

## CHILE - HUMAN RESOURCES FOR THE KNOWLEDGE ECONOMY

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*This paper assesses the current education system in Chile and the skills profile of the Chilean population. The objective is to assess whether the education system has succeeded in creating a skills profile, which allows Chile to develop into an innovative, knowledge-based economy. The first part of the paper describes recent trends in Chile's educational system. Chile has made notable efforts to improve its education system. In consequence, the educational attainment of the Chilean population is among the highest in the Latin America. Still, gains in educational attainment have been unequally distributed in favor of the richer income groups, the younger age cohorts and urban residents.*

*The second part of the paper looks into the skills profile of the Chilean education. The ICT-skills of Chilean workers are high compared to most other Latin American countries and Chile has made progress in promoting 'higher order' skills such as flexibility and analytical skills. Still, Chile has a low supply of highly skilled workers with so-called hard skills: technical workers, engineers and other "exact" fields. The current supply of tertiary technical training is considered as low quality and is poorly integrated with the secondary level. At the same time, the Chilean economy is dominated by low-technology companies, which do not demand highly skilled technical workers. No ready-made solutions are available to break this deadlock, but the government clearly must intervene to make these programs attractive to students. Finally, the paper looks at training. The low educational attainment of older age cohorts makes a strong case for expanding training opportunities. However, employers, employees and unemployed alike see current training programs as obsolete. Against this backdrop, the Government of Chile and the World Bank have recently launched a project to expand and strengthen Chilean training programs in terms of quality and relevance.*

**World Bank**

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## **Introduction**

This paper takes stock at the Chilean education system and the country's stock of human capital. The objective is to assess whether Chile is sufficiently equipped in terms of human capital to take advantage of the knowledge economy. The paper rests upon two key assumptions: First, as pointed out in the 1999 World Development Report, knowledge has become increasingly important for sustaining economic growth. Accordingly, economies must respond by upgrading the skills and knowledge of their workforce. Second, the rate of technological change has become increasingly rapid. The introduction and constant change in information and communications technologies (ICT) is a case in point. The increasing flows of information, facilitated by ICT-technologies, have likewise increased the demands for employees capable of gathering *relevant* information and perform independent analysis – so-called higher order skills. These rapid changes imply that the workforce must adjust and attain new skills constantly. Hence, education should be viewed as a lifelong activity rather than full-time education for a limited number of years.

The paper will be divided into two main parts: Part one provides a general overview of the education system in Chile, and trends in expenditure, enrollment, attainment and quality. The second part of the study tries to assess whether the stock of human capital meets the needs of the knowledge economy. It does so by looking into a number of issues such as the increasing focus on higher order skills, a need for a complementary education system with soft and hard skills and the level of ICT-literacy in Chile. The second part also looks briefly into the issue of brain drain, and finalizes by focusing on lifelong learning, which in many ways is a key to the future development of Chile's human resources. The conclusion will summarize the paper and identify the main challenges, which the Chileans must confront to take successfully advantage of the knowledge economy.

## **I - Overview**

Chile's education system is a product of numerous policy reforms launched over the past decades. Various objectives have guided these objectives. Thus, the first wave of reforms was introduced in the early 1980 with a view to improve cost-efficiency and enrollment. Subsequent reforms have, by contrast, been more focused on educational output and quality.<sup>1</sup> As the subsequent parts will demonstrate, these initiatives have not been in vain. Hence, Chile has succeeded in making primary and secondary education almost universal and tertiary enrollment has increased significantly.

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<sup>1</sup> For thorough accounts and analysis of educational reforms in Chile, the reader is referred to Delannoy (2000), Cox & Lemaitre (1999) and Gauri (1998).

Still, significant challenges remain. Educational attainment, especially at the tertiary level, is still highly skewed towards the high-income quintiles of the population and the older age cohorts lag significantly behind in terms of educational attainment. International benchmarking tests has further revealed that the quality of the Chilean education system lags far behind more developed economies, even though Chilean quality assessments point to recent improvements in the achievements of Chilean children.

### **Organization and Governance**

*Organization.* The core of Chile's education system consists of three different levels: primary, secondary and tertiary. Primary school consists of 8 years of compulsory education targeting children between six and 13 years old. Secondary education includes general preparation for tertiary studies or vocational schools targeting students between 14 and 18 years old. Following the sweeping reforms of the early 1980's, the primary and secondary school system were divided into four different categories: i) Public schools administered by the municipalities, ii) Private schools receiving public subsidies, iii) private schools based entirely on parental contributions and iv) corporation schools, which are secondary technical-professional schools administered by business corporations. By 1996 public schools and private schools with public funding accounted for the bulk of enrollment with 55% and 35% of total enrollment, respectively.<sup>2</sup>

The tertiary level was changed profoundly in 1981 following structural and financial reforms. Hence, the range of higher education institutions grew from originally eight universities into a total of 257 tertiary institutions encompassing 68 universities (public and private), 70 professional institutes (private) and 119 technical training centers (private). The core education system is supplemented with a pre-school program targeting children up to five years old and training-programs directed towards young people and adults who have left the formal full-time education system.

*Governance.* The Ministry for Education (*Ministerio de Educacion*, MINEDUC), currently led by Minister Mariana Aylwin, is responsible for establishing the general guidelines for the education system. The Ministry has benefited greatly from high-level political support, seeing that education has been a top priority for several Chilean administrations. A case in point is the Center-Left coalition, which after assuming power in 1990 put the need for education at the center of its policy strategy.<sup>3</sup> The current president, Ricardo Lagos, who is a former Minister for Education, has likewise

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<sup>2</sup> Based on Cox & Lemaitre (1999, p.152f)

<sup>3</sup> Araneda & Marin, 2002.

expressed strong support for education.<sup>4</sup> Still, the Ministry and its affiliated bodies have been criticized for lack of efficiency and low flexibility. As pointed out by Delannoy (2001) this in turn has to do with lack of internal communication and poor horizontal coordination in the Ministry, just as the Ministry has been slow to adopt ICT-technologies into its operations. Subsequent modernization strategies launched by President Eduardo Frei have tried to correct these problems, and notable progress has been made. For example, the Government's secondary education support, which was supported by the Bank, succeeded in setting up new divisions within the Ministry, which were in better keeping with the needs of the sector.<sup>5</sup> Still, some of the efforts to strengthen the Ministry have been reduced due to a high turnover of personnel.<sup>6</sup>

The Ministry and its responsibilities have been subject to a large-scale decentralization process initiated under the military regime in the early 1980s. This has led to the devolution of administrative responsibilities and decision-making powers from central authorities to local authorities and education institutions. This outcome if this process has been mixed, though.

The decentralization of primary and secondary levels has opened for a more flexible management of the education sector [describe in more detail how it works – follow the money]. As pointed out by Vegas (2002), this has led to an increase in educational achievement at the primary level when combined with teacher autonomy. Nevertheless, many education institutions have not been sufficiently capacitated to lift this task, which in some cases has left the administration of schools in a void. This problem has been further aggravated by the fact that transfer of responsibilities has not been met by a corresponding rise in funding.<sup>7</sup>

Moreover, the decentralization process has in many cases failed to create a clear division of responsibilities between municipalities and local schools. Further, the government has to some extent remained in control of teachers' salaries and contract, which has made it difficult for local school administrators to hire and lay-off teachers according to changes in local demand.<sup>8</sup> Still, the

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<sup>4</sup> Lagos has *inter alia* expressed support for extending the pre-primary school system (Araneda & Marin, 2002).

<sup>5</sup> The Curriculum and Evaluation Unit (CEU) and the National Secondary Education Coordination Unit were established to strengthen the Ministry's ability to monitor, coordinate and improve the secondary education system, its relevance and quality (World Bank, 2001).

<sup>6</sup> Institutional capacity building of MINEDUC, was one of the objectives of the 1995 secondary education project launched by the Government with support from the Bank (see World Bank 1995 and 2001). It did so, *inter alia*, by delivering training to bureaucrats in the Ministry, but due to a high turnover in this group the effect of this intervention was reduced.

<sup>7</sup> See Delannoy, 2000.

<sup>8</sup> Hence, as pointed out by the *Economist Intelligence Unit* (EIU, 2002: 15), the centrally defined 2<sup>nd</sup> Teachers' Statute, has been perceived as a major obstacle to improve performance in public schools.

system has become more flexible with the adoption of the 1995 Teachers' Statute, which allows local authorities some flexibility in staff management.

MINEDUC manages tertiary education through the Higher Education Division (*La División de Educación Superior*, DIVESUP). Alongside DIVESUP, The Higher Council for Education (*Consejo Superior de Educación*), has been set up as a semi-autonomous organization to monitor the tertiary education sector and set forth policy recommendations.<sup>9</sup> Like the basic education system, the higher education sector is also strongly decentralized and many of the tertiary education institutions operate with extensive autonomy vis-à-vis the central government. This in turn has had implications somewhat similar to those of the basic education system. First, the extensive autonomy means that the Ministry has limited possibilities to control the course of the higher education sector. Second, not all of the tertiary institutions have been sufficiently capacitated for self-governance.<sup>10</sup> This has, as the following sections will show, led to the establishment of a very heterogeneous tertiary sector.

Whereas MINEDUC is clearly the main political body responsible for governing primary, secondary and tertiary education, the Ministry is not responsible for adult training programs and lifelong learning. By contrast, the central government body is the Ministry of Labor and its affiliated body: The National Training and Employment Service (SENCE).

It is important to keep in mind that policy formulation also happens under influence from other stakeholders. The Teachers' Union (*Colegio de Profesores*), for example, is a major player with regard to primary and secondary education. The Catholic Church also has considerable influence on the education sector, especially in the private sector. Major stakeholders at the tertiary level include the Commission for Scientific and Technological Research (CONICYT), the Council of Rectors (25 traditional universities); *Consejo de la Educación Superior Privada* (council of higher private education); and CONIFOS (professional institutes and technical training centers).

### Finance for Education

*Overall trends in public expenditure.* The overall level of public education expenditure decreased throughout the 1980s, ~~partly as consequence of an economic downturn~~. Over the 1990s by contrast public expenditure gained momentum which to some extent can be seen as a reaction to the reforms of the 1980s, which had managed to increase enrollment without raising costs (Graph 1).<sup>11</sup>

Eliminado: from  
Eliminado: a  
Eliminado: government reforms, which aimed at improving cost-efficiency in the education system rather than expand resources

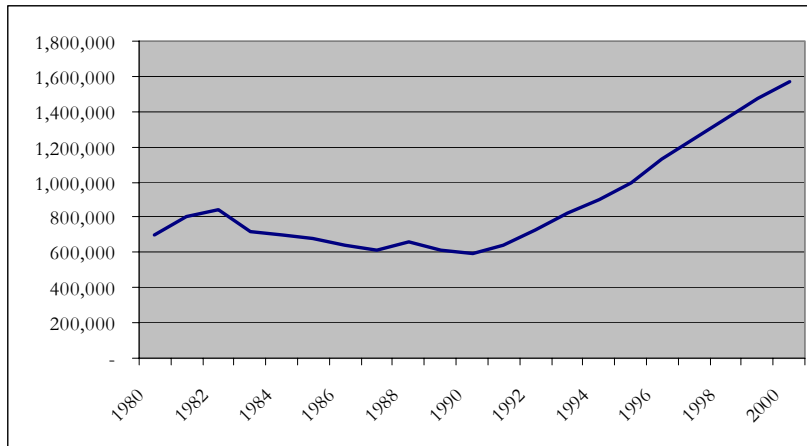
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<sup>9</sup> The Higher Council for Education is the body responsible for quality monitoring at the tertiary level.

<sup>10</sup> See World Bank, 1998, p.4.

<sup>11</sup> This was made possible, *inter alia*, by keeping teacher salaries fixed.

**Graph 1 Public Expenditure on Education, 1980-2000**  
Million Chilean Pesos (2000)



Source: CENDA, 2001

Still, the current level of public expenditure constitutes only 3.7% of GDP (1998), which is significantly below the average level in low and middle-income countries (4.2%) and high-income countries (5.6%).<sup>12</sup> However, as pointed out in Graph 2, public expenditure is clearly on the rise as share of GDP.

