

# The Development Gap: Implications for Higher Education and Research in Latin America

*Hebe M.C. Vessuri*

## THE INTERNATIONAL SCENE

In the highly competitive, technically advanced and rapidly changing new world economic structure, knowledge-based resources constitute a vital component. The era of low interest rates, limited foreign competition, slow technological change, stable markets and mass-production processes which allowed key sectors of industry to function in a protected climate, has led into a new era of high costs, extensive international competition, changing markets and rapid technical change. The importance of the 'human capital' component of national wealth, has been recognized and analysed by many an economist ever since the end of World War II. Today, we have available an impressive array of plausible data and interpretations linking productivity both to investments in human resources and to the quality of the economic context.<sup>1</sup> However, although it is easy to accept that education has a positive value for the economy of a country, it is not as easy to determine a causal relationship between education and employment.

### Dynamic sectors and implications for higher education

A large part of the growth and job creation in the new international economic context occurs in sectors such as advanced manufacture, information services and high technology, and at the level of small and medium-sized firms. Besides, the competitiveness of all sectors – industry, services and commerce – in this new context depends increasingly on new management models, on the use of technology in practice and on a properly trained and adaptable labour force. These changes have critical repercussions for higher education institutions. Rapid technological change demands a stronger, more specialized and more efficient level of research in the universities, and a greater effort on their part in terms of technology transfer and marketing. The globalization of the economy creates a new need for a better knowledge of the culture, market and language of competing nations. This means a new role for disciplines in the arts, humanities and the social sciences. Also, individuals need to acquire the capacity to learn rapidly new skills and to adapt to changes in career patterns.

### A diversified demand

The range of higher education expands and diversifies beyond traditional universities and schools, already incorporating the innovative experiences of the large corporations, the labs of high-technology firms, the 'open universities', continuing education, short-term vocational and general courses.

### Tertiarization

In the rapid growth of the service sector, new technology plays an important role. Although services are difficult to define and the substitution of the traditional manual work/white-collar work distinction by that of goods/services results in confusion if one does not take into account that they are not symmetrical (that is to say, white-collar work and services are not identical), it is important to recognize that a large proportion of the service sector is a necessary and integrated part of goods production (for example, transportation, commerce, government and commercial and financial services) (Leiss, 1985).

## Transnationalization and localization

The new industrial systems in the fields of telecommunications, raw materials, agribusiness and services have been designed, developed, and organized on an international scale by firms which collectively develop, acquire and embody technology in their strategies. We are living the beginnings of a 'privately' managed world system, in which the firms are the main agents of what some have called 'techno-globalism' (Gibbons, 1990). Contrary to common expectations, the main restrictions to globalization derived from 'techno-nationalism' do not come from the less developed nations but are more noticeable in the technologically most advanced countries, becoming manifest in multiple and subtle ways, through, for example: preventing foreign firms in the host countries from participating in R&D programmes promoted by government; the use of technical standards to favour local suppliers; bilateral governmental agreements which fix levels of imports and exports through quotas of price mechanisms; and the pressures on governments by firms which retain a national identity and subordinate their foreign operations to national corporate matrixes to secure protection and support.

## THE IMPLICATIONS FOR LATIN AMERICA

In order that Latin America takes an active part (and with some degree of autonomy) in the organization and development of the new world economic set-up, it will have to be adequately equipped in terms of science, technology and commerce. Latin Americans must be certain to have their own firms and governments extensively involved in the transnationalization process. Indeed, the reorganization of the world demands the reorganization of the economic and industrial space constituted by the Latin American nations, lest they become reduced to mere consumers of new products and services conceived of elsewhere. This ought to inspire Latin American societies to accelerate the promotion and use of the new technologies for 'local' ends, exploiting 'local' features and taking advantage of the considerable adaptability of those technologies. The gap separating Latin America from the industrialized nations continues to be huge. In the 1965–89 period, it did not prosper as other regions of the world; indeed, only in 1991 the per capita gross product of the region recovered the levels of 15 years earlier. In varying degrees according to individual cases, but as a general trend, there is a historical lag in R&D, whose causes and manifestations are now better understood.<sup>2</sup>

The economic condition of almost all Latin American countries limits severely their expenditure on scientific activity. Even so, some of them have sought to implant the scientific tradition and the corresponding institutional arrangements, although this has been more than their economies could bear. This may be observed in the inabilities in recent times to respond positively to growing costs of the scientific enterprise, unable to make their scientific establishment grow as rapidly as was needed to come closer in the technology-competitive race.<sup>3</sup> The growing scientific gap between the most industrialized countries and those in Latin America can contribute seriously to the economic gap increase and this, in turn, will increase the scientific gap. Latin America runs the risk of getting ever more distant from the world decision-making centres.

