

Higher Education in Regional and City Development

Bío Bío Region, Chile



THE WORLD BANK

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Bío Bío Region, Chile 2010



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Foreword

Universities and other higher education institutions can play a key role in human capital development and innovation systems in their cities and regions. Reviews of Higher Education in Regional and City Development are the OECD's vehicle to mobilise higher education for economic, social and cultural development of cities and regions. The reviews analyse how the higher education system impacts local and regional development and help how this impact can be improved. In addition to human capital and skills development, technology transfer and business innovation, the reviews also considers higher education's contribution to social, cultural and environmental development and regional capacity building. The review process facilitates partnership building in regions by drawing together higher education institutions and public and private agencies to identify strategic goals and work together towards them. To know more about the OECD review process and requirements, visit Higher Education and Regions' website at www.oecd.org/edu/imhe/regionaldevelopment.

These reviews are part of a wider multi-annum work of higher education in cities and regions coordinated by the OECD Programme on Institutional Management of Higher Education (IMHE). In 2004-07, the OECD/IMHE conducted an extensive study with fourteen regional reviews across 12 countries. This resulted in the OECD flagship publication *Higher Education and Regions: Globally Competitive, Locally Engaged* (OECD, 2007) with recommendations to benefit both higher education institutions and national and regional governments.

In 2008, the OECD/IMHE launched a second series of OECD Reviews of Higher Education in Regional and City Development to address the demand by national and regional governments for more responsive and proactive higher education institutions. As a result, 14 regions in 11 countries have undergone the OECD review process in 2008-10. The reviews are conducted in collaboration with international organisations and associations and other OECD programmes and directorates. This work also supports the OECD Innovation Strategy and OECD Green Growth Strategy.

This OECD/World Bank review of the Bío Bío Region in Chile has pioneering in three ways: it has been the first of its kind to be conducted in Chile; the first to be conducted in collaboration with the World Bank; and was the inaugural region reviewed of the second round of OECD Reviews of Higher Education in Regional and City Development.

This OECD/World Bank review calls for closer collaboration between higher education institutions and regional and local government to help secure sustainable development. As the people of the Bío Bío Region rebuild their society and their economy after the devastating earthquake of February 2010, it is more than ever essential that these institutions and organisms work together to bring recovery and progress.

Acknowledgements

Numerous national and regional stakeholders and representatives of higher education institutions provided valuable insights during the review visit and in the form of comments. This OECD report is based on data published up to and including 2009. The OECD and the World Bank would like to thank in particular the lead coordinators and other active local counterparts for this review: Martin Zilic, Andrés Viveros, Sergio Lavanchy, Héctor Gaete, Juan Cancino, Javier Vera, Aldo Ballerini, Claudio Lapostol, Marcos Delucchi, Felix Alderstein, Daniela Moraga, Pelayo Covarrubias and the rest of the regional steering committee (see Annex 2). Additional thanks goes to Eliana Chamizo, Ricardo Reich, Mónica Poblete and Juan Sandoval.

This publication draws on interviews carried out during a week-long review visit held on 16-22 August 2009 findings of the Bío Bío Region's Self-evaluation Report and using additional information provided to the review team. The OECD/World Bank Review Team had a full and intensive programme and were received openly by a wide range of stakeholders. The team had the benefit of an extensive and reflective Self Evaluation Report prepared by a research team lead by Jorge Dresdner (see Annex 3) which went beyond description to postulating a number of hypotheses about strengths and weaknesses which the team were able to test. The team were also able to rely on a range of other reports, including the OECD/World Bank Review of Tertiary Education in Chile (2009) and the OECD Territorial Review (2009) – and tested their conclusions and recommendations within the higher education sector in the Bío Bío Region.

This publication was co-ordinated by Jaana Puukka (OECD/IMHE), with support from Ernesto Flores, a Mexican national seconded from Sonora Institute of Technology (ITSON) to the OECD/IMHE. Peer reviewers from the World Bank, Chile, France and United States participated in the review process: Michael Crawford (World Bank), Dewayne Mathews (Lumina Foundation, US), Philip Wade (consultant on regional policy and former OECD staff), Jorge Yutronic (national expert, Chile). Details about the Review Team are at Annex 1 of this report. Rachel Linden supervised the publication process and Fionnuala Canning provided invaluable assistance in the editing phase.

