Education Institutions and the new requirements for the preparation of high-level human resources in Latin America[1]

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Science and technology: backward and forward links

There is broad consensus, today, that knowledge is as a key component of the new economies. In Latin America, most countries are investing in science and technology, creating graduate programs, and strengthening their institutions for science policy implementation. The usual practice is to work on the supply side: to provide support for scientists and their institutions, with the expectation that their knowledge and competence will eventually be used for the benefit of society. More recently, this linear view of the links between science and society has been replaced by perception that, in more advanced economies, the conceptual and institutional barriers between science, technology, innovation and industrial production has broken down, leading to the development of a new mode of knowledge production, requiring different institutional arrangements and links between universities, research centers, private companies and governments. The first, traditional approach has been labeled "mode 1", and the latter, "mode 2" of knowledge production (Gibbons et al. 1994). This notion has been taken up my multilateral agencies for science and technology (De Ferranti et al. 2002; Organisation for Economic Co-operation and Development 1997; Stern, Porter and Furman 2000; World Bank 1998) and adopted in most countries in the region The efforts to move from

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”mode 1” to “mode 2” has led to the introduction of the word “innovation” after “science and technology” in science policy documents and many changes in the organization and mandates of science and technology agencies. In this transition, countries have to face the issues of how to establish forward links between science and applications, and backward links between science and education. I have discussed the forward links elsewhere, stressing the need to think on the forward links not only in terms of approximation between science, technology and the business sector, but also of the public sector as a major user and buyer of knowledge-intensive applications (Schwartzman 2002a). In this paper, I discuss the backward links between science, technology and education.

The knowledge economy, education, and the labor markets

A common assumption in the policy prescriptions for the knowledge economy is that, as science and innovation is becoming more strategic for economic competitiveness and the production of wealth, the whole labor market should increase its scientific and technological competence, and the recent expansion of higher education in most countries is perceived as a clear indication that this trend is taking place. However, the fact that most higher education students are enrolled in the so-called “social professions” and humanities, and that most students completing secondary education fail to learn the basic scientific concepts, are seeing as distortions hampering the full development of the knowledge society. The prescription for higher education is, therefore, to increase the size of the engineering and science-based courses, both at the graduate and undergraduate levels, and, for secondary education, to provide the students with better science education, and to develop programs of technical education to unable them to find productive jobs if they do not continue to work for higher degrees. Each of these assumptions, however, can be questioned, as discussed below.

The transformations of the labor market

Is it true that the jobs in the labor market are becoming more knowledge-intensive? “Knowledge” is too ample a term, and we need to ask what kinds of

knowledge modern societies actually require from their citizens.[2] There is strong statistical evidence that the traditional jobs in manufacture and agricultural production are rapidly disappearing or being drastically reduced, as laborsaving technologies develop. In high and middle-income countries, this reduction takes place not only because of technological changes, but also because of the migration of labor-intensive activities to countries like China and India, with their endless supply of cheap labor. In labor statistics, jobs in the primary and secondary sector – agriculture and industry – are being replaced by jobs in the tertiary sector – services. But "services" is too broad a term, and includes from street sellers of caramels and the attendant at MacDonald's to the work of medical doctors, lawyers and the provision of sophisticated consulting in different sectors. There are many attempts to classify the job market according to the their knowledge intensiveness, rather than their economic sector. One problem with these measurements, however, is that knowledge content is often measured in terms of the number of school years of their holders; but, since the number of years people spend in schools are growing everywhere, apparent increases in knowledge content can be in fact just an effect of education inflation.

In any case, the available data and projections on employment for the United States as well as for Latin America show that, while knowledge intensive activities are expected to grow, they will still cover just a small percentage of the total labor force, with the bulk remaining in the communication, social interaction and service sectors[3]. In the United States, which is presumably setting the trend for the knowledge intensive societies of the 21st century, the US Bureau of Labor Statistics estimates that, between the years 2000 and 2010, the number of jobs for "professional and related occupations", which are

[2] For a discussion, aimed mostly at South Africa, (Muller and Subotzky 2001).