## THE ROLE OF THE UNIVERSITIES

We may consider two aspects here: a) the target groups for education and training; and b) the institutional providers of education and training. From the point of view of the *clientèle*, the most outstanding aspect of higher education in recent decades has been its 'mass' nature and its differentiation, being no longer the reserve exclusively of the social and political élite. It fulfilled a historical role at a time when it was necessary to form a broad cultural base, but today, this type of educational model is crumbling under the weight of too many problems and it has become obvious that it is necessary to substitute quality for quantity. Besides, recent experience runs against conventional wisdom as to the aims of higher education in Latin America. The common expectation has been that higher education provides professional training, on the assumption that the graduate will find a position in the employment market congruent with his studies. When this does not happen, there is a problem to be solved. The cause has been usually attributed to: an excess in the numbers of professionals graduating, due to the 'massive access' to higher education; to an imbalance in the course offer – an excess of courses in some areas; to the 'economic crisis' which prevents the expansion of the labour market; or finally, to the 'quality of the courses being offered'. We know now, however, that many students are already working while pursuing their studies, that getting a job compatible with the programme they completed is neither easy nor does the course guarantee the specific skills demanded by some employers, and nor does getting a diploma seem to be the aim of all the students (Schwartzman and Magalhaes de Castro, 1991).

As to the institutional providers of education and training, the student growth of the 1970s and 1980s fostered an extraordinary institutional proliferation, resulting in quite dramatic changes in university and post-secondary education. Crucially, in several countries, the national universities saw their leading role (sometimes kept for over a century and a half) undermined, either as monopolies or at least as undisputed leaders of the educational system. At present a growing trend is observable by which institutional prestige is granted by research. But research resources are highly concentrated in small élite segments of the higher education systems in those countries where there is a certain research capacity installed. It is likely that such concentration will become more marked if policies of resource concentration continue to be applied in order to save or improve the quality of research. On the other hand, there is still an ongoing process which counterbalances the trend to concentration, that of the establishment of new institutions of higher education (Brunner, 1991).

The most remarkable aspect of institutional proliferation has been the privatization of a system that in several Latin American countries used to be a full or almost complete public monopoly. However, it is necessary to take into account that the highly heterogeneous private sector frequently performs neither research nor graduate activities. Many of the most difficult responsibilities of the provision of highly qualified resources remain to be assumed by the public sector, while private institutes select carefully their activities and challenges (Levy, 1991). From the point of view of the general educational system, it seems obvious that some kind of complementarity of functions will eventually have to be reached between the two sub-sectors.

## FINANCIAL CAPABILITY TO EFFECT THE NECESSARY CHANGES

Improving the quality of teaching involves increasing teaching requirements and qualifications, expanding library facilities, insuring an adequate level in the expenditures on non-teaching staff for the correct use of laboratories and equipments and updating equipment and infrastructure. With increasingly smaller expenditures per teacher, often none of the requisites to improve teaching is properly satisfied. In some cases, the problem is simply one of substantial and sustained reduction in the expenditure per student, as has happened in Peru and Argentina (in the latter case it passed

from an annual average expenditure per student of US\$1800 in 1963 to US\$225 in 1989, with an average annual rate of 7.5 per cent reduction (Gertel, 1991). In other cases, such as Venezuela or Brazil, although resources increased accompanying the growth in student enrolment, in terms of internal efficiency there is a serious problem of excess non-teaching (and even teaching) staff in higher education institutions. To give an idea, full-time equivalent student-teacher ratios in Brazil's federal institutions average 8.1:1, and student-non teaching ratio is 3.9:1 (it was 5.1:1 in 1980). Brazil's federal system appears to be one of the highest cost systems in the world, once one takes into consideration Brazil's salary levels. The main determinants of these high costs are the large numbers of teaching and non-teaching staff compared to students (Paul and Wolff, 1991).

