Frederick Harbison and Charles Myers (ed.), Manpower and Education. New York: 1965.

House of Representatives, Committee on Government Operations, The Brain Drain into the United States of Scientists, Engineers, and Physicians. A Staff Study for the Research and Technical Programs. Washington, D. C.: U. S. Government Printing Office, 1967.

Higgins, Benjamin. Economic Development, Problems, Principles and Policies. New York: W. W. Norton and Co., Inc., 1968.

Institute of International Education. Open Doors. New York: 1970.

Kidd, V. Charles. "Migration of Highly-Trained Professionals from Latin America to the United States." In The International Migration of High-Level Manpower. The Committee on the International Migration of Talent. New York: 1970.

Leftwich, Richard H. The Price System and Resource Allocation. 4th ed. Hensdale, Illinois: The Dryden Press, Inc., 1970.

Lewis, W. Arthur. Economic Development with Unlimited Supplies of Labor. The Manchester School of Economics and Social Studies, Vol. 22, No. 2, 1954.

Meade, J. E. A Neo-Classical Theory of Economic Growth. London: 1962.

Medina, Jose Echavarria and Benjamin Higgins. Social Aspects of Economic Development in Latin America. Vol. II. Paris: UNESCO, 1963.

Meier, M. Gerald. Leading Issues in Development Economics. New York: 1964.

Myint, H. Economic Theory and the Underdeveloped Countries. New York: Oxford University Press, 1971.

Nisbet, T. Charles. Latin America, Problems in Economic Development. New York: The Free Press, 1969.

Northrup, R. Herbert and Gordon F. Bloom. Government and Labor. Homewood, Illinois: Richard Irwin, Inc., 1963.

Organization for Economic Co-operation and Development. Education, Human Resources and Development in Argentina. Paris: 1967.

Ruiz, E. Ramon. Interpreting Latin American History, From Independence to Today. New York: Holt, Rinehart and Winston, Inc., 1970.

Schultz, W. Theodore. Transforming Traditional Agriculture. New Haven: Yale University Press, 1965.

_____. The Economic Value of Education. New York: Columbia University Press, 1963.

_____. "Investment in Human Capital." American Economic Review. March, 1961.

Seymour, L. Martin and Salari Aldo. Elites in Latin America. London: Oxford University Press, 1967.

Shearer, John C. "International Migration of Talent, and the Foreign Student." Proceedings of the Twenty-Second Meeting of the Industrial Relations Research Association, 1969.

_____. "Intra- and International Movements of High-Level Human Resources." In James Heaphey (ed.), Spatial Dimensions of Development Administration. Durham, North Carolina: Duke University Press, 1971.

Social Progress Trust. Socio-Economic Progress in Latin America. Economic Commission for Latin America. New York: 1968.

Solow, Robert M. "A Contribution to the Theory of Economic Growth." Quarterly Journal of Economics. February, 1965.

Swan, T. W. "Economic Growth and Capital Accumulation." Economic Record. November, 1956.

United Nations. Education, Human Resources and Development in Latin America. Economic Commission for Latin America. New York: 1968.

United Nations, UNESCO. Social Prerequisites to Economic Growth. Report of an Expert Working Group. Kyrenia, Cyprus: April, 1963.

United Nations, UNESCO. Statistical Yearbook. New York: 1965-1970.

United Nations. Towards a Dynamic Development Policy for Latin America. New York: 1963.

United Nations. The Economic Development of Latin America in the Post War Period. New York: 1964.

United Nations. Yearbook of National Account Statistics. New York: 1969.

United States Department of Agriculture. Agricultural Economic Growth. Agricultural Economic Report No. 28. Washington, D. C.: United States Government Printing Office.

United States Department of Justice. Annual Indicators of Immigrations to the U. S. of Alians in Professional and Related Occupations. Fiscal year, 1969.

Vaizey, John. "The Labour Market and the Manpower Forecaster - Some Problems," International Labour Review. 1965.

Zschock, K. Dieter. Manpower Perspective of Colombia. Industrial Relation Section, Department of Economics. Princeton, New Jersey: Princeton University, 1967.

APPENDIXES

APPENDIX A

DISTRIBUTION OF STUDENT ENROLLMENTS AND GRADUATES IN LATIN AMERICAN UNIVERSITIES IN SELECTED YEARS

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN ARGENTINA IN SELECTED YEARS