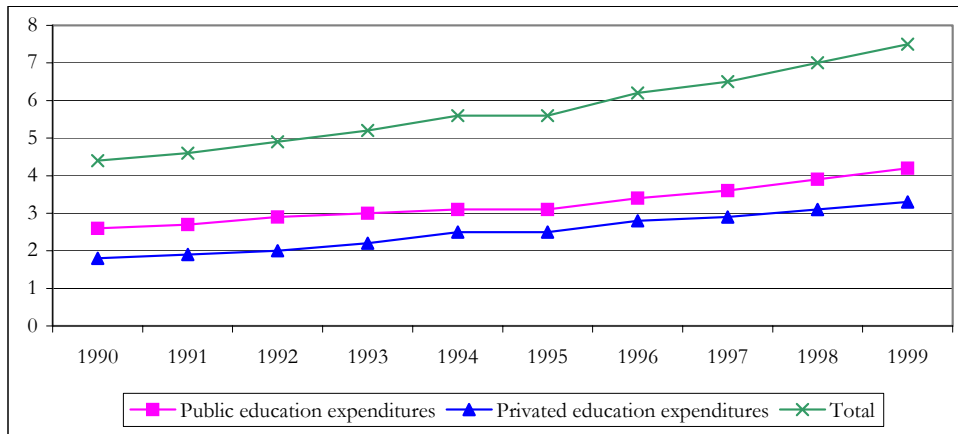
*Public vs. private expenditure.* The relatively low share of public expenditure relative to GDP is compensated by a very high level of private sector funding amounting to approximately 2.7% of GDP (Graph 2). Hence, Chile is clearly an outlier in a LAC context, but also stands out in an international context, seeing that average private sector funding amounts to 1.2 percent of GDP for OECD-countries.<sup>13</sup> The role of the private sector is especially dominant with regard to higher education. Hence, government funding as share of total tertiary funding dropped from a level of 100% prior to the reforms of the early 1980s to a level of only 27% of by 1990. In consequence, the massive expansion in tertiary education institutes has primarily been financed by private sources.<sup>14</sup>

<sup>12</sup> As pointed out in PREAL (2001) a comparison with education spending as share of GDP in high-income countries must consider that the size of the school population is larger in the Latin American region. This implies that the proportion spent on education relative to GDP should be even higher in Latin America if spending on education was to compare to high-income countries.

<sup>13</sup> Moreover, only very few countries, Korea is one example, has a larger share of private funding relative to GDP than in Chile.

<sup>14</sup> World Bank, 1998: 3

**Graph 2 Chile's expenditure on education (percentage of GDP) 1990-1999**



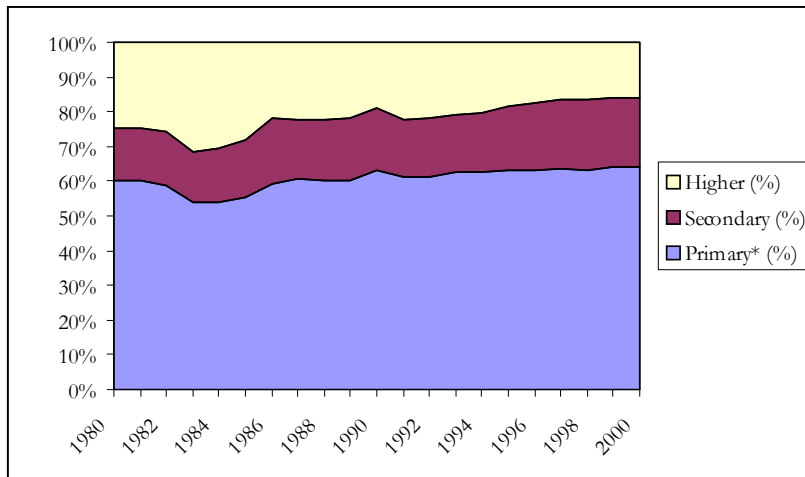
Source: MINEDUC following CENDA, 2001

*Public expenditures by level of education.* Has funding been granted to the basic education system at the expense of higher education? Many Latin American countries have a history of investing significant sums in tertiary education and at the same time keeping per student costs significantly lower at the primary and secondary level. [\[insert graph from quality section\]](#) Venezuela and Brazil, for example, invest between eight and 11 times as much per tertiary pupil than on primary and secondary pupils. As pointed out by PREAL (2001) this can to some extent be explained by the fact that tertiary students have larger political clout in these countries. Clearly it is difficult to define an optimal formula for the relation between basic and higher education costs, but it goes without saying that massive investments in the tertiary education sector will not suffice, if the lower levels of the education suffer from under-investment, which in turn affects quality. Unlike Venezuela and Brazil, Chile only invests twice as much per student at the tertiary level compared to primary and secondary school, a ratio, which is comparable to that of Canada and only slightly higher than USA.<sup>15</sup> In consequence, tertiary spending in Chile seems to be better balanced against the primary and secondary level than in most Latin American countries. Hence, primary education is currently averaging more than 60% of the annual assignation, secondary 18% and higher education 22%. This

<sup>15</sup> All figures based on UNESCO data according to Preal (2001, p.24)

in turn is a significant change from mid 1980s, where tertiary education accounted for approximately 30% of total public education expenditures (Graph 3).<sup>16</sup>

**Graph 3 Public Expenditures by Level of Education**



\*Also includes expenditures for special and adult education.

Source: CENDA, 2001

Note: Original data in Annex

*Allocation of public expenditures.* The rules guiding the allocation of public expenditures have been changed profoundly over the last decades. Hence, one of the most significant traits of the reforms in the 1980s was the introduction of the capitation system linking resources for basic education allocation to student attendance.<sup>17</sup> This, in turn, has ensured a better fit with the needs of the system. Moreover, reforms have been launched to tie allocation to performance. For example, the Government launched the System of Merit Awards to Schools (SNED) in 1995, which links compensation rewards to the performance of teacher teams (as opposed to individual teachers). This, in turn, gives schools an incentive to cooperate with a view to get high ratings on a number of variables defined by the central government.<sup>18</sup>

The allocation rules guiding public expenditures for tertiary education have also been reformed in the past decades. Prior to the launch of the Governments Higher Education Project in 1998,

<sup>16</sup> These numbers differ with the ones published by the Ministerio de Educacion, División de Educación Superior, "Sistema de Educación Superior, Compendio Estadístico 1997-1999". However, the difference is not considered substantial, thus it does not change the analysis.

<sup>17</sup> Sometimes referred to as "Voucher system". Strictly speaking, a voucher would be directly paid to parents, which is not the case in Chile.

<sup>18</sup> Delannoy, 2000, p.22f.

funding for tertiary education was channeled through four mechanisms. Almost 50% were allocated as direct subsidies (*Aportes Fiscales Directos*) to the 25 universities affiliated with the *Consejo de Rectores*.<sup>19</sup> By contrast, all tertiary education institutions were eligible for indirect subsidies (*Aportes Fiscales Indirectos*), which amounted to almost 10% of public support for tertiary education. These funds were allocated according to the number of top scorers admitted in each institution the previous year. Another 9% were allocated through the Institutional Development Fund (*Fondo de Desarrollo Institucional*, FDI), which in turn consisted of four different competitive funds. Finally, a substantial amount of public support for tertiary education was allocated directly to the students in the form of scholarships and loans.

This system had numerous flaws though. First of all, the system was highly unfavorable to tertiary institutions not affiliated with the *Consejo de Rectores*, seeing that these did not qualify for direct subsidies. Moreover, the FDI was heavily criticized for letting political criteria dominate the allocation of funds. These shortcomings have been recently challenged, by the higher education improvement project launched in 1998 with support from the Bank. First of all, it seeks to level the playing field, by giving all tertiary education institutions access to direct subsidies. Second, the FDI has been replaced by a US\$225 Mio competitive fund in support quality and relevance.<sup>20</sup>

### Participation

*Enrollment.* Pre-primary gross enrollment lies currently at 75%, which in Latin America is second only to Cuba and Costa Rica and on par with Mexico for example. Other Latin American countries such as Argentina and Brazil are far behind with gross enrollment rates around 50%.<sup>21</sup>

At the primary level, Chile has attained virtually universal coverage with gross enrollment currently (1998) above 100% and net enrollment at 96% (enrollment in the 6-14 years old cohort).<sup>22</sup> Moreover, Chile boasts very low repetition and desertion rates compared to the average Latin American country.<sup>23</sup> Chile has also seen a significant increase in secondary enrollment from approximately 50% in 1980 to more than 80% in 1998. This development represents a general trend

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<sup>19</sup> 1999 figures; Ministerio de Educacion, División de Educación Superior, "Sistema de Educación Superior, Compendio Estadístico 1997-1999"

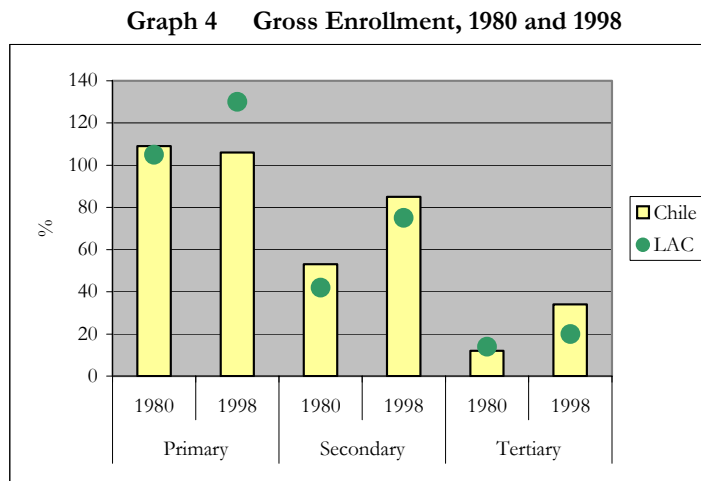
<sup>20</sup> This section is based on World Bank, 1998, World Bank, 2002f and CENDA, 2001.

<sup>21</sup> All figures according to UNESCO (2001, p.57).

<sup>22</sup> Net enrollment differs slightly with 1998 UNESCO estimates at 88% (1998, p.59).

<sup>23</sup> The very high level of gross primary enrollment for LAC as a whole is likely to be a reflection of high repetition rates. Repetition, which is a common problem among developing countries, is on the other hand relatively low in Chile with 2.91% in primary education and 6.53% in secondary education. Desertion is 1.35% for basic education and 4.05% for secondary (MINEDUC, 2000 and UNESCO, 2001: 43).

throughout the Latin American region, but secondary enrollment rates in Chile are nevertheless slightly above the regional average.



Source: World Development Indicators, 2002

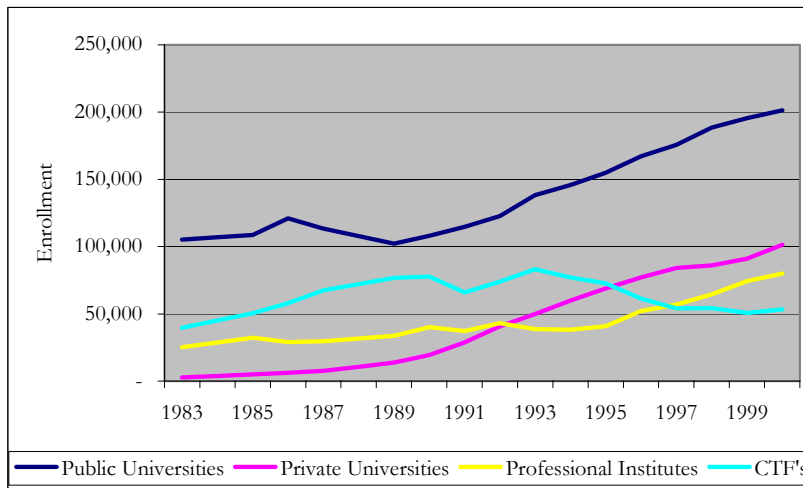
Finally, Chile has seen a notable increase in tertiary enrollment by regional standards. Hence, whereas LAC tertiary enrollment rose from 14 to 20% in 1980-1998, the Chilean number went up from 12% to 34% in the same period (Graph 4). However, Chilean tertiary enrollment is still behind the OECD average of 51%.