## NEW FIELDS OF HIGHER EDUCATION TRAINING

The broader trends in the evolution of higher education are related directly to developments in the employment market itself. In this respect, changes in four 'domains': public service, industry and the economy, the political world, and the scientific milieu, pose new demands to educational institutions. This can be expanded on as follows:

1. *The public domain* requires ever more substantial quantities of men and women academically educated in areas such as health and educational services, the judicial apparatus and public administration.
2. *The industrial and economic domain* comprises an extremely diverse professional world, posing a complex task. At a very fundamental level, in terms of the challenges of industrial and economic development, the emphasis on the unity of teaching and research in the university implies that courses ought to reflect as much the ordered development of science as the short-term demands of the employment market.
3. *The political world*, including parties and political associations of all kinds, constitutes another domain giving expression to new demands for higher education. The individuals responsible for decision making in the legislative and executive powers must have a solid education in order to make appropriate, factually based decisions.
4. *Science* itself can be considered a separate domain of the employment market, as the demand for specialists to work in university, governmental and private research centres is increasing in several places. The growth of university research is leading to a crisis and redefinition of the university institution and to a diversification of the institutional profiles linked to higher education. Also, a very small but growing number of research units in industry are responsible for a portion of the activity of the sector.

## QUANTITATIVE AND QUALITATIVE ASPECTS OF THE SCIENTIFIC CAPACITY

In the 1960s and 1970s, the main objectives of higher education were to increase substantially the numbers of technicians, engineers, technologists and scientists, and to make science better understood and appreciated by society. This was done through conventional teaching arrangements. At present, the quantitative aspects of human resources continue to be important in the region. However, it is admitted that the existence of a scientific community is, at best, a necessary though not a sufficient condition of national development. In the 1980s, qualitative considerations for the planning of science and engineering teaching acquired greater weight.

At the same time, the aim of making science comprehensible to society suffered a transformation. There was an appeal to external criteria, such as usefulness, and the accent was placed on the solution of concrete problems. Technology and management rapidly replaced science in the public discourse.

The basic sciences have kept a very low percentage of the total student enrolment: between 3 per cent and 4 per cent, depending on the country. On the other hand, despite the difficulties of absorption in the industrial employment market due to the vicissitudes of industry in several countries, engineering and technological subjects have grown significantly and today comprise between 15 per cent and 30 per cent of total enrolment. However, as soon as an industrial sector acquires a certain dynamism, as in the case of chemistry in Mexico and Venezuela, insufficiencies may be observed in the pool of available human resources.

In addition to the changes in the sciences and engineering, recent decades have seen changes in other disciplines as well, reflecting the changing interests of students and also of the employment market. If in 1960 in most countries in the region the bulk of graduates came from medicine, by 1984 it already came from education, and there was also a significant growth in the social sciences, especially in Brazil. Education and the social sciences represent about one-third of graduates – accompanying, to a great extent, the process of ‘tertiarization’ of the employment market – while agricultural sciences stand for only between 2 per cent and 9 per cent.

The traditional notion of education seems to be on the verge of changing drastically. Educational philosophy increasingly recognizes the importance of employment in an individual’s identity and the marked changes that occur both in his job and in his lifestyle as a consequence of new technologies. The value of theoretical knowledge relative to practical learning is being increasingly challenged, and knowledge seems to be conceived of by more and more people in terms of action and use, rather than as something to be sought for itself. Indeed, the more knowledge is apprehended in action, the less it is perceived as having meaning apart from action or use. The changing position of theory and practice, of general vs specialized knowledge, are matters for deep reflection on, for example their implications for the long-term development of higher education and science.

## GRADUATE EDUCATION

The tertiary educational level does not have as its specific function the task of training researchers. When it does, it is basically as a subproduct of teaching oriented to professional practice or to ‘higher level technologies’. In accordance with the models of higher education, it is the graduate programmes, especially Masters and Doctoral courses, that constitute the domains for the training of human resources qualified for research. However, as the evidence of different countries in Latin America shows, in practice this division of functions is neither so clear-cut nor general and, on the other hand, there are effects derived from a reciprocal implication between undergraduate and graduate courses.<sup>4</sup>