	Enrollment				Graduates						
	1955	1960	1963	1965	1957	1960	1962	1963	1964	1965	1966
Humanities	3656	13604	*	*	482	373	1566**	3176**	3035**	3945**	4303**
Education	284	2562	34739	38715	161	482					
Fine Arts	6963	11551	14315	13881	603	529	704	829	869	722	802
Law	38206	40176	31711	36477	1039	1337	1432	1709	1637	1861	2135
Social Sciences	27238	30565	39663	55701	712	813	1142	1063	1174	1501	1456
Natural Sciences	4620	6653	19344	16644	524	576	497	833	647	802	459
Engineering	18386	26205	22989	31216	832	2036	1167	1227	1675	1473	1563
Medical Science	40924	46146	49626	51320	3297	3192	4363	4587	4749	4914	5187
Agriculture	2198	3334	4501	5887	421	393	151	202	259	291	289
Non-Specified	47										
Total	142522	180796	216888	249841	8071	9731	11022	13626	14045	15509	16194
	Percent of Total				Percent of Total						
Humanities	2.6	7.5			6.0	3.8	14.2	23.31	21.61	25.4	26.6
Education	.2	1.4	16.0	15.5	2.0	5.0					
Fine Arts	4.9	6.4	6.6	5.6	7.5	5.4	6.4	6.1	6.2	4.7	5.0
Law	26.8	22.2	14.6	16.6	12.9	13.7	13.0	12.5	11.7	12.0	13.2
Social Sciences	19.1	16.9	18.3	22.3	8.8	8.4	10.4	7.8	8.4	9.7	9.0
Natural Sciences	3.2	3.7	8.9	6.7	6.5	5.9	4.5	4.7	4.6	5.2	2.8
Engineering	12.9	14.5	10.6	12.5	10.3	20.9	10.6	9.0	11.9	9.5	9.7
Medical Science	28.7	25.5	22.9	20.5	40.9	32.8	39.6	33.7	33.8	31.7	32.0
Agriculture	1.54	1.8	2.1	2.4	5.2	4.0	1.4	1.5	1.8	1.9	1.8
Non-Specified	4.7										

*Not available. **Humanities are included with education.

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN BRAZIL IN SELECTED YEARS

	Enrollment					Graduates				
	1954	1960	1964	1965	1966	1957	1960	1961	1963	1964
Humanities	241	9731	7770	17086	48093	1571	2589	3302	2107	2403
Education	11650	5572	7062	9045		1564	1930	1737	1323	1525
Fine Arts	3162	4746	2551	4989	4640	901	903	819	884	776
Law	17864	24033	30987	33402	36363	3124	3332	3509	3817	4140
Social Sciences	5802	14380	31619	30222	29196	1833	2099	2016	3150	4056
Natural Sciences	386	3447	9618	6915	----	399	697	784	707	835
Engineering	7326	11106	23241	22121	26723	1172	1601	1489	1965	2306
Medical Science	17262	19938	25215	25548	28086	4003	3952	3989	3885	3662
Agriculture	1899	2738	3917	6137	7008	398	474	581	649	735
Non-Specified	41	----	406	316	----	---	---	---	---	---
Total	65633	95691	142386	155781	180109	14965	17577	18226	18487	20438
					Percent of Total					
Humanities	.4	10.2	5.5	11.0	26.7	10.5	14.7	18.1	11.4	11.8
Education	17.8	5.8	5.0	5.8		10.5	11.0	9.5	7.2	7.5
Fine Arts	4.8	5.0	1.8	3.2	2.6	6.0	5.1	4.5	4.8	3.8
Law	27.2	25.1	21.8	21.4	20.2	20.9	19.0	19.3	20.7	20.3
Social Sciences	8.8	15.0	22.2	19.4	16.2	12.3	12.0	11.1	17.0	19.9
Natural Sciences	0.6	3.6	6.8	4.4	---	2.7	4.0	4.3	3.8	4.1
Engineering	11.2	11.6	16.3	14.2	14.8	7.8	9.1	8.2	10.6	11.3
Medical Science	26.3	20.8	17.7	16.4	15.6	26.8	22.5	21.9	21.0	17.9
Agriculture	2.9	2.9	2.7	3.9	3.9	2.7	2.7	3.2	3.5	3.6
Non-Specified	0.1	---	0.3	.2	---	---	---	---	---	---

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN CHILE IN SELECTED YEARS

	Enrollment							Graduates				
	1949	1957	1960	1961	1963	1965	1967	1957	1960	1961	1963	1965
Humanities	---	533	1000	1054	367	409	2834	5	138	55	54	101
Education	2457	4686	7167	7283	4196	4576	19467	274	545	426	855	1104
Fine Arts	634	930	1435	1370	901	1069	2898	50	73	83	88	107
Law	2170	2960	2799	2876	1431	1637	4303	169	195	73	145	209
Social Sciences	237	1730	2794	2783	2370	2814	2055	75	173	227	447	423
Natural Sciences	477	535	1058	1456	119	131	2578	81	64	86	95	102
Engineering	907	3382	5299	5350	1726	2031	12833	231	298	284	292	368
Medical Science	2074	2733	3277	3241	2324	2636	6750	499	591	606	559	799
Agriculture	568	696	1248	1142	557	526	2741	29	97	123	177	227
Non-Specified	---	---	---	---	---	1512	32	---	---	---	---	---
Total	9524	18185	26027	26555	13991	17341	56491	1413	2175	1963	2712	3440
	Percent of Total											
Humanities	---	2.9	3.8	4.1	2.6	2.4	5.0	.35	6.34	2.80	1.99	2.94
Education	25.8	25.8	27.5	27.4	30.0	26.4	34.5	19.39	25.06	21.70	31.53	32.09
Fine Arts	6.7	5.1	5.5	5.2	6.4	6.2	5.1	3.54	3.36	4.23	3.24	3.11
Law	22.8	16.3	10.8	10.8	10.2	9.4	7.6	11.96	8.97	3.71	5.35	6.08
Social Sciences	2.5	9.5	10.7	10.5	16.9	13.9	3.6	5.31	7.95	11.56	16.48	12.30
Natural Sciences	5.0	2.9	4.1	5.5	.8	.8	4.6	5.73	2.94	4.38	3.50	2.97
Engineering	9.5	18.6	20.4	20.2	12.3	11.7	22.7	16.35	13.70	14.47	10.77	10.70
Medical Sciences	21.8	15.0	12.4	12.2	16.6	15.2	12.0	35.31	27.17	30.87	20.61	23.23
Agriculture	6.0	3.8	4.8	4.3	3.4	3.0	4.9	2.05	4.46	6.27	6.53	6.60
Non-Specified	---	---	---	---	---	8.7	.1	---	---	---	---	---