The growth in tertiary enrollment is partly facilitated by the increase in tertiary education institutions, notably private universities and technical institutes (Graph 5).<sup>24</sup> Moreover, Beyer et al. (1999) points out that the private returns to tertiary education have been increasing relative to primary and secondary over the past three decades, which in turn can explain the increase in tertiary enrollment from 1980 to the mid 1990s. A simple correlation between educational attainment and average labor income suggests that the earnings of tertiary graduates went up from 2.4 times the earning of secondary graduates in 1980 to 3.3 times by 1996. The trend is especially clear among younger age cohorts. More sophisticated regression analysis likewise documents that the skill premium has been increasing over the last decades, although there has been a slight decrease in the

<sup>24</sup> See Teixeira & Amaral, 2001, p.13ff.

1990s.<sup>25</sup> As pointed out by Beyer et al. (2001, p.121f.) this reversion may reflect the increase in supply of tertiary graduates, which should drive down the price on highly skilled labor.

**Graph 5 Tertiary Enrollment by Institution, 1983-2000**



Source: CENDA, 2001, p.11

On the other hand, the value of secondary education relative to primary education has decreased from 2.4 in 1980 to 1.7 in 1996. This in turn reduces the incentive to enroll in secondary education, unless secondary enrollment is seen as a natural step-stone to tertiary education and not an objective *per se*.

*Equity.* The gains in enrollment and educational attainment have not been equally distributed and major imbalances exist across income quintiles, age cohorts and geography. Enrollment does not seem to differ significantly between males and females on the other hand.<sup>26</sup>

Graph 6 presents a picture on enrollment by level of education across income quintiles. Whereas primary enrollment is evenly distributed, inequity still remains with regard to secondary and especially tertiary education; a trend which is common to most countries notwithstanding their level of economic development. The main difference is that the ratio of inequality typically is higher in

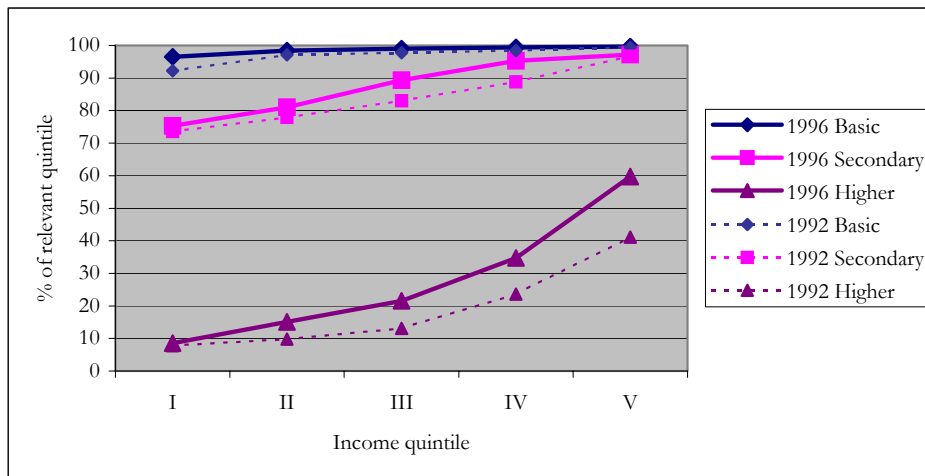
<sup>25</sup> Beyer et al. (1999) conducted a regression in order to estimate the returns on tertiary education relative to tertiary. The regression controlled for third variables such full-time vs. part-time job, apparent work experience and the square of experience. They found that the skill premium had increased over the last three decades with a minor reversion on the 1990s.

<sup>26</sup> The distribution between male and female enrollment does not seem to be a major issue. Enrollment is perfectly equal at the pre-primary, primary and secondary and only slightly in favor of males at the tertiary level: 36% net male enrollment vs. 32% female (UNESCO, 2001).

developing countries. Moreover, as can be seen in the graph, the level of inequity has actually increased for tertiary education: Tertiary enrollment rose by almost 50% for the richest income quintile, but was stagnant for the lowest income quintile.<sup>27</sup> As pointed out by Teixeira and Imaral (2001, p.15) this follows from the fact that the poorest income quintiles cannot afford to enroll in the new private universities and find it difficult to be accepted to public universities, which are highly elitist in terms of academic admission criteria.

A number of policy initiatives have been launched to mitigate the imbalances at the tertiary level. The Bank supported Higher Education Project (1998), for example, has contributed to the development of a new student loans program for low-income students in tertiary education. Moreover, student grants have been provided within the framework of the *Sistema Nacional de Financiamiento Estudiantil* (National System for Student Finance). Still, these schemes have arguably been insufficient to make low-income students enroll, seeing that many loans only cover part of the costs leaving the students with the challenge of financing living costs during the studies.

**Graph 6 Net Enrollment by Level and Income Quintile, 1992 and 1996**



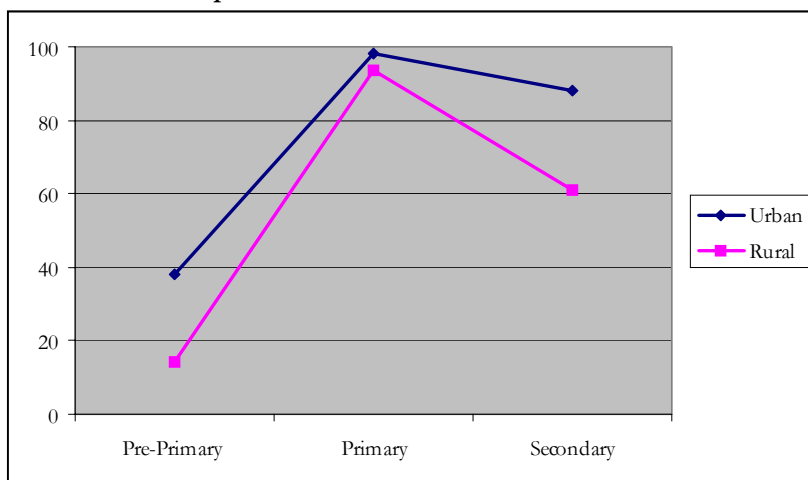
Source: Household Survey 1992 and 1996 according to Delannoy, 2000, p.43

There is also a major imbalance in enrollment across the country, especially between urban and rural areas. The dispersion between urban and rural gross enrollment is especially marked at the pre-primary and secondary level. Likewise, data also suggest large variations between urban and rural

<sup>27</sup> Inequity in tertiary enrollment is prevalent throughout Latin America according to Araneda & Marin, 2002.

enrollment at the tertiary level. Enrollment at the primary level, by contrast, does not vary significantly between urban and rural location. In conclusion, the distance between rural and urban enrollment tends to grow with the level of education. One major exception to this trend is pre-primary enrollment, which appears to be an urban phenomenon possibly reflecting socio-cultural differences between urban and rural living.<sup>28</sup>

**Graph 7 Urban vs. Rural Gross Enrollment**



Source: World Bank, 1999b, Annex D.

It is difficult to account for the changes in equity. However, as pointed out by Tedesco the increasing rates of inequality may be associated with the process of decentralization. This hypothesis is supported by evidence from Chile and Argentina, and may be associated with the decrease in central government control.<sup>29</sup>

### Outcome

Chile's educational attainment is one of the highest in Latin America, with 7.9 years of formal education almost equally distributed between males and females.<sup>30</sup> This number is only exceeded in Latin America by Argentina with 8.49 years and is well above the Latin American average of 5.7

<sup>28</sup> Somewhat related to the urban-rural divide is the issue of indigenous people. Educational attainment among indigenous people is on average 2.2 years below average. Moreover, indigenous people have a high probability of being employed in unskilled jobs or in the agricultural sector (World Bank, 2002a).

<sup>29</sup> Juan Carlos Tedesco in PREAL, 2002, p.26.

<sup>30</sup> Chile's domestic figures published by MINEDUC in the "Compendio Estadístico 2000" present a 10.17 national figure for educational attainment (with a range of 8.43 to 11.04 between regions).

years (Barro & Lee, 2000). However, a significant gap still exists to high-income countries, which feature 9.5 years of average educational attainment.<sup>31</sup>

The patterns of unequal enrollment have translated into inequalities with regard to educational attainment. Hence, average attainment is 7.4 years in the lowest income decile and 13.1 for the highest income decile. The distribution is also highly unequal across generations: Whereas 54% of the 25-34-age cohort has attained upper secondary education, the corresponding number for the oldest age cohort in the labor market (55-64-age) is 24%, which translates into a ratio of 2.25, significantly above the high-income OECD countries with a ratio of 1.55 (Table 1).

**Table 1: Educational Attainment by Age**  
Percentage of the population that has attained at least upper secondary education

	25-64 years	25-34 years	35-44 years	45-54 years	55-64 years	Ratio: (25-34)/(55-64)
High income OECD	64	74	68	60	48	1.55
Chile	NA	54	38	33	24	2.25

*Source:* OECD Education at a glance 2001 following Arellano, 2002.

Another cleavage exists between rural and urban residents. Hence, among the 25-44 years old, average educational attainment was 11.22 years in urban areas and 7.43 in rural areas.<sup>32</sup>

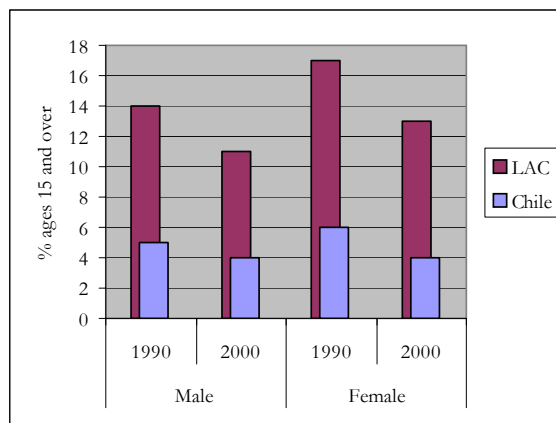
The relatively high level of educational attainment in Chile, by Latin American standards, has translated into adult illiteracy rates notably lower than the average Latin American levels. Whereas Chile boasts illiteracy rates around 4% for men and women alike, the rates for Latin American in general lie at approximately 11% for men and even higher for women at approximately 13% (Graph 8).<sup>33</sup>

### Graph 8 Adult Illiteracy Rates, 1990 and 2000

<sup>31</sup> See Barro and Lee, 2000.

<sup>32</sup> 1998 data from ECLAC according to Arellano, 2002: 64

<sup>33</sup> Chilean rates of illiteracy are even lower for the 15-24-age cohort, where only 1% of the cohort remains illiterate (World Development Indicators 2002).



Source: World Development Indicators 2002

### Quality of Education

There is generally little data available on quality of education in Latin America. However a number of proxies can be used to assess the quality, notably the ratio of educational expenditure per student, teacher salaries (both indicators relative to relative to GDP per capita) and student-teacher ratios. These indicators give a rough indication, whether the level of resources invested in the system is sufficient to guarantee high quality education. Still, a high level of student and teacher expenditure does not guarantee a high quality system, but it can to some degree be seen as a necessary condition.

**Table 2: Quality proxies, Chile and beyond, 1998**

	Expenditure per student relative to GDP per capita			Teachers' salaries as share of GDP per capita (%)		Ratio of students to teaching staff	
	Primary	Secondary	Tertiary	Primary	Lower Secondary	Primary	Secondary
Chile	17	20	67	1.8	1.8	33.4	29.1
Latin America	12	18	71	1.3	1.3	24.9	22.0
High Income	20	27	42	1.3	1.4	16.7	13.6
East Asia and Pacific	15	20	123	2.3	2.5	26.4	23.2

Note: Expenditure per student relative to GDP is based on public and private institutions  
 Source: Arellano, 2002, p.72

Con formato: Inglés (Estados Unidos)

Education expenditure per student in Chile (relative to GDP) is the highest in Latin America, which in turn bodes well for the quality of education provided that the system is efficient and responsive.<sup>34</sup> A breakdown by level of education reveals that this is only the case for primary and secondary education, whereas Chile is slightly behind the regional average at the tertiary level. Compared to high-income countries, on the other hand, Chile lags significantly behind with regard to per student expenditure at the primary and basic level but spend more per student at the tertiary level than do high-income countries.