In some countries, the formal development of the fourth and fifth levels (Masters and Doctoral programmes) obeyed in good measure deliberate government policies (for instance, in Brazil, Mexico and Venezuela). Although among the initial objectives of the creation of the graduate programmes was the introduction into the universities of the constructive ferment of high quality research, after the experience of the last two-and-a-half decades of expansion of this level of training, the relative failure of this objective from a global point of view is admitted, both as regards research and teaching. In general, the growth of graduate education coincided with the drastic loss of quality and prestige of teaching activities, especially those associated with non-academic careers (practically all the undergraduate and sectors of the graduate programmes), precisely during its period of greater expansion. In view of the disproportionate growth of the graduate programmes but not of the research which had been conceived in association with them, a new issue has emerged: that of research without the support of graduate work. In countries like Brazil and Mexico, a cautious move begins to be observed by which research divorces itself from the package of graduate education as a whole, as it had been thought of in the previous period, and seeks to restrict the strategic alliance to some centres of ‘excellence’ (Durham, 1991). There is thus a gradual abandonment of the previous idea that all teachers had to be trained

as researchers. Graduate programmes, therefore, start to be understood either in *lato sensu* or *stricto sensu*. There is growing recognition that the ills of research in Latin America stem from poor teaching. From where are to come the good scientists, if in the baccalaureate and *licenciatura* that which is mostly learnt is how to run away from science and mathematics as if they were a curse? A very high proportion of students do not manage to build ordered and coherent knowledge and competence frameworks which define the domain of a discipline or profession, nor do they master the referents of general knowledge that could allow them to understand their cultural heritage and the surrounding world (Fuentes Molinar, 1990).

## FUTURE PROSPECTS

The problems that affect governments are so urgent and in many cases so intractable, that they will demarcate the boundary conditions within which Latin American universities may evolve. It is unlikely that purely cultural or scientific aims will have weight at the time of defining government policies. But a considerable percentage of the cohort of those of ages 18 to 20 enter universities and other higher education institutions. Affecting as it does such a significant proportion of the population, higher education will continue to demand a considerable portion of national resources. It seems probable, therefore, that the most visible and politically outstanding function of the universities will continue to be educational. As a consequence, the future of universities will continue to be based more on educational policies than on scientific and technological research.

A greater and better interaction of scientific research and society is needed, but society must be understood in its complexity and heterogeneity. We cannot ignore that for most countries in the region an important challenge is the need that the teaching of science acknowledges and takes into consideration traditional cultures, to explore the role of traditional technology in the modern technical university (for an example of this one may turn to the initiative of the Universidad Agraria de la Molina, Peru, and the Board on Science and Technology for International Development (BOSTID) of the United States National Academy of Sciences). Taking into account the structural heterogeneity of Latin American countries, institutions of higher education ought to be the main contributors to three of the vital factors in the new economic structure: technological development, human resources, and management. They must restructure themselves to contribute to economic and social development. A series of factors must be included in a strategy of modernization and dynamic development of the higher education systems in Latin America:

1. Extension of the number of graduate programmes in fields that have an impact in the process of modernization.
2. A closer connection between institutions and the manufacturing activities.
3. Global improvement of the quality of teaching.
4. Introduction of courses that will provide training for work, and additional training courses in the field of regional integration projects to increase mobility and exchange of experiences.
5. Approval of legal frameworks for private higher education as a means of stimulating and promoting its qualitative improvement and its expansion.
6. Substantial growth of collaboration with other institutions in the country and abroad.
7. Development of activities of scientific research as part of the training of professionals, without which those professionals will become, in the modernization process, mere ‘translators’ of strategies originating outside the region.

## NOTES

1. For recent references see Bengtsson, 1991; Freeman and Soete, 1987; OECD, 1989.
2. For a recent review of the problem of scientific capability in Latin America see Vessuri (in press).

3. While between 1973 and 1986 the number of scientific papers in the industrialized countries changed +1.61, in Latin America it only changed +0.23, and while in the same period, the change in the ratio of the percentage of papers to the percentage of the population in the industrialized countries was +0.61, in Latin America it was only +0.02 (Schott, 1991).
4. In the case of Uruguay, for example, characterized by the absence of graduate programmes oriented to research and of a science faculty only created in 1991, the third level of education, despite its limitations and anachronisms, had an important role in the training of human resources that devoted themselves to research (Filgueira, 1991).

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