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN COLOMBIA IN SELECTED YEARS

	Enrollment						Graduates					
	1955	1960	1963	1964	1965	1966	1957	1960	1961	1963	1964	1965
Humanities	329	1085	2439	3014	3613	2536	44	98	196	236	301	281
Education	314	367	1646	2718	2293	5163	92	25	153	127	123	181
Fine Arts	215	2376	3140	3275	3839	2901	92	164	229	259	360	441
Law	2484	3987	4561	4735	5115	5178	247	312	263	351	317	262
Social Sciences	582	2247	4992	5219	6310	8632	116	147	288	411	421	416
Natural Sciences	660	1563	1426	3104	2237	1182	90	193	73	186	315	269
Engineering	3184	5422	7979	7710	10879	12141	161	269	575	659	427	512
Medical Science	4419	4108	4830	4911	5513	6575	874	613	660	894	808	697
Agriculture	448	1483	2733	2776	3455	3690	31	86	58	115	191	198
Non-Specified	649	22	---	---	---	1932	---	---	---	---	---	---
Total	13284	22660	33746	37462	43254	49930						
	Percent of Total											
Humanities	2.5	4.8	7.2	8.1	8.4	5.1	2.5	5.1	7.9	7.3	9.2	8.6
Education	2.4	1.6	4.9	7.3	5.3	10.3	5.3	1.3	6.1	3.9	3.8	5.6
Fine Arts	1.6	10.5	9.3	8.7	8.9	5.8	5.3	8.6	9.2	8.0	11.0	13.5
Law	18.7	17.6	13.5	12.6	11.8	10.4	14.1	18.4	10.5	10.4	9.7	8.0
Social Sciences	4.4	9.9	14.8	13.9	14.6	17.3	6.6	7.7	11.5	12.7	12.9	12.8
Natural Sciences	5.0	6.9	4.2	8.3	5.2	2.4	5.2	10.1	2.9	5.7	9.7	8.3
Engineering	24.0	23.9	23.6	20.6	25.2	24.3	9.2	14.1	23.1	20.4	13.1	15.7
Medical Science	33.3	18.1	14.3	13.1	12.8	13.2	50.0	32.1	26.5	32.4	24.76	21.4
Agriculture	3.4	6.5	8.1	7.4	8.0	7.4	1.8	4.5	2.3	3.6	5.9	6.1
Non-Specified	4.9	.1	---	---	---	3.9	---	---	---	---	---	---

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN MEXICO IN SELECTED YEARS

	Enrollment				Graduates				
	1961	1963	1965	1966	1957	1960	1961	1962	1963
Humanities	3573	3708	16431	9226	**	**	**	**	**
Education	4474	6735	394	2406	2608	3213	2488	5235	5164
Fine Arts	8277	6183	7141	6197	127	113	178	211	195
Law	12304	14298	16808	17401	488	588	553	502	678
Social Sciences	20276	26758	32996	36252	33	32	51	344	492
Natural Sciences	5339	7843	1153	16304	389	239	422	506	586
Engineering	18667	22772	23229	26475	978	818	992	1087	1002
Medical Science	17823	20763	20719	21602	1641	1320	1912	2498	2290
Agriculture	2859	1382	4336	4226	31	68	69	165	92
Non-Specified	481	30	1023	----	870	1343	2236	2202	8071
Total	94073	110172	134429	140899	8165	7734	8981	12750	18570
	Percent of Total								
Humanities	3.8	2.5	12.2	6.6	**	**	**	**	**
Education	4.8	6.1	.3	1.7	44.14	41.5	27.7	41.1	27.8
Fine Arts	8.8	5.3	5.3	4.4	1.56	1.5	2.0	1.7	1.1
Law	13.1	13.0	12.5	12.4	6.00	7.6	6.2	4.0	3.7
Social Sciences	21.6	24.3	24.6	25.7	.4	0.4	.6	2.7	2.7
Natural Sciences	5.7	7.1	8.6	11.6	4.8	3.1	4.7	4.0	3.1
Engineering	19.8	20.7	17.3	18.8	12.0	10.6	11.1	8.5	5.4
Medical Sciences	19.0	18.9	15.4	15.3	20.1	17.1	21.3	19.6	12.3
Agriculture	3.0	1.3	3.2	3.0	0.4	.9	.8	1.3	.5
Non-Specified	.5	0.0	.8	---	10.7	17.4	24.9	17.3	43.46

**Humanities are included with education.

Source: United Nations, UNESCO, Statistical Yearbook, 1965-66.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN PERU IN SELECTED YEARS