A significant amount of educational expenses in Chile is allocated to teachers' salaries, seeing that expenditures, relative to GDP, are well above the regional average in Latin America and the high-income countries for that matter (relative to GDP).<sup>35</sup> Still, teacher salaries take up an even greater share relative to GDP in the East Asian countries. The relatively high level of teacher salaries in Chile follows chiefly from massive pay increases over the 1990s designed to make up for stagnation in the 1980s.<sup>36</sup>

Finally, the number of students per teacher is significantly higher in Chile than in high-income countries or in the LAC region in general. Still, these numbers do not take the skills of the teachers into consideration. As already pointed out Chilean teachers are better paid than in most other LAC countries, which in turn should ensure that more qualified people are attracted to the profession. This assumption is supported by the fact that 96% of Chilean primary teachers have required the necessary academic qualifications against 84% for LAC as whole. Likewise, 1997 data from CEPAL show that pre-primary and primary school teachers in Chile have on average 15.6 years of schooling, which is higher than any other Latin American country.<sup>37</sup>

Based on the evidence presented above, no definitive conclusions can be drawn on the quality of Chile's education system. First of all, the evidence is slightly inconclusive: Chile compares well in a regional context, but is significantly behind high-income countries with regard to per student spending at the primary and secondary level. Second of all, these indicators are only vague proxies for the quality of education and do not measure whether the resources invested pay off in terms of

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<sup>34</sup> PREAL, 2002

<sup>35</sup> Chilean teachers salaries are also the highest in Latin America in US\$ expressed in terms of purchasing power parity. Thus Chilean teachers at the start level make US\$12,711 annually, which is approximately US\$2,000 more than Mexican teachers and almost three times as much as Brazilian teachers (OECD according to PREAL, 2001).

<sup>36</sup> Hence, teacher salaries grew by 125% in real terms over the 1990s (Delannoy, 2000, p.16).

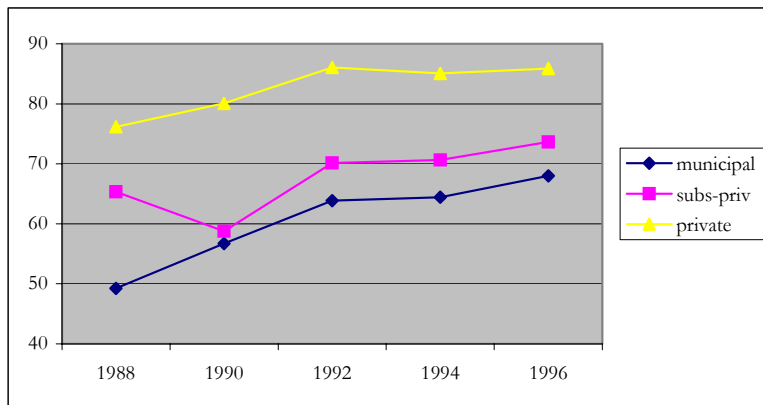
<sup>37</sup> The data applies to teachers in urban areas. The second highest level of schooling is in Ecuador with 14.7 years and Bolivia with 14.5. Data provided by CEAPL according to World Bank, 1999b.

skills attainment. For that matter, the following section will review a number of quality assessments designed to capture student achievements at the primary and secondary level.

*Primary and secondary education.* Seen in a Latin American context, Chile has been in the avant-garde of Latin American countries in terms of developing and participating in quality assessments. The need for developing quality assessments was in part created by the liberalization of the education system and the ensuing decentralization, which created a demand for quality monitoring of public and private schools alike. In consequence, Chile today has access to a fairly wide selection of data on student performance. On a national level, SIMCE, *Sistema de Medición de la Calidad de la Educación* (System for the Measurement of Educational Quality) has been used consistently since its introduction in 1988. It was developed in collaboration with the Catholic University, and has gained wide support in society. It is applied to 4<sup>th</sup> and 8<sup>th</sup> graders with focus on Spanish and Mathematics abilities, and have proven instrumental in revising university admission tests and monitoring curriculum relevance., students' self-image and perceptions.

The consistent use of SIMCE has allowed policymakers to follow student performance over time and consequently evaluate the impact of different public policies.<sup>38</sup> Moreover, SIMCE results have been released to the public since 1995, which promotes accountability in the education system.

**Graph 9 SIMCE Results by school type, 4<sup>th</sup> grade, 1988-1996**



Source: SIMCE

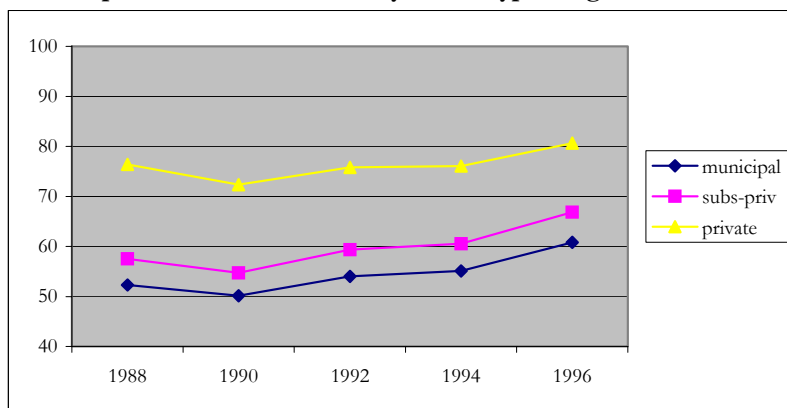
Note: "Subs-priv" are private schools who receive public funding.

Following a downward trend in the 1980s, the Spanish and Mathematics abilities of fourth graders in municipal schools have made significant progress over the last years according to the

<sup>38</sup> In 1996, it was modified to include the "equating" technique to make the annual results comparable.

SIMCE assessment.<sup>39</sup> The national test average was around 50 in 1988, but by 1996 the pupils had achieved a score of 72. Moreover, the progress applies across the board seeing that the gap in test average between urban and rural has decreased from 30 percentage point in 1992 to roughly 10 percentage points by 1996.<sup>40</sup> Graph 9 and Graph 10 reveal notable differences in achievements across school types at the 4<sup>th</sup> and 8<sup>th</sup> grade level. Still, as pointed out by Vegas (2002) these differences largely disappear once socio-economic differences among students are taken into account.<sup>41</sup> On the other hand, Vega finds that decentralized schools with a significant degree of teacher autonomy tend to perform significantly above average.

**Graph 10 SIMCE Results by school type, 8<sup>th</sup> grade, 1988-1996**



Source: SIMCE

Note: "Subs-priv" are private schools who receive public funding.

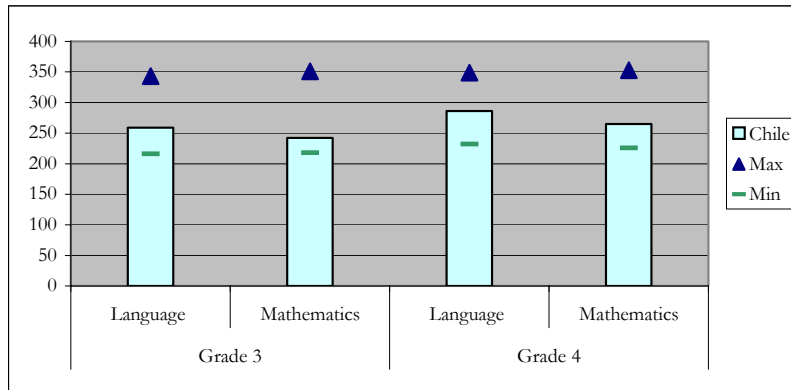
Notwithstanding improvements in the quality of education, Chile is still far behind the level of many middle and high-income countries beyond Latin America. Chile has, unlike most Latin American countries, taken part in various regional and international assessments of student performance, notably the UNESCO/OREALC-assessment, the *Latinobarometro*-survey and the international TIMSS-test.

<sup>39</sup> According to Cox & Lemaitre, 1999, p.159.

<sup>40</sup> Data according to SIMCE following Delannoy, 2000.

<sup>41</sup> For example, Mathematics and Spanish achievements among upper class children are significantly higher than the achievements of middle class children, who in turn lead lower class children by a wide margin. See test scores by income group in World Bank, 1999b; Annex B.

**Graph 11 Student outcomes in Latin America and the Caribbean, 1998**



Source: UNESCO/OREALC, 1998

Note: The sample consists of Latin American and Caribbean countries.

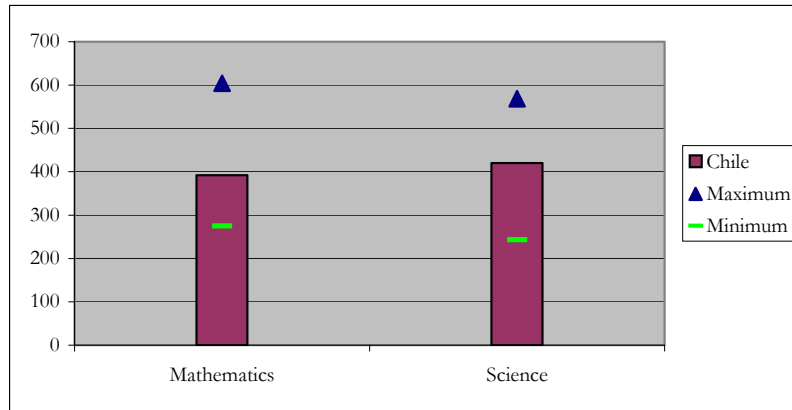
The UNESCO/OREALC assessment, conducted in 1997, targeted all the countries in the Latin American region in mathematics and language skills at the third and fourth grade level. Chile emerged among the top four countries, notably behind Cuba though, which have outperformed all the LAC countries by a wide margin by following a development, which puts basic education at the very center (Graph 11).

The *Latinobarometro* survey, by contrast, is a public opinion survey conducted throughout the LAC region. The survey, *inter alia*, asked respondents to assess the quality of their education systems at primary-secondary and tertiary levels on a scale from 1-4, with one indicating “very good”. Based on this very subjective assessment, Chile was rated 2.2 lagging most of the Central American countries with regard to primary and secondary education. Apparently, the Chileans thought more highly of their tertiary education system, which was rated at 1.66 only trailing Costa Rica. However, such survey data may not be appropriate for inter-country comparison, seeing that the perception of a high-quality system may differ significantly from country to country.

Unlike the UNESCO/OREALC assessment and the *Latinobarometro* survey, the TIMSS-test puts the performance of Chilean students into a truly global perspective. Hence, Chile participated as the only representative from the LAC region in the 1999 TIMSS-test together with 37 other countries mainly from North America, Europe and the Far East. The test was designed to benchmark the mathematics and science ability of students at the eighth grade level. The top performers in the sample were mainly Asian countries like Taiwan, Singapore and Korea Chile on the on the other

hand was rated below the mean score and notably behind several Central and East European countries like Hungary, the Czech and Slovak Republic and the Russian Federation (Graph 12).

**Graph 12 Mathematics and Science Achievement, 1999**



*Source:* Third International Mathematics and Science Study according to World Economic Forum, 2002  
*Note:* The Sample consists of a sample of North American, European and Asian countries encompassing high-income as well as middle-income countries. Scale goes from 0-800, with 800 indicating the highest possible achievement in science and mathematics, respectively.

In conclusion, the quality of Chilean education seems to be among the highest in Latin America. Further, the results of recent SEMCE assessments reveal that the quality has been improving over the 1990s. This is arguably a reflection of a strong Government commitment and increasing spending to make up for the 1980s, where quality was out of focus. By contrast, the reforms of the 1980s neglected support for learning inputs, which in turn led to decreasing student achievements.

Still, the quality of Chilean education is significantly behind East Asian countries and several emerging markets in East- and Central Europe. As pointed out in the beginning, the level of finance at the primary and secondary level is significantly behind the levels of high-income countries. This however does not provide a convincing explanation: Average education spending in the Far East is on target with Chile, but the Asian countries nevertheless outperform Chile in the test.