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Acronyms and abbreviations

AFD	<i>Aporte Fiscal Directo</i> Direct Public Contribution
AFI	<i>Aporte Fiscal Indirecto</i> Indirect Public Contribution
AMDEL	<i>Asociación de Municipios para el Desarrollo Económico Local</i> Association of Municipalities for Local Economic Development
ARIDP	<i>Agencia Regional de Innovación y Desarrollo Productivo</i> Regional Agency for Innovation and Productive Development
ASNM	<i>Agenzia di Sviluppo Nord Milano</i> Northern Milan Development Agency
BIEM	<i>Brandenburgisches Institut für Existenzgründung und Mittelstandsförderung</i> The Brandenburg Institute for Entrepreneurship and SMEs
BTU	<i>Brandenburgische Technische Universität Cottbus</i> Brandenburg University of Technology, Cottbus
CAE	<i>Crédito con Aval del Estado</i> State-Guaranteed Student Loan Programme
CASEN	<i>Encuesta de Caracterización Socioeconómica</i> National Survey of Socio-Economic Characterisation
CD	<i>Convenios de Desempeño</i> Performance Agreements
CEIA	<i>Centro de Estudios de Ingeniería Ambiental</i> Centre for Environmental Engineering Studies
CEUR	<i>Centro de Estudios Urbano Regionales</i> Centre for Urban and Regional Studies
CFT	<i>Centro de Formación Técnica</i> Technical Training Centre
CIDE	<i>Centro de Innovación y Desarrollo Empresarial</i> Centre for Innovation and Entrepreneurial Development

CIDERE	<i>Corporación Industrial para el Desarrollo Regional del Bío Bío</i> Industrial Corporation for the Regional Development of Bío Bío
CIMP	<i>Centro de Investigación Marítimo Portuario</i> Centre for Maritime and Harbour Research
CLP	Chilean peso
CNIC	<i>Consejo Nacional de Innovación para la Competitividad</i> National Council of Innovation for Competitiveness
CONICYT	<i>Comisión Nacional de Investigación Científica y Tecnológica</i> National Commission for Scientific and Technological Research
COPAS	<i>Centro de Investigación Oceanográfica en el Pacífico Sur Oriental</i> Centre for South-eastern Pacific Oceanographic Research
CORBIOBIO	<i>Corporación para la Regionalización del Bío Bío</i> Corporation for the Regionalisation of Bío Bío
CORE	<i>Consejo Regional</i> Regional Council
CORECYT	<i>Consejo Regional de Ciencia y Tecnología</i> Regional Council for Science and Technology
CORFO	<i>Corporación de Fomento de la Producción</i> Production Development Corporation
CREA	<i>Centro Regional de Estudios Ambientales</i> Regional Centre for Environmental Studies
CREAMAR	<i>Centro Regional de Estudios Ambientales, Marítimos, Acuícolas y de Transferencia Tecnológica</i> Regional Centre for Environmental, Maritime and Aquaculture Research and Technology
CRUCH	<i>Consejo de Rectores de las Universidades Chilenas</i> Council of Rectors of Chilean Universities
CSE	<i>Consejo Nacional de Educación</i> National Council of Education
DIRPLAN	<i>División de Planificación y Desarrollo Regional</i> Planning and Regional Development Division
DPI	<i>Departamento de Propiedad Industrial, Ministerio de Economía</i> Industrial Property Department, Ministry of Economy

DUOC	<i>Departamento Universitario Obrero y Campesino de la Universidad Católica de Chile</i> University Department for Peasants and Workers of the Universidad Católica de Chile
ERD	<i>Estrategia Regional de Desarrollo</i> Regional Development Strategy
EU	European Union
EULA	<i>Centro de Ciencias Ambientales Europa Latinoamérica, Chile</i> Europe-Latin America Centre for Environmental Sciences, Chile
EUR	Euro
FDI	<i>Fondo de Desarrollo Institucional</i> Institutional Development Fund
FIAC	<i>Fondo de Innovación Académica</i> Academic Innovation Fund
FIC	<i>Fondo de Innovación para la Competitividad</i> Innovation Fund for Competitiveness
FNDR	<i>Fondo Nacional de Desarrollo Regional</i> National Fund for Regional Development
FOB	Free on Board
FONDART	<i>Fondo Nacional de Desarrollo Cultural y las Artes</i> National Fund for the Development of Culture and Arts
GEM	<i>Observatorio Mundial del Emprendedurismo</i> Global Entrepreneurship Monitor
GORE	<i>Gobierno Regional</i> Regional Government
GTZ	<i>Deutsche Gesellschaft für Technische Zusammenarbeit</i> German Organisation for Technical Cooperation
HDI	Human Development Index
HE	Higher Education
HEI	Higher Education Institution
ICT	Information and Communication Technologies
IDE	<i>Instituto para el Desarrollo de Emprendedores del Tecnológico de Monterrey</i> The Monterrey Tech's Institute for Entrepreneurial Development