	Enrollment			Graduates			
	1957	1959	1963	1957	1959	1961	1962
Humanities	4474	4530	7886	17	7	222	229
Education	1263	1671	9253	1014	1079	280	314
Fine Arts	152	175	554	---	---	9	24
Law	2406	2987	3680	394	389	532	452
Social Sciences	2854	4139	8643	127	150	156	200
Natural Sciences	4805	4778	2248	38	297	81	90
Engineering	2622	3427	4159	165	203	740	1248
Medical Science	3619	3925	5117	1168	810	1101	1343
Agriculture	1039	984	3068	119	126	642	273
Non-Specified	---	---	1226	---	---	64	131
Total	23234	26616	46334	3042	3062	3827	4304
	Percent of Total						
Humanities	19.3	17.0	17.0	0.6	0.2	5.8	5.3
Education	5.4	6.3	20.0	33.3	35.2	7.3	7.3
Fine Arts	0.7	.7	1.2	---	---	0.2	0.6
Law	10.4	11.2	7.9	13.0	12.7	13.9	10.5
Social Sciences	12.3	15.6	18.7	4.2	4.9	4.1	4.7
Natural Sciences	20.7	18.0	5.9	1.3	9.7	2.12	1.9
Engineering	11.3	12.9	9.0	5.4	6.7	19.3	25.0
Medical Science	15.6	14.8	11.0	38.4	26.5	28.8	31.2
Agriculture	4.6	3.7	6.6	3.9	4.1	16.8	6.3
Non-Specified	---	---	---	---	---	1.7	3.0

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

DISTRIBUTION OF STUDENT ENROLLMENT AND GRADUATES IN VENEZUELA IN SELECTED YEARS

	Enrollment					Graduates				
	1950	1956	1960	1964	1966	1958	1959	1961	1963	1964
Humanities	141	374	2201	2831	3589	75	114	144	99	86
Education	448	367	2157	4479	7164	54	52	263	455	36
Fine Arts	---	310	839	1223	1655	35	44	38	31	---
Law	941	1391	4034	6483	6766	116	287	385	551	233
Social Sciences	342	1376	5574	7944	11823	132	306	756	616	376
Natural Sciences	1916	201	446	1670	1578	14	14	31	40	8
Engineering	---	1652	4648	5785	7320	121	246	312	267	223
Medical Science	2749	3267	5145	7725	9079	291	632	831	806	344
Agriculture	364	218	1121	2655	3210	22	46	71	77	55
Non-Specified	---	---	312	577	1606	---	---	---	---	---
Total	6901	9156	26477	41372	53790	860	1741	2831	2942	1361
	Percent of Total									
Humanities	2.0	4.1	8.3	6.8	6.7	8.7	6.6	5.1	3.4	6.3
Education	6.5	4.0	8.2	10.8	13.3	6.3	3.0	9.3	15.5	2.7
Fine Arts	0.0	3.4	3.2	3.0	3.1	4.1	2.5	1.3	1.1	---
Law	13.6	15.2	15.2	15.7	12.6	13.5	16.5	13.6	18.7	17.1
Social Sciences	5.0	15.0	21.1	19.2	22.0	15.35	17.6	26.7	20.9	27.6
Natural Sciences	27.8	2.2	1.7	4.0	2.9	1.6	.8	1.1	1.4	.6
Engineering	---	18.0	17.6	14.0	13.6	14.1	14.1	11.0	9.1	16.4
Medical Sciences	39.8	35.9	19.4	18.7	16.9	33.84	36.3	29.35	27.4	25.3
Agriculture	5.3	2.4	4.2	6.4	6.0	2.6	2.6	2.5	2.6	4.0
Non-Specified	---	---	1.2	1.4	3.0	---	---	---	---	---

Source: United Nations, UNESCO, Statistical Yearbook, 1965-69.

APPENDIX B

PATTERNS OF SPECIALIZATION OF LATIN AMERICAN GRADUATE STUDENTS IN UNITED STATES UNIVERSITIES, 1965-66 TO 1969-70

PATTERN OF SPECIALIZATION OF THE SEVEN LATIN AMERICAN COUNTRIES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	192	8.5	208	7.3	235	7.3	293	8.1	297	7.4
Agronomy	55				39				69	
Horticul.	22				35				40	
Soil	21				32				38	
Animal Hus.	26				75				60	
Others	68				54				90	
Business	142	6.3	108	6.6	260	8.0	296	8.2	389	9.7
Business Adm.	138								381	
Others										
Education	91	4.0	139	4.8	142	4.4	158	4.4	208	5.2
Engineering	459	20.3	598	20.8	646	20.0	724	20.1	920	22.9
Chemical	39				64				94	
Civil	124				124				138	
Electrical	95				130				170	
Industrial	62				73				112	
Mechanical	43				55				80	
Others	96				200				326	
Fine Arts	27	1.2	43	1.5	83	2.6	112	3.1	136	3.4
Humanities	225	9.8	286	10.0	354	10.0	354	9.8	351	8.7
Medicine	108	4.8	168	5.9	150	4.6	151	4.2	172	4.3
Vet. Medicine	16	.7	19	.7	22	.7	19	.5	29	.7
Natural Sci.	479	21.1	601	21.0	710	21.9	799	22.2	800	19.9
Social Sci	502	22.1	603	21.0	631	19.5	662	18.4	657	16.4
Ind. Labor Rel.	1				4				2	
Economics	177				222				212	
Ag. Economics	66				89				110	
Pol. Sci.	23				45				41	
Psychology	36				61				69	
Public Admin.	37				25				20	
Sociology	53				80				88	
Others	121				105				123	
Law	26	1.2	16	.6	34	1.1	35	1.0	55	1.4
Total	2267		2869		3238		3601		4014	