[3] This section is based on (Schwartzman 2002b).

supposedly the more knowledge intensive, will increase by 26% by 2010, the highest growth rate of all occupational groups; but will still take up only 20% of the jobs[4].

United States, employment by major occupational group, 2000 and projected 2010 [Numbers in thousands of jobs]

Occupational group	Employment number		Percent		change Number	change Percent
	2000	2010	2000	2010		
Total, all occupations	**145,594**	**167,754**	**100**	**100**	**22,160**	**15.2**
Management, business, and financial occupations	15,519	17,635	10.7	10.5	2,115	13.6
Professional and related occupations	26,758	33,709	18.4	20.1	6,952	26.0
Service occupations	26,075	31,163	17.9	18.6	5,088	19.5
Sales and related occupations	15,513	17,365	10.7	10.4	1,852	11.9
Office and administrative support occupations	23,882	26,053	16.4	15.5	2,171	9.1
Farming, fishing, and forestry occupations	1,429	1,480	1	0.9	51	3.6
Construction and extraction occupations	7,451	8,439	5.1	5	989	13.3
Installation, maintenance, and repair occupations	5,820	6,482	4	3.9	662	11.4
Production occupations	13,060	13,811	9	8.2	750	5.7
Transportation and material moving occupations	10,088	11,618	6.9	6.9	1,530	15.2

Source: US Bureau of Labor Statistics, http://www.bls.gov/news.release/ecopro.t02.htm

According to other source, "Nearly three-quarters of the job growth for professional and related is projected for three subgroups - computer and mathematical occupations; health care practitioners and technical occupations; and education, training, and library occupations. A 10.3-percent increase is projected for self-employed professional and related occupations. Most growth among self-employed is projected for two subgroups—arts, design, entertainment, sports, and media occupations; and computer and mathematical occupations" (Hecker 2001), p. 58.

A recent "Survey of Talent" published by *The Economist* refers to a classification of three types of jobs, used by McKinsey consultants: " transformational" (extracting raw materials or converting them into finished goods); " transactional" (interactions that can

[4] These projections were made before the crisis that affected the high technology industries in the US in 2001, and they would be probably revised downwards today. This, however, is controversial. "In the 1990s, there was a lively debate between John Bishop from Cornell University and BLS economists on the validity of their projections. Bishop argued, using current employment data, that BLS projections grossly underestimated growth of professional related professions, by 34%, and overestimated the growth of lower skill jobs. According to him, the methods BLS used to project occupational employment missed an important portion of the upskilling that was underway in the U.S. economy" (Gregory Elacqua, personal communication). (See (Bishop 1995; Bishop 1997).

easily be scripted or automated) and " tacit" (complex interactions requiring a high level of judgment). The company argues that over the past six years the number of American jobs that emphases " tacit interactions" has grown two and a half times as fast as the number of transactional jobs and three times as fast as employment in general" (The Economist 2006), p. 4.

In Latin America, economic growth in recent years has been erratic, and, when it took place, it was led by expansion in limited sectors of the economy of a few countries, through the introduction of new advanced, labor saving technologies, while most of the labor force kept working in small firms requiring little or no professional competence and training. All countries suffered violent drops in growth rates at some point, and some recovered better than others. At the end of the decade, Brazil, Chile and Mexico were at similar levels of economic development, characterized by a combination of modern dynamic centers and large sectors of the population living still in poverty; while Colombia and Peru were still lagging in more traditional economies, with about half the per capita income of the other three. A careful analysis of the existing data and long-term projections carried on by the Economic Commission for Latin America shows that employment for persons in professional activities is not expected to rise very significantly in the foreseeable future. For eight Latin American countries, the percentage of professionals in the labor force at the end of the 1990's was 3.1%. For Chile, one of the most well developed countries in the region, the figure in 2000 was 8.4%, and the projection for 2015, given the trends of the nineties and assuming an income growth rate of 4.8 for the occupations, is 10.4%. For Brazil, the figure for 2000 is 2.1%, and the projection for 2015, with a similar growth rate, is 3.5%. The distribution of occupations by type shows that Chile has a distinctive larger percentage of persons in high-level positions, including professionals, with Brazil with the lower percentage. There was a steady decline in the number of persons working in regular jobs, with a corresponding growth of the self-employed and the so-called "informal market".