Chile also compared fairly well with regard to teacher quality. Still, the effects of high teachers' salaries may not yet have translated into superior performance at the student level. Moreover, as noted by Arellano (2002), lack of confidence seems to be a common problem among teachers in Chile notwithstanding their relatively high level of education compared to their fellow Latin Americans. Hence, a significant share of science (40%) and mathematics teachers (24%) in Chile has

expressed concern that they are not able to perform their tasks in a fulfilling way.<sup>42</sup> In conclusion, Chilean teachers seem to value their own skills lower than what is granted by the objective criteria.

Maybe the most decisive factor has been the prevalence of outdated curriculum and low priority of science education at the basic level. As pointed out by Arellano, the Chilean science curriculum has been relatively limited in Chile compared to many other countries, notably the Far Eastern countries which have put extensive focus on the exact sciences. Likewise, Mullin et al. (2000) point out that science teaching in Chile has suffered from serious deficiencies. By implication, the focus of the TIMSS-test enhanced the weaknesses of the Chilean curriculum. Had the focus of the assessment been targeted towards more humanistic fields, the Chilean rating could have fallen out in a more positive light.

*Policy measures.* Educational quality has been at the center of Chilean education policy during the 1990s and as shown by the SIMCE-assessment, the quality is clearly on the rise. Hence, as stressed by Arellano (2002), Chilean authorities acted swiftly upon the results of the TIMSS-test and put into effect a new science curriculum designed to give science a higher profile in the curriculum in primary and secondary schools. This curriculum will be in effects from this year, so no indications are yet available on the success of this initiative.

Other notable policy initiatives include the 900 Schools program, which on the basis of SEMCE assessments has identified the weakest schools across the country. These schools in turn have received inputs in terms of education materials, infrastructure support and in-service training. So far there are indications of improving performance at the schools included in the program, which in turn confirms that increasing inputs of education material can bring about significant results.<sup>43</sup> Likewise, the Government's rural educational program, MECE-Rural, have had success in raising quality at the most remote parts of the country, which is reflected in the growing convergence between urban and rural SMECE-scores.<sup>44</sup>

Other examples include the Bank supported projects MECE Básica (World Bank, 1991) and MECE Media (World Bank, 1995) programs, which have explicitly targeted the need for quality improvements at the primary and secondary level. These projects have done so by providing, *inter alia*, funds for hiring new teachers, teacher training, textbook materials, inventory for classrooms and capacity building. Finally, to integrate and deepen the elements of reform already in place, the Full

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<sup>42</sup> Data according to Arellano, 2002.

<sup>43</sup> See PREAL, 2001, p.15.

<sup>44</sup> The MECE\_Rural program created special curricula adopted to the needs of rural areas and provided for textbook materials and other learning inputs. See Delannoy, 2000, p.18.

School Day Reform, launched in 1996, extended the school day to give students more time for learning and extra-curricular activities and to give teachers more time for planning, teamwork and training.

Finally, as pointed out in Vegas' (2002) analysis, policymakers should further promote decentralization and teacher autonomy. In her analysis she points out that these institutional features increase flexibility and teacher engagement, which in turn promotes the quality and relevance of the education system

*Quality in higher education.* Compared to primary and secondary quality assessments, very few indicators exist to track the level of quality at the tertiary level. Still, the educational level of faculty staff can give a rough indication of the quality level. 1997 data on faculty staff in public universities reveal that Brazil is the leader in Latin America with more than 20% of faculty having doctoral degrees. Costa Rica comes second at 17% and Chile and Argentina both range about 12%. Compared to most high-income OECD countries these numbers are very low, and indicate in turn that quality of faculty staff in Chilean universities is low.<sup>45</sup> This situation, in turn, is partly created by low a low turnover of PhDs in Chile (see Graph 15 in the section on hard skills).

A 1998 World Bank assessment further concludes that quality is very heterogeneous in the tertiary education sector. The *public* higher education sector is generally considered to be high quality, whereas quality levels tend to be lower in *private* sector institutions, notably IP's and CTF's.<sup>46</sup> This picture of heterogeneity is arguably a result of a flawed quality framework. For example, the absence of systematic quality assessments naturally prevents policymakers from identifying the strengths and weaknesses of the tertiary system. Still, some progress have been made in recent years with the decision to make the Higher Council for Education be responsible for developing a coherent and all-encompassing quality system. These efforts are supported by the Bank supported Higher Education project which, *inter alia*, promotes the adoption of a flexible accreditation system, which should allow authorities (and students!) to monitor and benchmark higher education institutions more closely. So far the results are encouraging. According to a recent Bank mission (2002f), the changes have stimulated a sense of competitiveness between the different higher education institutions, which in turn gives them an incentive to improve the quality and relevance of their programs.

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<sup>45</sup> Data according to García Guadilla in World Bank, 1999b, p.36.

<sup>46</sup> See also Teixeira & Amaral (2001, p.14) who reports that a quality assessment carried out by a weekly magazine in Chile placed the private universities in the lowest end of the sample..

The variation in quality at the tertiary level has also been created by discriminatory government subsidies, which, as noted, have benefited public and private universities affiliated with the Rectors' College at the expense of Professional Institutes and Technical Training Centers. The Bank supported Higher Education project is likewise addressing this problem by promoting equality of opportunities between tertiary education institutions notwithstanding their historical origin and affiliation with the Rectors College.

*Quality through diversification.* Diversification is a keyword for improving the quality of educational output in the higher education sector. The strategy is to allow institutions to capitalize on their comparative advantages with a view to provide specialized high-quality institutions rather than "department-stores" with a full stock of educational programs. At the same time diversification strategies try to create a market, where public and private education suppliers compete, which in turn should induce them to cater to the needs of the students. As such the introduction of the 1981 reform of the higher education sector can be seen as a step ahead by allowing for a differentiation of higher education institutions. Still, this diversification process has not been entirely successful. As already noted the reform created a massive growth in the number of private tertiary institutions, especially at the technical level. Still, a 1998 World Bank evaluation pointed out that the diversification had led to widespread duplication leaving universities and CFTs competing for the same students rather than develop complementary programs (World Bank, 1998).

Moreover, the enrollment figures indicate a lack of success among many of the new institutions. Whereas university enrollment has increased markedly, total enrollment in technical training centers has dropped from more than 77,000 in 1990 to approximately 50,000 in the late 1990s.<sup>47</sup> This is arguably due to reports of low-quality standards in these institutions. Moreover, the vertical integration between secondary and tertiary technical programs is very poor. The lack of quality assessment at the tertiary level means that tertiary technical institutions operate with outdated curricula, which neglect the needs of the economy. This in turn implies that there is no progression and integration between secondary and tertiary technical programs. In conclusion, there is no educational or economic incentive for secondary graduates to enroll in tertiary technical institutions.

The Bank supported higher education project (1998) addresses several of these shortcomings. First of all, as already pointed out, the program promotes a more level playing field by providing for

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<sup>47</sup> The decrease has been especially marked for technical training centers, where enrollment dropped 17% in the course of a three-year period (World Bank, 2002d; p.5).

public subsidies, which in turn is expected to promote quality at private institutions. Moreover, the project also addresses the overlaps between the different programs and institutions.

## **II - Skills for the Knowledge Economy**

Notwithstanding increases in educational attainment and quality, the question remains: Does the outcome of the current education system meet the needs of the economy? This part will address this question by looking at the demand and supply side. The paper will open by briefly looking at the demand side: That is, what are the skills demanded by the Chilean economy? Has the Chilean economy become a knowledge-knowledge based economy demanding flexibility, high skills, rapid learning and constant innovation from the labor force? Or, is the economy still trapped in a more resource-based economy where secondary or primary skills are in stronger demand?

The analysis of the supply-side, in turn, will look at five different, but related aspects in order to assess whether the Chilean stock of human capital allows the Chilean economy to develop into a truly knowledge based economy. First, the study looks at the prevalence of higher order skills whereas the next section takes stock at the prevalence of hard skills. The third section focuses on the supply of ICT-skills and the fourth section looks briefly at the extent of brain drain, which may undercut government initiatives to build up a highly skilled population. Fifth, and finally, the paper focuses on lifelong learning and training activities in Chile. This is an area of strategic importance for the future development of the Chilean economy, seeing that skills and educational achievements of the sizable, older age cohorts in Chile lag far behind the youngest cohorts.

### **The Needs of the Economy**

As noted above, the skill premium for tertiary graduates relative to secondary and primary graduates has been rising significantly over the last decades. This in turn indicates that knowledge and high skills are in strong demand. Still, this is only a preliminary observation and does not reveal what specific skills are demanded by the Chilean economy. For that purpose, this section will make a brief assessment of the structure of the Chilean economy. The section conveys three messages: i) The need for higher order skills has been strengthened with the liberalization of the Chilean economy; ii) the technology intensity of manufacturing production in Chilean is low, which in turn reduces the demand for hard skills in the workforce and iii) Due to a fairly high penetration of ICT-technologies, ICT-skills are in fairly high demand in Chile compared to most other Latin American countries.

*Higher order skills.* The opening of the Chilean market in the early 1980s has increased the economic interdependence of the Chilean economy. In sum, the country has become increasingly vulnerable to external shocks and structural changes in the global economy; challenges which can be effectively countered by developing a workforce capable of making sense of change and taking advantage thereof. Such skills are generally defined as *higher order skills*, which encompass the ability to perform independent analysis, adapt quickly to new situations and interact with other persons on a professional level and show tolerance and solidarity.<sup>48</sup>

*Hard skills.* Hard skills (physicians, engineers, mathematics, technicians etc.) are in strong demand in most developed knowledge economies. First, as pointed out by Brunner (2001) researchers in fields like engineering, technology, physics and other related fields are vital for creating and sustaining technological innovation. Moreover, workers with training in hard skills (technological skills for example) are needed to make the most of these innovations.

The Chilean economy has displayed impressive growth rates over the last decades with an average growth rate about 6.6% in the 1980s and 6.3% in the 1990s. In spite of these impressive growth rates, the Chilean economy has not changed in the way most advanced economies have: The agricultural sector has been growing, whereas the services sector has been in decline as share of GDP. Industry on the other hand has remained fairly stable, but the share of knowledge based industries remains fairly low at less than 18% of total manufacturing output and value-added in manufacturing is significantly below that of more developed countries.<sup>49</sup> Moreover, Chilean high-technology products only amount to 5% of total exports of total exports, a number which is significantly below the levels in other LAC countries such as Mexico (60%), Brazil (32%) and Argentina (19%).<sup>50</sup> In sum, the Chilean manufacturing sector seems to be relatively low-tech, which in turn is explained by the high intensity of small and micro companies, who typically lag behind with regard to integrating new technologies.<sup>51</sup> The exploitation of natural resources, on the other hand, has become increasingly technology-based, which in turn is expected to stimulate demand for hard skills in this particular area. Still, this does not change the overall impression that the Chilean economy lags behind with regard to the integration of advanced technologies, which in turn lowers demand for workers with advanced hard skills. For examples, workers with secondary technical training should be fully capacitated to work in most companies.

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<sup>48</sup> See Delannoy, 2000

<sup>49</sup> See Agapitova & Holm-Nielsen (2002)

<sup>50</sup> UNDP, 2001

<sup>51</sup> Alarcon et al. 2000 according to Agapitova & Holm-Nielsen, 2002, p.7ff.

*ICT-skills.* ICT-skills, a subdivision within hard skills, are another key feature of modern economies. ICT-skills appear to be in stronger demand in Chile than are hard skills generally. Hence, the penetration of ICT-technologies in Chile is one of the highest in Latin America, but Chile still lags far behind the levels of OECD countries. Still, as Agapitova & Holm-Nielsen (2002, p.6) point out, knowledge intensive services such as computing have experienced very rapid growth in Chile. Telecommunications is likewise a very dynamic sector, and has in the wake of privatization made impressive progress in terms of equipping the nation with fast and reliable means of communication. Currently, the sector thrives due to large investments in long-distance telephony and cellular and wireless communication.

In consequence, the demand for ICT-workers in Chile must be assumed to be fairly strong compared to most Latin American countries, but less so in comparison to OECD countries.