PATTERNS OF SPECIALIZATION OF ARGENTINEAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	15	4.4	14	3.5	16	3.4	23	4.2	19	3.5
Agronomy	4		3		4		7		3	
Horticul.	0		1		3		5		3	
Soil	4		3		1		3		1	
Animal Hus.	5		7		5		8		7	
Others										
Business	21	6.2	24	6.0	23	4.9	27	4.9	45	8.3
Business Adm.	21		14		22		0		44	
Others										
Education	5	1.5	16	4.0	12	2.5	17	3.1	17	3.1
Engineering	41	12.0	44	11.0	43	9.1	52	9.5	64	11.8
Chemical	1		4		5		7		9	
Civil	14		5		9		6		3	
Electrical	5		8		8		11		11	
Industrial	8		2		3		3		6	
Mechanical	2		5		5		8		13	
Others	11								22	
Fine Arts	4	1.2	8	2.0	14	3.0	19	3.5	22	4.1
Humanities	60	17.2	57	14.2	66	14.0	74	13.5	83	15.3
Medicine	26	7.6	30	7.5	21	4.4	19	3.5	19	3.5
Vet. Medicine	1	.3	1	.3	1	.2	2	.4	4	.7
Natural Sci.	49	14.4	75	18.7	134	28.3	171	31.2	148	27.4
Social Sci.	97	27.6	129	32.2	134	28.3	137	25.0	113	20.9
Ind. Labor Rel.	0		0		0		1		0	
Economics	46		45		39		33		19	
Ag. Economics	21		34		36		43		35	
Pol. Sci.	1		4		9		6		3	
Psychology	1		3		7		14		15	
Public Admin.	5		3		7		0		1	
Sociology	9		22		20		22		21	
Others	14									
Law	4	1.2	3	.8	9	1.9	7	1.3	10	1.9
Total	341		401		473		548		541	

PATTERNS OF SPECIALIZATION OF BRAZILIAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	21	5.3	31	6.9	63	11.1	65	9.6	71	9.6
Agronomy	9		8		10		15		27	
Horticul.	0		0		3		6		7	
Soil	1		4		7		15		11	
Animal Hus.	2		7		16		9		12	
Others										
Business	24	6.0	38	8.4	43	7.5	62	9.2	65	8.8
Business Adm.	24		26		43		62		62	
Others										
Education	24	6.0	21	4.7	23	4.0	30	4.4	35	4.7
Engineering	75	18.8	100	22.2	125	21.9	138	19.4	174	23.6
Chemical	8		11		13		14		13	
Civil	7		11		12		12		14	
Electrical	26		25		36		46		45	
Industrial	9		13		20		17		23	
Mechanical	8		9		13		14		19	
Others	17								60	
Fine Arts	6	1.5	6	6.3	8	1.4	17	2.5	20	2.7
Humanities	56	14.0	65	14.4	71	12.5	70	10.4	65	8.8
Medicine	9	2.3	16	3.6	25	4.4	23	3.4	20	2.7
Vet. Medicine	2	.5	3	.7	2	.4	1	.2	1	.1
Natural Sci.	67	16.8	75	16.7	89	15.6	127	18.8	137	18.5
Social Sci.	110	27.5	93	20.7	113	19.8	32	19.6	137	18.5
Ind. Labor Rel.	1		0		0		0		0	
Economics	30		34		38		47		55	
Ag. Economics	9		9		10		16		15	
Pol. Sci.	7		10		17		17		17	
Psychology	13		13		13		12		14	
Public Admin.	9		2		3		6		8	
Sociology	12		11		11		11		10	
Others	33									
Law	6	1.5	2	.4	8	1.4	10	1.5	14	1.9
Total	400		450		570		675		739	