Latin America: some characteristics of occupational strata, 1997(1)

occupational strata	% of the labor force	mean income(2)	mean years of study
employers	4.3	15.8	8.9
directors, managers	2.0	11.6	11.5
professionals	3.1	12.1	14.9
technicians	6.0	5.3	12.1
administrative employees	7.9	4.8	10.6
employees in commerce	13.4	3.6	7.3
workers, artisans, drivers	25.3	3.4	6.1
personal services	14.8	2.2	5.5
agricultural workers	19.6	1.8	2.9

Soruce: ECLAC, based on special tabulations of household surveys of the countries
1. Weighted average for eight countries (Brazil, 1996; Chile, 1998; Colombia, 1998, Costa Rica, 1997; El Salvador, 1997; Mexico, 1998; Panama, 1997; and Venezuela, 1997)
2. In equivalents of the poverty line

These trends have been observed before, and, in a review essay, Peter Scott discusses, among others, the work of Phillip Brown and Anthony Hesketh, *The Mismanagement of Talent* (Brown, Hesketh and Williams 2004; Scott 2005). Basically, according to Scott,

> "They argue that the knowledge economy that has grown up over the past two decades has not led to the anticipated increase in demand for highly-skilled 'knowledge workers'; that indeed, in some respects, it has led to a deskilling of what Robert Reich has called 'routine production' workers, and has also increased demand for (again in Reich's terminology) 'in-person services' workers (McDonaldization and all that). Second, they argue that, despite the growing emphasis on specific skills and competences, elite jobs still tend to be restricted to those who can demonstrate more general qualities – which once would have been unashamedly subsumed under the label 'character'. As a result, they suggest that the expansion of higher education has conferred few substantial advantages on those who are not fortunate enough to attend elite universities.

Scott does not agree, questions the "positivist" nature of the data used by the authors and argue, in a post-modernist vein, that "one of the primary characteristics of the knowledge economy/society is to blur boundaries between 'productive' work and 'unproductive' leisure, between producer and consumer, between workplace and home and, by extension, between job- or gender determined roles and identities. So it may be misleading to define a knowledge economy/society simply as one in which there is a high and growing proportion of highly-skilled 'knowledge workers' (who, as one of the more radical results of globalization, may no longer 'belong' in a particular place)." It is

difficult to ascertain this interpretation without the use of "positivistic" indicators of some kind.

Changes in higher education

Throughout the world, higher education is expanding, and changing from an elite to a mass phenomenon, according to a classic article by Martin Trow (Trow and Carnegie Commission on Higher Education 1973). There are two contending theories in the literature regarding the expansion of education. One, preferred by the economists, is the human capital theory, according to which there is a linear correspondence between the expansion of education, the expansion of competences, and economic growth (Becker 1967; Mincer 1974; Schultz 1970). The other, preferred by many sociologists, is theory of credentialism and reproduction, according to which the benefits associated with education derive from status positions defined by education credentials, and just reproduce and sometimes amplify the patters of social inequality of the past {Collins, 1979 #7801; Collins, 2000 #16553; Bourdieu, 1970 #14685. Many authors have observed that education is a "positional good", like in a star system, in which the number of top position is limited, and people compete with ever more effort to the same places in the rankings of prestige and revenues. The consequence is the search for higher and higher degrees, leading sometimes to overskill, without necessarily higher levels productivity (Wolf 2002).