#### **Towards higher order skills**

Due to the fluidity of the concept, the prevalence of higher order skills is difficult to assess. Still, the International Adult Literacy Survey (IALS)<sup>52</sup> developed by the OECD and *Statistics Canada* can be used to approximate the skill profile of the Chilean education relative to a number of developed high-income economies. The 1998 survey targeted three different kinds of literacy: Prose literacy, document literacy and quantitative literacy. Prose literacy is the ability to understand and use information from various text materials. Document literacy targets the ability to locate and apply information from formats such as job applications, itineraries, tables and charts. Finally, quantitative literacy covers the ability to do arithmetic operations in order to balance checkbooks, determine the amount of interest on a loan etc.<sup>53</sup> Clearly, these definitions do not encompass the full meaning of higher order skills, but they do capture, however, the ability of individuals to locate relevant printed information and make effectively use thereof. Moreover, statistical analysis has documented that these literacy scores are positively correlated with the probability of being in white-collar, high-skill employment. This in turn indicates that the literacy variables are useful to determine whether the workforce is sufficiently skilled to take part in the knowledge economy.<sup>54</sup>

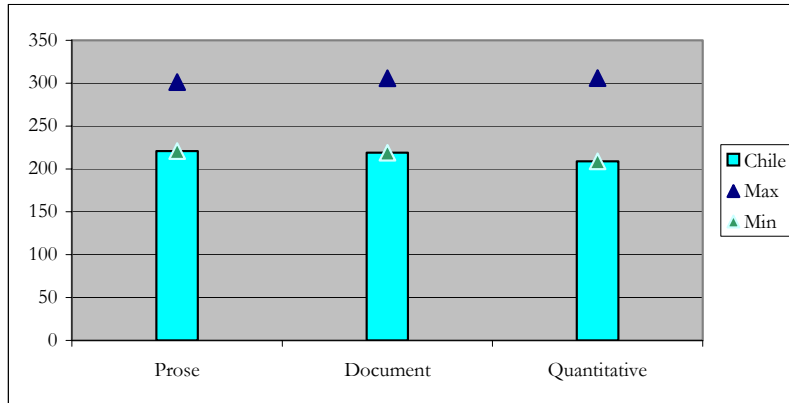
#### **Graph 13 Adult Literacy, 1994-1998**

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<sup>52</sup> IALS was developed by the OECD. It provides a score on a five-level scale of the individuals command of common texts, its understanding and usage of data (in varied forms as maps, tables, charts) and its ability to manipulate numbers in the occupational and private environments.

<sup>53</sup> These definitions are described in detail in the introductory part of OECD, 2000.

<sup>54</sup> See the chapter "Outcomes and Benefits of Literacy" in OECD, 2000, p.61ff.



Source: OECD, 2000

Note: The country sample includes 20. See note 55 for a full list of the countries.

Survey data is reported on a scale from 0-500, with 500 indicating maximum levels of literacy

Chile was the only Latin America country to take part in IALS assessment, which in addition to Chile consists of 18 OECD-countries and Slovenia.<sup>55</sup> As illustrated in Graph 13, Chile is located at the very bottom across all three types of literacy. These results imply that only 20% of the Chilean population have a reading comprehension sufficient to deal with the “the demands of everyday life and work in a complex advanced society”.<sup>56</sup> A further breakdown of the results show that the low literacy levels are especially prevalent among the older age cohorts, which in turn makes a case for intensifying training efforts targeting the older part of the workforce (see section on lifelong learning below).<sup>57</sup> In consequence, Chileans still have a long way to go in developing higher order skills, and the economy will, by implication, remain vulnerable to external shocks.

*Policy measures.* The Chilean Government has introduced a number of policy initiatives to stimulate higher order skills. Ricardo Lagos, while Minister for Education, was one of the pioneers arguing for an overall conceptual shift from traditional to higher order skills.<sup>58</sup> This, in turn, has led to the adoption of curriculum reforms moving focus from knowledge accumulation to critical reasoning and problem solving. In teaching language and communication, for example, the focus changed from grammar and literature to a focus on linguistic and communication skills; in history and social sciences, focus was changed to give the student an understanding of the present in a

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<sup>55</sup> The OECD countries included are: Australia, Belgium, Canada, Czech Republic, Denmark, Finland, Germany, Hungary, Ireland, the Netherlands, New Zealand, Norway, Poland, Portugal, Sweden, Switzerland, United Kingdom and USA.

<sup>56</sup> IALS following Arellano, 2002, p.68f.

<sup>57</sup> OECD, 2000, p.34.

<sup>58</sup> See Delannoy, 2000, p.14.

historical context (Delannoy, 2000). Likewise, Cox & Lemaitre (1999) conclude that Government programs supported by the Bank have contributed to changing the focus to a curriculum stressing the ability to investigate and organize information, suspend judgment in the absence of information, communicate and resolve problems, think analytically, interpret information and adapt to change.<sup>59</sup> As pointed out in the evaluation of the Governments' secondary education project, these efforts have paid off well. Hence, the Bank's completion report (2001, p.6) concludes that the project succeeded in bringing the curriculum of Chilean secondary schools in better agreement with the "future needs of the economy". Even though policymakers have less control on the curriculum at the tertiary level, a number of policies and institutions have also been established at the tertiary level to support universities to innovate their pedagogic program curricula.<sup>60</sup>

### **Hard skills**

Shortage of hard skills has been a recurrent issue in Chile. Whereas, the country features a sizable stock of lawyers, psychologists and journalists (soft skills), technical programs have been less popular. The following section will look closer at the supply of hard skills in Chile. It will make a distinction between the general endowment of hard skills in the work force and the need for hard skills at the research level.

*Hard skills in the labor force.* Industrial technological development is to a large extent dependent upon high-quality vocational schools at the secondary level. Fortunately, enrollment in technical-vocational secondary programs has increased significantly and consistently over the last two decades.<sup>61</sup> The growth in secondary enrollment also implies that the pool of students likely to enter tertiary technical programs has increased. Nevertheless, enrollment in technical training centers has been decreasing (see Graph 5 on page 10). As pointed out earlier, this is, *inter alia*, due to lack of integration between technical programs at the secondary and tertiary level. At the same time, the private returns to tertiary technical programs are expected to be low, seeing that the general structure of the Chilean economy does not hard, technical skills.

Moreover, the expansion of private universities has favored soft skill at the expense of hard skills programs. Whereas basic science programs represent 12% of careers offered in traditional universities it only takes up 0.5% in the private universities. Social sciences, by contrast, represent 27% of careers in the private sector and only 7% in the traditional university sector. This arguably

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<sup>59</sup> see World Bank, 1991 and 1998.

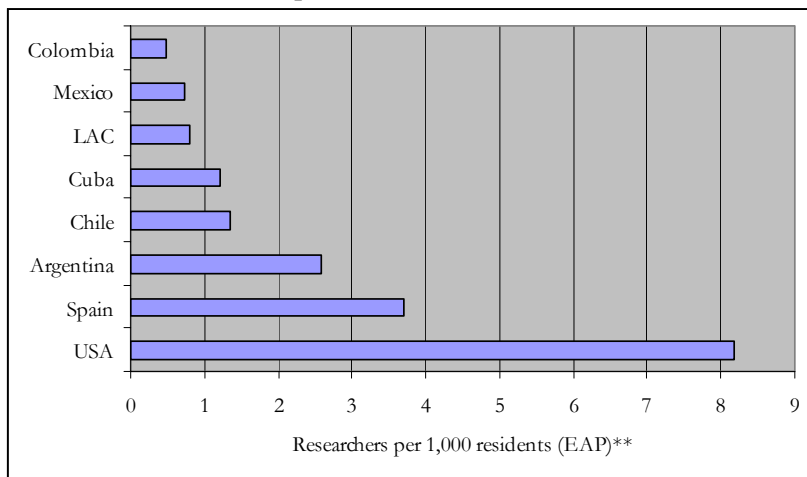
<sup>60</sup> In 1997 the Program for the initial formation of teachers (*Programa Formación Inicial de Docentes*) delivered support to 17 universities.

<sup>61</sup> See Araneda & Marin, 2002

reflects a lack of willingness among privately funded institutions to engage in expensive programs; a low-risk behavior identified in most countries according to Teixeira & Amaral (2001, p.21).<sup>62</sup>

In order to correct this mismatch, various initiatives have been launched to increase the flow of information between the university and enterprise sector. One initiative, proposed by the Universidad Adolfo Ibáñez and Universidad de Chile is designed to generate continuous and relevant information on the supply and demand trends in the labor market and is scheduled to begin in 2002. (World Bank, 2002e).<sup>63</sup> Still, these initiatives are not likely to lead to a sufficient increase in hard skills programs unless students and tertiary education institutions are given incentives to supply and demands such programs. In sum, it could be argued that the social returns to expanding hard skills programs are significantly above the private returns, which in turn warrants government intervention in this particular area.

Graph 14 Researchers, 1999\*



\* 1999 or latest year available

\*\* Economically active population

Source: RICYT, 2000

<sup>62</sup> This trend is further confirmed by the fact that private university enrollment in social sciences and law amounted to almost 33,000 students compared to less than 28,000 in publicly funded universities. This difference is significant seeing that total enrollment in private universities only account for 31% of total university enrollment. However, soft skills programs are popular in all sectors of the university system, and programs like journalism, law and business administration have proliferated significantly at the undergraduate level. See World Bank, 1998.

<sup>63</sup> Another example is the development of an information tool, within the framework of the MECE-Sup program, to be shared among universities. This system will provide general guidelines on how to upload, validate and manage information of higher education institutions (project of development of an information system) (World Bank, 2002e).

Policymakers could correct some of these mismatches by supporting hard skills programs with public subsidies. Another venue for action is curriculum reform in higher education institutions. One obvious case is the curricula of secondary and tertiary technical careers, which should be better aligned in order to give secondary graduates a stronger incentive to enroll in tertiary technical programs. This is currently addressed within the framework of the Bank's higher education project.

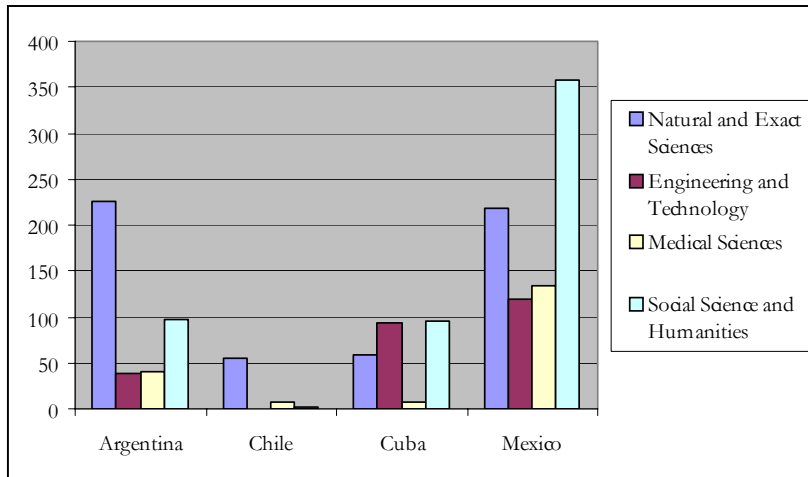
*Hard skills at the research level.* The extent of hard skills at the research level can be measured by the relative number of researchers and the annual turnover of PhD's in hard skills programs. According to Graph 14, Chile's endowment of researchers is well above the average Latin American endowment of researchers and only second to Argentina. However, a wide gap exists between Chile and more developed economies such as Spain and the US, where the ratio of researchers is three to six times higher than in Chile.

The hard skills profile of Chile is further weakened by a low turnover of PhD's in hard skills fields such as natural and exact sciences, medical sciences and engineering and technology (Graph 15). One possible explanation for the low turnover of researchers could be the fact that potential researchers perceive that they exclude themselves from careers in the private sector by enrolling in PhD programs. In other words, research programs are chiefly associated with careers in universities and research institutions.<sup>64</sup> In sum, Chile faces an important challenge in making PhD programs more attractive. This can be made by bringing research programs in better agreement with the needs of the economy, which would make PhD candidates more attractive to the enterprise sector and in turn boost the incentive to enroll in PhD programs.

#### **Graph 15 Doctoral Graduates by Field, 1999\***

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<sup>64</sup> See Mullin et al., 2000, p.86ff.



\* Or latest year available  
 Source : RICYT, 2000, p.85f.