PATTERNS OF SPECIALIZATION OF CHILEAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	18	6.8	26	7.0	39	9.5	44	10.2	48	10.6
Agronomy	2		5		3		6		7	
Horticul.	3		3		11		11		8	
Soil	4		6		6		5		5	
Animal Hus.	1		4		7		12		14	
Others										
Business	15	5.7	19	5.1	23	5.6	23	5.6	27	6.0
Business Adm.	15		12		23		23		27	
Others			7							
Education	17	6.4	24	6.4	29	7.0	29	7.0	37	8.2
Engineering	54	20.4	75	20.1	59	14.3	64	15.5	95	21.0
Chemical	2		9		6		6		9	
Civil	17		15		14		15		14	
Electrical	14		11		10		10		21	
Industrial	8		5		7		6		5	
Mechanical	8		13		7		6		4	
Others	5								42	
Fine Arts	4	1.5	7	1.9	8	1.9	18	4.4	25	5.5
Humanities	22	8.3	24	6.4	38	9.2	41	9.9	47	10.4
Medicine	10	3.8	12	3.2	11	2.7	11	2.7	10	2.2
Vet. Medicine	3	1.1	3	.8	2	.5	3	.7	2	.4
Natural Sci.	68	25.7	99	26.5	110	26.7	98	23.7	92	20.4
Social Sci.	51	19.3	85	22.7	90	21.8	79	19.1	66	14.6
Ind. Labor Rel.	0		1		1		1		0	
Economics	14		26		33		26		20	
Ag. Economics	12		10		12		11		10	
Pol. Sci.	4		6		7		4		6	
Psychology	5		12		14		11		5	
Public Admin.	0		2		4		3		2	
Sociology	7		16		13		16		12	
Others	9									
Law	3	1.1	0	0	3	.7	3	.7	3	.7
Total	265		374		412		413		452	

PATTERNS OF SPECIALIZATION OF COLOMBIAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	30	8.2	42	8.9	45	9.1	45	7.6	63	8.9
Agronomy	9		9		7		7		12	
Horticul.	1		1		2		4		4	
Soil	3		4		6		4		5	
Animal Hus.	8		11		12		15		3	
Others										
Business	19	5.2	38	8.1	47	9.5	43	7.2	61	8.6
Business Adm.	18		20		47		43		61	
Others										
Education	9	1.0	25	5.3	31	6.3	36	6.1	58	8.2
Engineering	96	26.2	113	24.0	105	21.3	147	24.8	185	26.1
Chemical	14		15		15		20		27	
Civil	30		34		27		46		37	
Electrical	16		12		20		22		29	
Industrial	16		16		12		16		20	
Mechanical	10		9		3		14		14	
Others	10								58	
Fine Arts	5	1.2	7	1.5	10	2.0	14	2.4	18	2.5
Humanities	33	9.0	47	10.0	46	9.3	57	9.6	35	4.9
Medicine	19	5.2	38	8.1	31	6.3	31	5.2	27	3.8
Vet. Medicine	4	1.1	3	.6	4	.8	4	.7	12	1.7
Natural Sci.	60	16.4	57	12.1	75	15.2	100	16.8	117	16.5
Social Sci.	86	23.4	100	21.2	95	19.3	114	19.2	130	18.3
Ind. Labor Rel.	0		0		0		1		1	
Economics	31		35		32		40		41	
Ag. Economics	7		11		11		20		24	
Pol. Sci.	3		5		3		3		8	
Psychology	4		4		7		13		10	
Public Admin.	5		4		2		2		2	
Sociology	13		23		14		13		19	
Others	26									
Law	6	1.7	2	.4	4	.8	3	.5	4	.6
Total	367		471		493		594		710	

PATTERNS OF SPECIALIZATION OF MEXICAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	55	13.4	43	8.8	35	6.2	44	7.4	47	6.3
Agronomy	13		10		6		5		4	
Horticul.	8		3		4		4		4	
Soil	6		5		1		2		3	
Animal Hus.	7		9		15		21		17	
Others										
Business	29	7.1	30	6.1	60	10.5	71	12.0	110	14.6
Business Adm.	27		18		54		64		108	
Others										
Education	5	1.2	9	1.8	18	3.2	18	3.0	24	3.2
Engineering	73	17.8	106	21.5	113	19.9	126	21.2	182	24.2
Chemical	9		11		12		19		22	
Civil	17		21		26		21		28	
Electrical	21		23		26		24		29	
Industrial	13		22		13		17		26	
Mechanical	5		7		11		12		10	
Others	8								67	
Fine Arts	5	1.2	5	1.0	19	3.3	20	3.4	22	2.9
Humanities	29	7.1	62	12.7	66	11.6	66	11.1	80	10.6
Medicine	15	3.7	22	4.5	27	4.8	32	5.4	47	6.3
Vet. Medicine	4	1.0	3	.6	6	1.1	5	.8	3	.4
Natural Sci.	123	29.9	129	26.3	132	23.2	122	20.5	139	18.5
Social Sci.	68	16.6	75	15.3	88	15.5	85	14.3	83	17.0
Ind. Labor Rel.	0		0		1		0		1	
Economics	29		37		37		31		32	
Ag. Economics	8		4		4		4		7	
Pol. Sci.	4		2		3		4		1	
Psychology	5		0		11		14		12	
Public Admin.	4		11		0		4		3	
Sociology	6				9		9		12	
Others	13									
Law	5	1.2	6	1.2	5	.9	5	.8	15	2.0
Total	411		490		569		594		752	