There is no point in taking stands on this debate. There is enough evidence to show that, in broad terms, the better educated a population is, the higher is its productivity and income, and that countries that invested heavily in the education of their population harvested important benefits. At the same time, it is also true that education achievement is strongly correlated with the student's family socioeconomic background, and that prestige and credentials play a large part in determining the persons' earnings in society. In a recent document from OECD, we read that

> "Cross-country growth regressions also usually assume that the impact of education is linear, and constant across countries. However, research suggests that the assumption of constant growth effects of education across countries is unfounded. There is also

> evidence of diminishing effects on growth above an average of 7.5 years of education. This is well below the average years of education across the OECD as a whole (in 1998, this was 11.3 years, across 20 OECD member countries for which data were available). Much remains uncertain in education-growth research. As noted above, it is still unclear whether education and increases in the stock of human capital affect the level of GDP or its growth rate. Policy-relevant issues that could be addressed by further research include: how is growth affected by investment in different stages of education (from pre-school to advanced tertiary education and work-related training)? After how many years, and at which levels of education, do diminishing growth returns become important? How is growth affected by investment in different types of education, such as engineering disciplines or the arts? How is growth affected by the quality of education? How, if at all, are growth effects from the expansion of one stage of education affected by the level of attainment achieved at an earlier stage?" (OECD 2004) , p. 188.

The importance of the sociological approach is not that it denies the broad links between education and productivity, but that it helps to identify the disfunctionalities and problems of uncontrolled education expansion. For instance, if only some segments of higher education is providing benefits for society, but others, there would be no reason for the public sector to subsidize higher education as a whole.

The recent expansion of higher education is not leading to an increase in technically oriented jobs. According to a US source,

> Of the 1,184,000 bachelor's degrees conferred in 1997-98, the largest numbers of degrees were conferred in the fields of business (233,000), social sciences (125,000), and education (106,000). At the master's degree level, the largest fields were education (115,000) and business (102,000). The largest fields at the doctor's degree level were education (6,700), engineering (6,000), biological and life sciences (5,000) and physical sciences (4,600). The pattern of bachelor's degrees by field of study has shifted significantly in recent years. Declines are significant in some male majority fields such as engineering and computer and information sciences. Engineering and engineering technologies declined 12 percent between 1987-88 and 1992-93, and then posted a further 5 percent decline between 1992-93 and 1997-98. Computer and information sciences grew rapidly during the 1970s and mid 1980s, but dropped 22 percent between

1987-88 and 1997-98. Other technical fields have been driven upwards in recent years, in part by increasing numbers of female graduates. For example, biological science degrees increased 28 percent between 1987-88 and 1992-93, and then rose 40 percent between 1992-93 and 1997-98. During the later period, the number of male graduates grew 30 percent, while the number of female graduates grew 50 percent. After declining by 5 percent between 1987-88 and 1992-93, the number of male graduates in the physical sciences rose 1 percent between 1992-93 and 1997-98. The number of female graduates in the physical sciences increased by 6 percent in the first period and rose a further 30 percent in the second half. Although the number of male graduates in agriculture and natural resources grew by 25 percent between 1992-93 and 1997-98, the number of female graduates grew by 66 percent.

United States, National Center for Education Statistics,
http://nces.ed.gov/fastfacts/display.asp?id=37

In Latin America, most students in higher education are enrolled in the so-called "social professions" – administration, accounting, law, and business. In part, this is due to the fact that these fields are cheaper to provide, can be given during the evening for students that need to work during the day, and do not require strong previous education in the sciences and mathematics. But they are also congruent with the existing job market, which, for the most part, do not have enough placements for people with specialized competencies. Data from the 2000 Population Census in Brazil show that, for the so-called "social professions", most of the persons do not work in the fields in which they graduated (Nunes 2006). This also holds, somewhat surprisingly, for engineering, which, although more technical in content, provides credentials of all kinds of jobs and occupations in the market.