### ICT-literacy

The relatively penetration of ICT-technologies have created a fairly strong demand for ICT-skills, which in turn can be divided into two groups: The skills needed to perform non-specific ICT-functions such as word processing, data entry, web navigation and spreadsheet entry . The second group of skills is ICT-specific skills, such as the ability to develop websites, programs and database systems. Unfortunately, very little valid data exist to assess the current levels of ICT-skills in Chile at either level, but based in the available evidence Chile seems to compare well in a Latin American context but lag behind the levels of OECD-countries.

*Non-specific skills.* As pointed out in a recent study by a Chilean presidential commission, the Chilean endowment of ICT-skills was far from sufficient by the late 1990s.<sup>65</sup> Still, it is difficult to get a more detailed picture of the level of ICT-literacy in the Chile seeing that very little data is available. The Chilean strategy paper *Chile: Hacia la Sociedad de Informacion* (Chile: Towards the Information Society) is a rich source of information on policies and strategies and the penetration of ICT-technologies, but less informative with regard to the ICT-skills of the Chilean population. Despite the lack of indicators, a number of proxies and surveys can be used to approximate the extent of ICT-skills in Chile.

#### Box 1: Promoting ICT in the basic education system: *Enlaces*

Chile has been a leader in using advanced ICTs to improve educational outcomes. The most notable example is *Enlaces* (formally: *Red Educacional Enlaces*) launched by the Government in 1993 as part of a larger reform to enhance the quality of primary and secondary education. The goal of *Enlaces* was to promote cooperation, higher-level thinking, data management, and communications skills through the use of computers. The project provided for hardware, software and teacher training. By the end of 1995, *Enlaces* had substantially surpassed its original

<http://www.enlaces.ufro.cl>),

*ICT-specific skills.* In a 2001 survey carried out by the World Economic Forum, Chilean employers were asked to assess the level Chilean ICT workers relative to other countries. Based on this inquiry,

The IALS study, for example, has identified the number and characteristics of workers in Chile who use computers in their profession.<sup>66</sup> Provided that workers who use computers frequently in their profession can be assumed to be ICT-literate these number can give some indication of the level of ICT-literacy in Chile. The study finds that approximately 20% of the workforce uses computers regularly in their work. This number is significantly lower than the number in the United States where almost 50% use computers on a regular basis in their profession. Moreover, the ability to use computers seems to be correlated with the general level of educational attainment. Hence, as pointed out by Bravo and Contreras, more than 50% of the workforce with tertiary education uses computers at work. By contrast, in the group of workers with completed primary education or less, only 5% use computers regularly. Bravo & Contreras also found that urban residents and workers in

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<sup>66</sup> See Bravo & Contreras, 2000.

large companies were more likely to use computers than the rural population and workers in micro- and small enterprises.<sup>67</sup>

*ICT-specific skills.* The only available data on the quality of Chilean ICT-workers has been provided by the World Economic Forum, which asked employers in a number of different countries to rate the quality of ICT-workers relative to other countries. Chilean employers rated the domestic supply of ICT-workers among the best in the Latin America. In fact Chile was, together with Costa Rica and Brazil, far above the mean value for Latin America and the East Asia and the Pacific. High-income OCED countries, on the other hand, were rated the best in the whole sample.<sup>68</sup>

*Policy measures.* The Government of Chile has committed itself to expand the number of computer-literates.<sup>69</sup> So far, one of the most significant policy initiatives is the *Enlaces* (Eng.: links) program, which has delivered computers and Internet connection to public schools. In consequence, almost 75% of primary schools and more than 90% of secondary schools have access to computers.<sup>70</sup> Even though these numbers indicate a high penetration of ICT-technologies in a Latin American context, the ratio of students to computers is at 57, which is significantly higher than most developed economies. Accordingly, the Chilean Government aims to reduce the ratio to 30 by 2005. Further, only a small selection of schools has broadband access, whereas the majority struggles with low-speed connections, which reduce the learning potentials of the Internet. Proliferation of broadband connections should therefore also be high on the Government's list of priorities. Realizing, that hard- and software needs to be coupled with skills to take advantage of it, the *Enlaces* program has also provided for training on how teachers can make the most of ICT-technologies in their education. So far close to 84,000 primary and secondary teachers have received basic ICT-training and an additional 20,000 have received special programs focusing on how ICT can be applied to the learning process. These efforts are supported by the Chile Education Portal, which is delivering various services supporting the use of ICT in primary and secondary schools.<sup>71</sup> A related project, *Reuna2*, has been launched to promote the use of ICT-technologies at the tertiary level. The project aims to integrate the use of ICT-technologies in the tertiary education and research process and set up a network connecting tertiary education institutions.<sup>72</sup>

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<sup>67</sup> All numbers according to Bravo & Contreras, 2000.

<sup>68</sup> See Arellano, 2002.

<sup>69</sup> Business Latin America, 2001, p.6.

<sup>70</sup> Numbers according to Ministry of Education following Araneda & Marin, 2002.

<sup>71</sup> This section build on Araneda & Marin, 2002. The portal can be found at [www.educarchile.cl](http://www.educarchile.cl).

<sup>72</sup> See Comisión Presidencial, 1999.

Whether these efforts will pay-off is difficult to assess. Survey data from the World Economic Forum (2002) suggests that the quality of IT education programs in Chile is among the best in Latin America, only second to Costa Rica. However, this rating is only slightly above the global average and Chile is far behind the quality of ICT-education programs in avant-garde countries like Finland, the Netherlands and the US. In conclusion, there is still room for improvement of Chilean ICT-education if the country wants to reach the level of the most developed economies.

### **Brain drain and brain gain**

Many developing countries' efforts to upgrade their stock of human capital have been countered by a net outflow of highly skilled people, who find it more attractive to live and work abroad. Moreover, many nationals who study abroad decide not to return to their native countries. This can add up to a serious erosion of highly skilled human capital. Brain drain is caused by various reasons, notably economic incentives and the desire of highly skilled people to work among peers. The brain drain debate has been especially prevalent with regard to people with hard skills, which are easier to transfer across borders. Soft skills on the other hand, lawyers for example, often have a considerable amount of country specific content, which makes them less useful in other geographical settings.

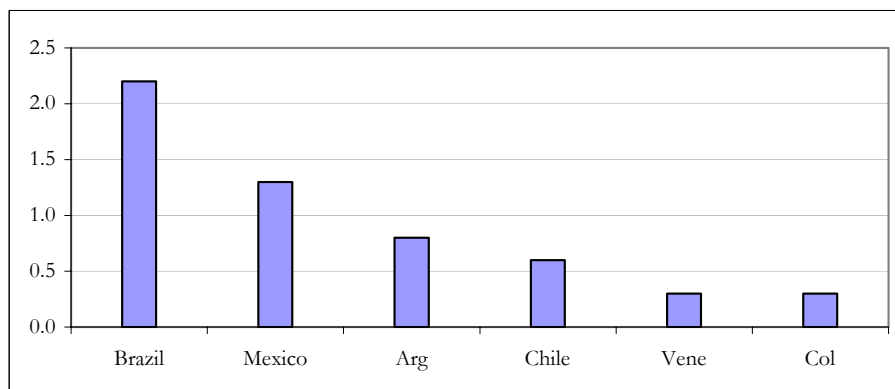
Under any circumstances, brain drain does not appear to constitute a serious problem to the stock of human capital in Chile. According to survey data from the World Economic Forum, Chilean scientists and engineers are far more likely to stay in Chile to pursue their careers, than are scientists in every other Latin American country included in the survey, including Brazil, Mexico, Argentina etc.<sup>73</sup> The survey also shows that Chilean highly skilled ICT workers are more likely to find good jobs in their native country, than are ICT-workers other in Latin American countries like Mexico, Argentina and Colombia.<sup>74</sup>

### **Graph 16 Foreign Participation in US scientific and technical articles, 1995-1997**

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<sup>73</sup> On a scale from 1-7, where one indicates that scientists and engineers normally leave the country and seven indicates that they almost remain in their native country, Chile was rated 5.2, Brazil 4.6, Mexico 3.9, Argentina 3.3 and Colombia 3.1. The average rating was 4.0 (World Economic Forum, 2002, p.370).

<sup>74</sup> On a scale from 1-7, where one indicates that highly skilled information technology workers must leave the country to find good job and seven indicates that they have their pick of well-paid, desirable jobs in their native country, Chile scored 5.3 only second to Brazil at 5.4. By contrast, Mexico, Argentina and Colombia scored 4.2, 4.1 and 3.3, respectively (World Economic Forum, p.380).



Source: National Science Foundation, 2000

Note:

Still, brain drain is not only associated with negative externalities. A high mobility of skilled labor across borders contributes strongly to technology transfer, for example. Graph 16 shows that the Chilean participation in US scientific and technical articles is relatively low compared to some of the leading Latin American economies like Brazil and Mexico. In consequence, the Chilean research community appears to be relatively isolated, which in turn may set back the innovation and technological development of the country. Moreover, a recent bank mission found the level of international collaboration to be very low in tertiary technical program compared to other tertiary careers.<sup>75</sup> This, in turn, is worrisome seeing that the need for innovation is especially high in this particular area.

#### **Expanding education: Training and lifelong learning.**

As noted in the introduction, structural changes and increasing rates of technological change have stimulated demand for highly skilled workers. However, as documented by the IALS survey, the skills of the Chilean workforce lags significantly behind those of more developed economies, especially so among the older cohorts of the workforce. Moreover, 4.5 Mio adult Chileans have not completed their primary education, which amounts to approximately 40% of the adult population. Another 2 Mio adults with completed primary education have yet to complete secondary education. In sum, close to 70% of the adult population is without completed secondary education. Further, 500,000 adults are illiterates, which corresponds to 4.3% of the adult population.<sup>76</sup> In consequence,

<sup>75</sup> See Bravo et al, 2002, p.51.

<sup>76</sup> All numbers according to World Bank, 2002d, p.4.

Chile faces a major challenge in elevating the skills of its work force in order to improve its competitiveness and take actively part in the knowledge economy.

Lifelong learning and training are essential concepts in this connection. Hence, the Chilean education system must expand the notion of education to be an all-encompassing system, where education is offered to all age groups in the form of on-the-job training, distance learning, evening classes etc. Moreover, a special effort must be made to ensure that the skills taught fit with the needs of the economy.

Compared to most Latin American countries, Chilean companies seem to be fairly proactive with regard to investments in staff training. Hence, Chilean, Brazilian and Costa Rican companies are among the leaders in the region in terms of investments in training, whereas countries like Mexico and Colombia lag behind. Still, investments in Chilean companies are only on average in a global comparison, far behind several Western European countries and the United States.<sup>77</sup> Further evidence points out that less than 10% of the Chilean workforce has received training.<sup>78</sup> In conclusion, there seems to be a strong need for further staff training in Chile notwithstanding the fact that the country compares well in Latin America. Moreover, the IALS survey found that current training programs primarily benefit the skilled population at the expense of the least skilled. Hence, Chilean professionals are far more likely to take part in training programs than are blue-collar workers.<sup>79</sup>

*Policy measures.* So far no coherent policy framework has been developed to manage the supply of lifelong learning in Chile, but a number of policy schemes have been launched though. These include a tax rebate scheme, which allows companies to deduct training expenses from their taxable income and a number of funds and programs targeting the need for training in the most vulnerable groups such as small enterprises and the unemployed. Still, as pointed out in a recent World Bank assessment of Chile (2002d), lifelong learning policies must deal with numerous challenges, of which three are especially salient.

First, many companies, notably SME's cannot afford to supply training to their employees. Clearly, the Government's tax rebate scheme has had some success and has, for example, led to an increase in the number of workers participating in training programs from approximately 450,000 in

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<sup>77</sup> On a scale from 1-7, where one indicates little investment in training and development and seven indicates heavy investment "to attract, train and retain staff", Chile scores 4.3 against an average of 4.2. Other countries include Brazil and Costa Rica with 4.3, Mexico at 3.8 and Colombia at 3.5. The leaders include the Netherlands and Denmark at 6.1.

<sup>78</sup> World Bank, 2002, p.6

<sup>79</sup> See OECD, 2000, p.41ff.