PATTERNS OF SPECIALIZATION OF PERUVIAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	28	15.3	29	11.5	37	11.3	29	8.8	32	8.8
Agronomy	9		6		2		4		4	
Horticul.	8		4		9		5		7	
Soil	3		1		4		3		5	
Animal Hus.	4		10		11		8		7	
Others										
Business	11	6.0	12	4.8	26	8.0	34	10.3	42	11.6
Business Adm.	11		12		23		31		41	
Others										
Education	2	1.1	7	2.8	8	2.5	11	3.3	20	5.5
Engineering	35	19.1	49	19.4	87	26.6	65	19.6	78	21.6
Chemical	2		3		5		8		5	
Civil	11		12		12		12		14	
Electrical	3		8		11		6		12	
Industrial	3		4		8		11		17	
Mechanical	1		5		5		4		5	
Others	15								25	
Fine Arts	2	1.1	2	0.8	6	1.8	5	1.5	8	2.2
Humanities	10	5.5	15	6.0	19	5.8	26	7.9	21	5.8
Medicine	8	4.4	17	6.8	19	5.8	18	5.4	17	4.7
Vet. Medicine	2	1.1	5	2.0	5	1.5	2	.6	4	1.1
Natural Sci.	51	27.9	73	29.0	81	24.8	85	25.7	71	19.6
Social Sci.	33	18.0	43	17.1	37	11.3	54	16.3	65	18.0
Ind. Labor Rel.	0		0		0		0		0	
Economics	10		22		23		32		27	
Ag. Economics	3		4		5		6		7	
Pol. Sci.	1		2		1		2		4	
Psychology	2		1		1		0		6	
Public Admin.	0		4		2		0		2	
Sociology	4		2		6		6		4	
Others	13									
Law	1	.6	0	0	2	.6	2	.6	4	1.1
Total	183		252		327		331		362	

PATTERNS OF SPECIALIZATION OF VENEZUELIAN GRADUATE STUDENTS IN THE UNITED STATES

	1965-66		1966-67		1967-68		1968-69		1969-70	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	25	7.7	23	5.4	31	7.3	43	9.7	55	11.2
Agronomy	9		5		7		10		12	
Horticul.	2		3		3		3		7	
Soil	0		2		7		4		8	
Animal Hus.	4		6		5		7		10	
Others										
Business	23	7.1	27	6.3	38	8.9	34	7.7	39	7.9
Business Adm.	22		12		33				38	
Others										
Education	29	8.9	37	8.6	21	4.9	17	3.8	17	4.9
Engineering	85	26.2	111	25.8	114	26.8	132	29.7	142	28.8
Chemical	3		11		8		12		9	
Civil	28		55		24		20		28	
Electrical	10		11		19		23		23	
Industrial	5		12		10		11		15	
Mechanical	9		9		11		15		15	
Others	30								52	
Fine Arts	5	1.5	8	1.9	18	4.2	19	4.3	21	4.3
Humanities	15	4.6	16	3.7	19	4.5	20	4.5	20	4.1
Medicine	21	6.5	33	7.7	16	3.8	17	3.8	32	6.5
Vet. Medicine	0	0	1	.2	2	.5	2	.5	3	.6
Natural Sci.	61	18.8	93	21.6	89	20.9	96	21.6	96	19.5
Social Sci.	60	18.5	78	18.4	74	17.4	59	13.3	63	12.8
Ind. Labor Rel.	0		1		2		1		0	
Economics	17		22		20		17		18	
Ag. Economics	6		9		11		8		12	
Pol. Sci.	3		3		5		3		2	
Psychology	6		6		8		6		7	
Public Admin.	14		14		7		6		2	
Sociology	2		8		7		7		10	
Others	13									
Law	1	.3	3	.7	3	.7	5	1.1	5	1.0
Total	325		430		425		444		493	

APPENDIX C

PATTERNS OF SPECIALIZATION OF LATIN AMERICAN GRADUATE STUDENTS BY SPONSOR GROUPS, 1965-66 AND 1969-70

PATTERNS OF SPECIALIZATION OF GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES BY SPONSOR GROUPS, 1965-66

	Total in Specified Field	Total Who Specified Sponsor	U. S. Gov't		Foreign Gov't		U. S. Univ.		U. S. Priv. Org.		Self	
			No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	192	176	19	10.7	20	10.4	8	7.3	74	14.6	25	9.7
Agronomy	55	53	10		6		0		25		8	
Horticul.	22	22	2		2		1		8		5	
Soil	21	20	1		1		0		10		2	
Animal Hus.	26	24	1		4		1		11		7	
Others	68	57	5		7		6		20		3	
Business	142	112	20	11.3	9	4.7	4	3.6	16	3.2	27	10.5
Business Adm.	138	91	19		9		4		16		27	
Others	4	21	1		0		0		0		0	
Education	91	77	10	5.7	7	3.7	0	0.0	20	4.0	12	4.7
Engineering	459	375	22	12.4	57	29.7	28	25.5	94	18.6	49	19.1
Chemical	39	34	4		1		2		12		4	
Civil	124	99	7		16		7		19		13	
Electrical	95	76	4		7		6		17		9	
Industrial	62	55	2		7		2		14		12	
Mechanical	43	31	0		4		3		9		6	
Others	96	80	5		22		8		23		5	
Fine Arts	27	27	0	0.0	3	1.7	2	1.8	8	1.6	6	2.3
Humanities	225	187	14	7.9	2	1.0	14	12.7	42	8.3	39	15.2
Medicine	108	64	3	1.7	9	4.7	3	2.7	14	2.8	8	3.1

PATTERNS OF SPECIALIZATION OF GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES BY SPONSOR GROUPS, 1965-66 (Continued)