Brazil, professional activitities of persons with university degrees, selected fields			
university degree	persons above 22 years of age with the degree		% active in the field of graduation
Medicine	230715	86.88%	75.06%
Pedagogy	576699	64.29%	56.25%
Lenguage	366992	69.19%	54.75%
Law	658693	75.08%	51.31%
Aministration	640273	79.94%	46.39%
Accounting	303681	76.73%	39.79%
Engineering	433182	84.56%	33.10%
Communications	180208	77.67%	27.65%

Source: Data from the Brazilian 2000 Household Census, tabulated by Observatório Univesitário, Rio de Janeiro.

Secondary and technical education

One corollary of the notion that most higher education should lead to science-based technical skills is that science education should start earlier, at least in secondary schools. In the past, in Europe, most of secondary education was dedicated to the humanities, appropriated for the future elites in the cleric and administrative elite positions in society; technical competencies were considered of a lower order, and relegated to practical training for the manual professions and trades. In France, the Napoleonic reform, which extinguished the traditional universities, placed engineering as the most prestigious career, an approach which was copied by most Latin American countries, which also kept, however, the humanistic traditions of the Catholic Church. In Germany, England and the United States, however, engineering remained until recently related to low-prestige technological schools and institutions, even after the natural sciences were finally admitted to the universities.

With the new prestige of the natural sciences and engineering, France, the United States and other countries started to introduce science the curriculum of secondary schools. A recent study argues that, until the fifties, there was a “modernist” culture of science and technology in the United States and other industrialized countries, concerned with the control of nature by men, which “connected science, citizens, and liberal democratic politics productively to each other”, and justified the assumption that science education and culture should be a central feature of modern citizenship. The passage from

a technological culture based on mechanics and standard biology to another based on microelectronics, molecular biology and other complex fields, however, led to a growing gap between the knowledge basis of science and technology and the ordinary, educated citizen. In the past, "the ordinary American could inspect, imitate, apply and even improve modern technologies. The average citizen could therefore comprehend the causal principles by which modernist machines and tools worked". "By contrast, most post-modernist technologies are beyond the average American's comprehension. Ordinary citizens have no informed access to these technologies." Overall, "the shift to post-modernism may well have contributed to a decline in the American public's position as competent practitioners of technology." The American public is more educated today than it was twenty or thirty years ago, and students take more math and science in school than their parents did, but historical data from the National Assessment of Educational Progress suggest that "they may not be gaining much additional competence for their efforts", and, given the unprecedented demands for complex knowledge by post-modern technologies, "they are perhaps less equipped than previous generations to evaluate the technological culture in which they are immersed" (Merelman 2000). Although I would not characterize the new technologies as "post-modern", I could not agree more with his conclusions.

Another recent trend in secondary education is to try to adopt and expand the kind early of professional specialization which has been the tradition in Germany and other European countries. In Germany, students were screened very early in terms of their ability to follow the more demanding curricula of the gymnasium, leading to university careers, and, if not, they were send to vocational career paths, in which they could get the skills needed to enter the manual and technical professions. For many years, this system seemed to work very well, providing the country with strong secondary education in the gymnasiums, competent university students, and a highly skilled professional and technically competent manpower. Attempts to copy this system by other countries, however, as for instance in England, never succeeded (Wolf 2002), and even in Germany, today, the old early divide between university and non-university education paths is being questioned.

The reason why the Germans succeeded where other countries did not was that their system of professional education was organized with strong links between education authorities, local industries and professional gilds and associations, providing the students with real-life working practice and experience. In Brazil, in the early 1930s, the Ministry of Education fought against the industrialists for the establishment of a similar system of technical education, and, at the end, each of them went their own way, creating their own technical and professional schools. The ones developed by the industrialists resulted in the very successful so-called "S" system (of which the best known is SENAI, the Sistema Nacional Aprendizagem Industrial", while the one developed by the Ministry of Education, by bringing professors of technical schools from Switzerland and Germany, failed completely (Schwartzman, Bomeny and Costa 2000).