1996 to more than 620,000 by 2000, which in turn accounts for 11.5% of the workforce.<sup>80</sup> Still, the bulk of companies participating in the scheme are large companies with sufficient funds who already make use of training in their strategies. The difficult part is engaging small firms and companies, which have little funds of their own to conduct training. In order to make up for this shortcoming, the Government set up a fund in 1997, FONCAP (*Fondo Nacional de Capacitación*), to address the needs of the most vulnerable groups and provide training to small and micro-enterprises.<sup>81</sup> Still, the need for providing access to training opportunities is far greater than the current supply, and further action is consequently warranted.

Second, the current supply of training in Chile is not attentive to the needs of the firms and employees. Even though little evaluation has been done so far of Chilean training programs, Araneda & Marin (2002) point out that there is an emerging consensus that the quality and relevance of training programs is insufficient. This in turn can be explained by the lack of information between suppliers and demanders of training, which serves to uphold current imbalances rather than correct them. Moreover, lack of indicators and systematic evaluations mean that suppliers of training face weak incentives to increase the quality of their programs.

Third, SME's do not generally appreciate the externalities associated with training programs and there has generally been very little interest in training programs in political and academic environments. This in turn begs for campaigns designed to raise the awareness of the benefits associated with training programs.

The lack of a coherent government strategy has in turn justified the recent launch of a US\$75.5 Mio. Bank project on lifelong learning and training in Chile. The objective of the project is to assist the Government of Chile in the establishment of an "articulated lifelong learning and training system with the participation of the private sector". More specifically, the project tries to address some of the challenges listed above by providing, *inter alia*, an increase in the supply of training opportunities, accreditation systems, which take skills acquired at the labor market into consideration, and an overall quality lift to technical training programs.

In a final note it should be pointed out that Chilean training programs have begun to take advantage of ICT-technologies with a view to set up distance learning training programs. This is an

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<sup>80</sup> All numbers according to SENCE following Araneda & Marin, 2002, table 2.11.

<sup>81</sup> The IDB-supported *Chile Joven* program was likewise set up to address the needs of youths likely to be in unemployment. This program was considered successful which in turn had negative externalities for the secondary education system, where youths started dropping out in order to qualify for the program.

approach with significant potential, especially in remote regions, which do not otherwise have access to training programs.<sup>82</sup>

### **Conclusions**

How should one assess the skills profile of Chile? In the IALS-assessment, which included a large number of successful economies, Chile was consistently ranged in the very bottom. Regional quality assessments, on the other hand, have shown that Chile is one of the leaders in Latin America. Hence, the evaluation of Chile's performance and achievements depends very much on the context chosen and it may not be fair to judge Chile on how it compares to some of the most successful systems in the world. On the other hand, if Chile wants to develop into a truly knowledge based economy, it cannot do so just by staying ahead in a regional context. Instead it's policies and achievements should be compared to high-income economies. In conclusion, Chile needs to make significant progress in order to close the gap to the most developed countries, but recent developments call for optimism.

*Governance.* The decentralization strategies have been successful in increasing the performance of the system. Vegas' analysis for example has shown that decentralization coupled with teacher autonomy can be a constructive approach to improve quality further in the basic education system.

*Expenditure.* Public expenditure for education has been on the rise throughout the 1990s, which in turn is a necessary condition for improving the performance of the system. Moreover, competitive criteria have been introduced to make the allocation of public funds more performance based, which in turn is expected to improve the overall performance of the system. Recent changes in the relative distribution between primary, secondary and tertiary costs likewise indicates that the Chilean education system is developing into a coherent system, where sufficient attention is given to the basic education system without neglecting the strategic importance of the tertiary sector.

*Participation.* Enrollment trends are also promising. Primary and secondary enrollment rates are among the highest in the region and repetition and desertion rates are low. Moreover, notable increase has been made with regard to tertiary enrollment and Chile is slowly edging in upon tertiary enrollment levels in OECD-countries. The positive trends in enrollment have led to an increase in educational attainment and increasing convergence between rural and urban achievements.

*Quality.* The quality of educational output is also on the rise according to the SEMCE-assessments and regional divides are diminishing. The improvement is not only due to the success of decentralization strategies; it has also been facilitated by the existence of a coherent and consistently

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<sup>82</sup> See Comisión Presidencial, 1999, p.45.

applied quality assessment system, which allows policymakers to monitor and assess the basic education system with great precision. In combination with the increasing focus on competitiveness (the SNED-system is a case in point), this system gives the suppliers of education a strong incentive to perform. Finally, quality improvements have also been facilitated by the increase in education expenditures, which has led to an increase in teacher salaries, extensive teacher training and increasing provisions of books, teaching materials and class room inventory.

*Relevance.* Policy-initiatives have also been launched to increase the relevance of education. Most notably, the curriculum of the basic education has been changed in order to put more emphasis on so-called higher-order skills. Moreover, The *Enlaces* and *Reuna2* programs represent notable improvements and will serve to increase the ICT-skills of coming generations, which in turn will benefit the growing ICT-sector substantially.

In conclusion the basics of the Chilean education system seem to be well established and notable progress has been made to upgrade the Chilean skills profile. Still, numerous obstacles and challenges remain, which in turn warrants further government intervention and further collaboration and coordination between the stakeholders in the system:

Despite notable progress in terms of educational achievement and educational quality, the Chilean education system has not been successful in supplying “skills for the knowledge economy”. Thus, the analysis has pointed out that Chileans lag behind with regard to higher order skills and hard skills. The supply of ICT-skills arguably also needs to be stimulated further. It is suggested to proceed along the lines of the existing *Enlaces project* and integrate ICT-technologies into all aspects of education policies such as curriculum reform and teacher training. Moreover, it is recommended to develop a framework for monitoring ICT-skills in the population. This, in turn, would be highly useful for policymakers trying to estimate the level of ICT-skills in Chile and assess whether interventions like *Enlaces* are effective in improving the level of ICT-literacy.

*Expand the supply of tertiary graduates with hard skills.* As pointed out by Brunner (2001, p.31), the low supply of hard skills at the tertiary level and beyond constitutes a major bottleneck to the development of the Chilean economy. Still, the low supply is to some extent understandable: As pointed out earlier, Chile is still far from developing into a truly knowledge based economy and a significant share of the economic production still rests upon low technology. This in turn begs the question: Should the current supply of hard skills at the tertiary level, for example, be expanded with government support even though there is no demand in the private sector? Or should policymakers

let the economy develop and hope that a demand for advanced hard skills will arise in due time? The current order is to some extent a vicious circle in the sense that the low supply of hard skills keeps the economy from developing from a resource-based to a knowledge-based economy. As noted by Brunner (2001, p.29) the OECD countries have made this transition by increasing the supply and quality of hard skills. In consequence, the Chilean Government must learn from these experiences and support the development of high-level hard-skills. On the other hand it is important to keep in mind that the Government runs the risk of educating a large number of technical workers, who can find no employment in the private sector. Clearly, there is no final answer to this question, but unless the Government intervenes, there is not much hope that the current circle will be broken.

*Establish inclusive and systematic quality assessment at the tertiary level.* The absence of a coherent, systematic quality framework for tertiary education is one the reasons why a significant part of the tertiary technical education system has been allowed to drift a part, which in turn has created a fall in enrollment. Accordingly, there is a need for a systematic approach to quality assessments in the tertiary education system. This in turn would also make the tertiary education sector more transparent to students who currently find it difficult to access valid and comparable information about tertiary education. The Government's Higher Education Project, launched in 1999 with support from the Bank, has made significant progress in this particular area.

*Strengthen lifelong learning and training activities.* The current training system enjoys little overall success and job training is not seen as a strategic tool by employees nor employers. A systematic quality assessment framework is needed. As pointed out above, no data is available on the quality of training courses, which in turn could have detrimental implications for the trainers' incentive to deliver high-quality programs. Thus, a coherent quality framework could be expected to improve competitiveness between trainers and provide for an overall quality lift. Clearly, the supply of training programs also needs to be extended and small enterprises must be financially supported to join such programs. Current efforts by the Government and the Bank are trying to address exactly these shortcomings.

In short Chile's stock of human capital needs to be further developed and improved on various accounts, but the successes of the past call for optimism with regard to what can be achieved in the future.

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Annex

**Total public Expenditure (Mio Pesos 2000) and by level of education**

Year	Public education expenditure (\$2000) MINEDUC	Basic/ special/ adults Public expenditure	Basic/ special/ adults (%)	Secondary Public expenditure	Secondary (%)	Higher Public expenditure	Higher (%)	Other
1980	695,450	417,857	60.08%	103,109	14.83%	171,429	24.65%	3,055
1981	804,593	483,435	60.08%	119,291	14.83%	198,333	24.65%	3,534
1982	846,443	495,889	58.59%	129,554	15.31%	217,415	25.69%	3,585
1983	714,238	384,469	53.83%	103,214	14.45%	223,616	31.31%	2,940
1984	700,994	376,912	53.77%	106,514	15.19%	214,805	30.64%	2,763
1985	679,949	376,194	55.33%	109,355	16.08%	191,631	28.18%	2,769
1986	642,857	379,031	58.96%	119,477	18.59%	141,182	21.96%	3,167
1987	614,305	370,571	60.32%	104,191	16.96%	136,508	22.22%	3,036
1988	660,615	393,560	59.57%	117,630	17.81%	145,131	21.97%	4,294
1989	612,752	366,031	59.74%	110,665	18.06%	132,320	21.59%	3,736
1990	589,583	370,403	62.82%	105,383	17.87%	109,994	18.66%	3,803
1991	638,479	388,501	60.85%	103,479	16.21%	141,615	22.18%	4,884
1992	731,508	443,017	60.56%	125,119	17.10%	157,224	21.49%	6,148
1993	824,199	510,773	61.97%	133,669	16.22%	170,562	20.69%	9,195
1994	896,295	556,846	62.13%	149,334	16.66%	179,743	20.05%	10,372
1995	999,246	624,512	62.50%	180,244	18.04%	182,990	18.31%	11,500
1996	1,125,790	703,721	62.51%	216,949	19.27%	192,492	17.10%	12,627
1997	1,244,481	779,912	62.67%	245,987	19.77%	204,860	16.46%	13,722
1998	1,363,207	850,094	62.36%	277,851	20.38%	219,699	16.12%	15,563
1999	1,475,950	934,343	63.30%	289,302	19.60%	235,243	15.94%	17,063
2000	1,573,291	995,964	63.30%	308,382	19.60%	250,757	15.94%	18,188

Source: CENDA, 2001

**Tertiary Enrollment by Region and Institution**

Region	Population*	Population (%)*	Traditional universities enrollment <sup>1</sup>	Private University enrollment	Professional Institutes (IP) enrollment	Technical training centers (CFT) enrollment	Total Enrollment
I. Tarapacá	405,183	2.63%	7,508	0	1,563	1,101	10,172
II. Antofagasta	474,487	3.08%	14,308	724	2,698	2,323	20,053
III. Atacama	278,058	1.80%	3,340	0	0	115	3,455
IV. Coquimbo	586,062	3.80%	8,060	985	2,881	2,307	14,233
V. Valparaíso	1,578,861	10.25%	30,633	9,793	5,575	5,203	51,204
VI. Libertador General Bernardo O'higgins	798,911	5.18%	260	673	1,045	2,365	4,343
VII. Maule	922,843	5.99%	8,441	0	1,389	2,588	12,418
VIII. Bio Bío	1,956,401	12.70%	28,043	4,791	8,873	6,296	48,003
IX. La Araucanía	883,251	5.73%	11,170	4,357	2,061	1,693	19,281
X. Los Lagos	1,072,619	6.96%	13,138	0	1,987	2,527	17,652
XI. Aysén	96,405	0.62%	0	0	0	0	0
XII. Magallanes y la Antártica Chilena	158,907	1.03%	2,790	0	216	400	3,406
RM. Metropolitan region	6,189,964	40.18%	72,282	66,374	36,305	27,372	202,333

\* Estimates of INE (Instituto Nacional de Estadísticas de Chile) for 2001

1. Otherwise known as Universities of the Council

Source: Ministerio de Educación, División de Educación Superior, "Sistema de Educación Superior, Compendio Estadístico 1997-1999"