	Total in Specified Field	Total Who Specified Sponsor	U. S. Gov't		Foreign Gov't		U. S. Univ.		U. S. Priv. Org.		Self	
			No.	%	No.	%	No.	%	No.	%	No.	%
Vet. Medicine	16	14	2	1.1	2	1.0	0	0.0	5	1.0	2	0.8
Physical and Natural Sciences	479	389	26	14.9	53	27.6	33	30.0	117	23.1	29	11.3
Social Sciences	502	437	61	34.5	30	15.6	18	16.7	114	22.5	60	23.4
Ind. Labor Rel.	1	1	0		0		0		1		0	
Economics	177	149	31		15		4		33		17	
Ag. Economics	66	59	1		5		4		27		0	
Political Sci.	23	18	3		0		1		5		4	
Psychology	36	28	3		0		2		3		11	
Public Admin	37	30	11		3		0		6		3	
Sociology	53	47	5		3		2		16		8	
Others	121	105	7		4		5		23		17	
Law	26	12	0	0.0	0	0.0	0	0.0	2	0.4	0	0.0
Total	2267	1870	177	100	192	100	110	100	506	100	257	100

PATTERNS OF SPECIALIZATION OF GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES BY SPONSOR GROUPS, 1969-70

	Total in Specified Field	Total Who Specified Sponsor	U. S. Gov't		Foreign Gov't		U. S. Univ.		U. S. Priv. Org.		Self	
			No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	297	252	40	20.5	41	17.3	16	10.0	50	10.7	35	5.7
Agronomy	69	50	9		9		0		12		6	
Horticul.	40	34	7		7		1		3		4	
Soil	38	34	6		7		1		5		5	
Animal Hus.	60	46	11		10		6		17		13	
Others	90	90	7		8		8		13		7	
Business	389	283	18	9.2	12	5.1	0	0.0	28	6.0	114	18.7
Business Adm.	381	280	16		11		0		27		112	
Others	8	3	2		1				1		2	
Education	208	162	15	7.7	7	3.0	1	0.6	36	7.7	43	7.1
Engineering	920	564	26	13.3	71	30.0	37	23.1	111	23.7	98	16.1
Chemical	94	71	3		10		8		11		10	
Civil	138	77	6		8		7		6		12	
Electrical	170	105	5		10		7		16		13	
Industrial	112	63	2		2		0		19		13	
Mechanical	80	59	0		7		4		15		13	
Others	326	189	10		44		11		44		37	
Fine Arts	136	88	3	1.5	4	1.7	3	1.9	6	1.3	36	5.9
Humanities	351	259	9	4.6	5	2.1	18	11.3	31	6.6	78	12.8
Medicine	172	101	2	1.0	10	4.2	4	2.5	18	3.8	54	8.9

PATTERNS OF SPECIALIZATION OF GRADUATE STUDENTS FROM THE SEVEN LATIN AMERICAN COUNTRIES BY SPONSOR GROUPS, 1969-70 (Continued)

	Total in Specified Field	Total Who Specified Sponsor	U. S. Gov't.		Foreign Gov't.		U. S. Univ.		U. S. Priv. Org.		Self	
			No.	%	No.	%	No.	%	No.	%	No.	%
Vet. Medicine	29	15	5	2.6	2	0.8	0	0.0	4	0.9	0	0.0
Physical and Natural Sciences	800	556	29	14.9	58	24.5	62	38.8	100	21.3	51	8.4
Social Sciences	665	481	47	24.1	27	11.4	19	11.9	85	18.1	94	15.4
Ind. Labor Rel.	2	1	0		0		0		0		0	
Economics	212	151	26		8		5		27		30	
Ag. Economics	110	63	7		6		3		22		11	
Political Sci.	41	36	3		1		2		6		4	
Psychology	69	56	4		4		1		6		12	
Public Admin.	20	14	4		0		0		3		4	
Sociology	88	60	0		3		2		13		8	
Others	123	100	3		2		5		8		25	
Law	55	18	2		0		0		0	0.0	7	1.1
Total	4014	2779	195		237	100	160	100	469	100	610	100

VITA

Nadia Hussein ElSheikh

Candidate for the Degree of

Doctor of Philosophy

Thesis: GRADUATE EDUCATION FOR ECONOMIC DEVELOPMENT: AN EVALUATION OF PATTERNS AND TRENDS OF SPECIALIZATION OF LATIN AMERICAN STU STUDENTS IN THE UNITED STATES

Major Field: Economics

Biographical:

Personal Data: Born in Damanhour, Egypt, April 10, 1939, the daughter of Hussein ElSheikh and Asma'a Kasem.

Education: Graduated from Zagazig Public High School, Zagazig, Egypt, in June, 1956; received the Bachelor of Science degree from Ain Shams University, Cairo, Egypt, with a major in Horticulture in June, 1961; received the Master of Science degree in August, 1965, from Oklahoma State University, Stillwater, Oklahoma, with a major in Agricultural Economics; completed the requirements for the Doctor of Philosophy degree at Oklahoma State Univeristy, Stillwater, Oklahoma, in July, 1972.

Professional Experience: Graduate Assistant at Oklahoma State University, January, 1968 until May, 1971; Assistant Professor of Economics, Northwestern State College, Alva, Oklahoma, August, 1971 to present.

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