However, even the successful experiences of secondary vocational education are being questioned today. There are many reasons for that. As the industrial labor shrinks, there are fewer jobs for persons with highly specialized skills which cannot be transferred and adapted to new technologies and activities. When the jobs do not disappear, persons in technical jobs may earn higher salaries and have better chances of finding employment, but their chances for promotion are usually lower, and their life-long earnings are likely to be lower than those with higher education. Whenever secondary education is divided, there is a trend for a social stratification to be created between the different education tracks, and technical education is perceived, and very often treated, as a kind of second-class education for second-class jobs. Students, therefore, tend to stay away from technical schools and careers (Buchtemann and Verdier 1998; Buchtemann and Vogler-Ludwig 1995; Finegold and Soskice 1988; Grubb 1985; Grubb and Lazerson 2004; Schwartzman and Christophe 2005).

The true requirements of the knowledge society

It is too simple, therefore, to equate the knowledge skills required for participation in the modern society with the universal grasp and familiarity with current scientific and technological concepts. The competencies required from most people to work in the modern economy include verbal, communication and behavioral traits that do not depend

on technical or scientific knowledge in the more usual sense of the word. It is possible to summarize the emerging working requirements in the following terms[5]. First, general intellectual qualifications become the main source of competence. These qualifications include the ability to think in abstract, to concentrate attention in specific tasks, to be precise, and able to communicate in written, oral and visual forms. Clearly, these abilities are not content-specific. Second, the frontiers between intellectual and manual work, and between professional and home-based work, tend to blur. Intellectual work requires at least proficiency in the use of computers, and manual work requires familiarity with abstract concepts and complex procedures, standards, and instructions. The requirements for speed and efficiency spill over from the professional to the private spheres: "social life and leisure are also subject to these rules. We consume more, and more rapidly, not only material products, but culture, relationships, friendship, countries, regions, information. This requires real qualifications - a strong and a good educational foundation, together with virtues required to assume continuous adaptation – physical and psychic endurance, and patience"[6]. Third, professions as such become less important, even as the professional qualifications increase. "It is not just the disappearance of old professions and the emergence of new ones, but a clear devaluation of the traditional professions at all levels of competence". The market values specific competencies of individuals and highly specialized technical communities, regardless of their professional identities. The old professional careers are replaced by new patterns of long-life professionalization and reprofessionalization, based on solid educational foundations and new sociological and psychological virtues and disposition. For those who can participate, this new context creates new opportunities and possibilities, but generates also high levels of uncertainty, insecurity and frustration.

[5] There is a large and controversial literature on this topic. See, among others, (Breier 1998). What follows is based mostly on (Fallows and Steven 2000; Kraak 1997; Paiva 1997).

[6] (Paiva 1997); my translation.

Education and innovation

On a recent report on the technological capabilities of Chile, José Joaquin Brunner notes that

> Chile could be a developed country by 2010. If income grows at an average rate of 5% (a very demanding condition), a boy or a girl born today could finish basic education with a country with a standard of life similar to Portugal, South Korea or Greece. To reach this goal, it needs to increase the international competitiveness of its economy. However, if the goods and services produced in the country – its persons, companies and ideas – do not compete successfully in the global arena, the economy will stop, and there will be no development. (Brunner 2001a; Brunner 2001b)

Still following Brunner, the ability to participate and to compete at the edge of technological development and innovation is limited, today, to a select group of countries which concentrate most of the world's scientific and technological capabilities – or, more specifically, to some areas and sectors of these countries. Developing countries and smaller economies can share the benefits of knowledge societies if they are able to link to the international economy, get the knowledge and information they need, and develop their own competence for innovation. They need to develop their "platform for transfers" and participation, requires a large stock of qualified manpower; a significant research and development establishment; infrastructure for information exchange and communications; economic integration with the international markets; the ability to acquire technologies from abroad, both in hardware and in intangible resources; the involvement of the private sector with research and development activities; and strong and fluid links between universities and industries. A quantitative analysis of indicators related each of these dimensions leads the author to conclude that Chile may not be able to keep up with the challenge. The same would apply to the other countries in the region, whose indicators are often worse than those of Chile.

The creation of effective innovation systems, including good-quality higher education, requires deliberate policies, and cannot be expected to derive from short-term market demands. If a country is successful in developing the whole set of requisites

needed to participate in the modern, knowledge-based society, then an extended and good quality higher education sector is a crucial component of this whole. If it does not, higher education can continue to expand and even improve its quality and efficiency, without, however, generating the expected benefits, and creating frustration and cynicism among the educated population.

The quest of quality – market pull or institutional push?

An overview of higher education in a selected group of Latin American countries suggests that the labor market is not pressing the countries' higher education institutions to produce better-trained graduates in significant quantities. In broad terms, the provision of higher education seems to be congruent with the current levels of economic development and occupational structure. Most occupations are in personal services, commerce and more elementary technologies (including data processing, and repairs), and this is where most of the course offerings and students are. The demand for higher education by students respond to their perceptions of the job market, to their ability to pay for their studies, and their chances to get admitted to the most prestigious course programs and professions, in terms of their previous education. The job market is also influenced by the legal rights and benefits associated to academic credentials, particularly in areas such as teaching, law, and health. However, a growing number of students are enrolled in "semi-professional" areas, such as administration and the social sciences, were formal credentials, by themselves, are of little value. Graduate education is expanding in a similar pattern. At the lower level, of specialization and master programs, most students are looking for credentials, or for a better market position in business, administration, health services and engineering. At the doctoral level, the main employers are the public universities, and the main sources of support, the national science foundations and agencies.

These findings are congruent with the notion that the creation of innovation competencies should be the object of deliberate policies, and cannot be expected to come from short-term market pressures and demands. We also find that the proportion of higher education students who fail to get their degrees is very high, particularly in mass

education sectors, whether in public universities of Mexico and Peru or in the private sector in Brazil. There are several possible explanations for this. Many students come to higher education from low quality secondary schools, and are unable to absorb the contents of the more demanding academic programs; they may have difficulties paying tuition; and they may become discouraged by the low quality of the education they are getting, or by the difficulties they perceive in the professional job market. We see no evidence, in the countries' policy documents, of organized efforts to change and adapt the curricula of higher education course programs to less qualified students, or the creation of alternative education paths. On the contrary, most of the attention is placed on the need for quality improvement. We see a drift towards more homogeneous, university-type courses, and a trend to create a new level of differentiation within the system, thorough the expansion of graduate programs. This orientation, when disconnected from the need to pay attention to the specific issues and demands of mass higher education, can easily backfire, leading to more waste of public resources and frustration.

The moral hazard of credentialism

The combination of a growing demand for academic credentials and the limited demand for highly qualified jobs in the labor market makes it difficult for policy makers to improve the quality of higher education, and to differentiate the provision education to respond better to the demands of the different segments of the job market. One important proposal, in this regard, would be to separate the functions of education and professional certification, which are done simultaneously by higher education institutions according to the Napoleonic tradition. If a university degree is also a professional certification, and if this certification leads to advantages in a regulated labor market, this is a stimulus for the proliferation of "diploma mills", and for the students not to complain about the low quality of their courses. It is a moral hazard that should be seriously considered wherever formal education requirements are established as requisites for specific jobs or benefits – like, for instance, salary increases for schoolteachers.

If the two functions were separated, with professional certification being provided by professional bodies of some kind, higher education institutions would have to compete

for quality, and would not have to abide to the curricula established by Ministries of Education or professional corporations. A more radical alternative would be to deregulate the labor market, and do away with all kinds of professional certifications. Most Latin American countries have intricate legislation establishing the requirements, rights and benefits for professional work, with strong impact in the demand for higher education and the content and organization of course programs. The real impact of these corporatist regulations, however, is not clear. When the state requires a school teacher to have a diploma in pedagogy, or a policeman to be a lawyer to get promotion, or a university professor to have a doctor's degree, these are clear stimulus to credentialism, and to the moral hazard of diploma mills. The private sector, whenever possible, tries to move away from these formalities. However, employers use education diplomas as proxies for quality for their employees, and can pay high premiums for the better qualified (Robbins and Minowa 1996).

Differentiation

To establish quality control and standards is very difficult by itself, but becomes still more daunting when applied to systems of mass higher education reaching out to poor or ascending segments of the population. It is clear, to any observer, that many institutions providing cheap evening courses of administration to ill-prepared students in Mexico, Brazil, Colombia or Chile are not giving them much in terms of content, and providing them with almost empty diplomas and certificates. The extraordinary growth of this segment shows, however, that there is strong demand for this kind of education, and that it is good business to provide it.

The traditional impulse in many countries has been to try to close down these courses, and to forbid for-profit higher education institutions altogether. This, however, is not possible, given the limited ability of public institutions to continue to expand, and the obvious prejudice of demanding that all higher education institutions should be public, community based or charitable. It should be possible to have private institutions providing good education for a fee, as an honest and legitimate business.

The central issue in the regulation of the lower tiers of higher education is whether what the students get in these institutions is worthless, or even detrimental to them and to society, or whether they add some value to the students, in terms of knowledge or professional credentials. It is possible to argue that, if the student is willing to pay, and the course programs are not supported or certified by the government, there is no reason for public agencies to interfere in this private contract. At the same time, it is the role of government to make sure that the population does not buy spoiled meat or ineffective medicine, and it should be its role to make sure that the public does not buy rotten education.

However, what are the limits, and the standards, for this intervention? Castro and Navarro have argued that, even if these courses do not deliver the contents they promise, they give to the students knowledge and information they did not have before, and a better chance in the labor market. For them, "the low end of the private higher education sector has a valuable social role to play in helping less-well-endowed and less-affluent students to reach the post-secondary level. Yet, by itself it is unable to develop the requisite types of programs, materials and staff to implement this role. The participation of the public sector is indispensable for the private sector to fulfill this role" (Castro and Navarro 1999) .

Thus, not only they argue against a policy of repression and suppression towards the low end of private higher education – they argue for a positive role of government in making it more useful. This same reasoning applies to the public sector. There is a clear tension, in all countries, between a concern with quality and the need to make public higher education more open to the less-endowed segments of the population. The trend, in democratic societies, is to the equity side to prevail. However, these policies are seldom associated with efforts to provide education contents that are compatible with these segments; the consequence is the lowering of standards, and the flight of better-endowed students to elite institutions in the country or abroad. The alternative should be for public institutions to develop special course programs that could compensate for past limitations of less qualified students, or, more realistically perhaps, to provide them with

learning alternatives more adjusted to their resources and competencies, in general and vocational education.

We can conclude by stating that the main reasons why Latin American higher education institutions are not responding well to the requisites of the knowledge economy are not related to institutional barriers and distortions, but to the fact that the job markets are not demanding high quality manpower in significant numbers. A policy to enhance higher education institutions in the region should not be based on what the market wants now, but in what it may want in the future, in the context of much broader policies of increasing the innovation capabilities of countries. Even in the best scenarios, in the foreseeable future the markets will continue to demand persons with different levels of skills, which have to be supplied by highly differentiated and flexible institutions, each one looking for their niche and special competencies. The best arrangements, therefore, will be those in which governments have the vision and the instruments to foster quality, standards and plurality, and institutions have the freedom and the incentives to perform at their peak.

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