ILPES/ECLAC	<i>Instituto Latinoamericano y del Caribe de Planificación Económica y Social / CEPAL</i> Latin American and Caribbean Institute for Economic and Social Planning / ECLAC
IMHE	OECD Programme on Institutional Management in Higher Education
INACAP	<i>Instituto Nacional de Capacitación Profesional</i> National Institute of Professional Training
INDAP	<i>Instituto de Desarrollo Agropecuario</i> National Institute for Agricultural Development
INE	<i>Instituto Nacional de Estadísticas de Chile</i> Chile's National Institute of Statistics
IP	<i>Instituto Profesional</i> Professional Institute
ISI	Institute for Scientific Information
ITESM	<i>Instituto Tecnológico y de Estudios Superiores de Monterrey (Tec de Monterrey)</i> Monterrey Institute of Technology and Advanced Studies (Monterrey Tech)
LAG	Local Action Group
LEADER	<i>Liaisons entre Acteurs du Développement Economique Rural</i> Liaison among Actors in Rural Economic Development
LECYCA	<i>Laboratorio de Experimentación, Control y Certificación de Calidad de los Alimentos</i> Food Quality Control and Certification Laboratory
MBA	Master of Business Administration
MECESUP	<i>Programa de Mejoramiento de la Calidad y la Equidad de la Educación Superior</i> Programme for the Quality and Equity Improvement of Higher Education
MIDEPLAN	<i>Ministerio de Planificación y Cooperación, Gobierno de Chile</i> Ministry of Planning and Cooperation, Government of Chile
NGO	Non-Governmental Organisation
NOM	<i>Investerings- En Ontwikkelingsmaatschappij voor Noord-Nederland</i> Northern Netherlands' Investment and Development Agency
NZD	New Zealand Dollars

OECD	Organisation of Economic Cooperation and Development
PMC	<i>Plan de Mejoramiento de la Competitividad</i> Programme for Improvement of Competitiveness
PSU	Prueba de Selección Universitaria University Selection Test
R&D	Research and Development
SER	Self-Evaluation Report
SERCOTEC	<i>Servicio de Cooperación Técnica, Ministerio de Economía</i> Technical Cooperation Service, Ministry of Economy
SEREMIS	<i>Secretarías Regionales Ministeriales</i> Ministerial Regional Secretariats
SERPLAC	<i>Secretaría Regional de Planificación</i> Regional Planning Secretariat
SIES	<i>Sistema Nacional de Información de la Educación Superior</i> National Higher Education Information System
SME	Small and medium enterprise
SPRI	<i>Sociedad para la Promoción y Reversión Industrial</i> Society for Industrial Promotion and Reconversion
SUBDERE	<i>Subsecretaría de Desarrollo Regional y Administrativo</i> Under-Secretary for Regional Development
UBB	<i>Universidad del Bío Bío</i> University of Bío Bío
UC	<i>Pontificia Universidad Católica de Chile</i> Pontifical Catholic University of Chile
UCSC	<i>Universidad Católica de la Santísima Concepción</i>
UDD	<i>Universidad del Desarrollo</i>
UDT	<i>Unidad de Desarrollo Tecnológico</i> Office for Technology Development
UNDP	United Nations Development Programme
US	United States
USD	United States Dollar
UDEC	<i>Universidad de Concepción</i> University of Concepción

Assessment and recommendations

Towards a region that reaps rewards from investment in higher education

Chile is Latin America's most successful economy and enjoys great natural wealth. Over recent years the country has made progress not only in economic development, but also in educational reforms. Despite this progress, higher education attainment rates and the R&D intensity remain low. The current OECD/World Bank Review of Higher Education in Regional and City Development in the Bío Bío Region confirms that Chile is ready for the second generation of higher education reforms to improve quality of education, to address challenges in equity and to improve employability outcomes and knowledge transfer. For reasons of both equity and competitiveness, education and the improvement of human capital should continue to be a priority for the Chilean government also in the coming years.

Chile has made greater decentralisation a priority in order to unleash the potential of its regions. Regional planning has been transferred to regional governments and promising reforms are underway. But more work is needed. In spite of recent measures, Chile remains centralised with more pronounced regional disparities than in most OECD countries. Administrative and financial limitations remain, and the regional agenda continues to be determined by national guidelines. There is a concentration around Santiago in the Metropolitan region in terms of decision making, business activity, work force, higher education and R&D. In addition, the concentration of Chile's innovation system slows down the development of regional innovation systems.

A closer look at the Bío Bío Region

Despite slow progress, the decentralisation process is building capacity in the fifteen regions of Chile. It has also created a window of opportunity in

the Bío Bío Region which has traditionally been a national pioneer in regional development and regional innovation policy. As part of its long term objectives, the Bío Bío Region aims to strengthen the decentralisation process, improve the quality of its human resources, increase the rates of technological innovation and strengthen the productive sector, competitiveness and rates of value added in the regional economy. The Agenda for Innovation and Regional Competitiveness identifies higher education and science and technology as one of the strategic areas for 2008-12 that will receive funding on the basis of Programmes for Improvement of Competitiveness (PMC, in its Spanish acronym, “Bío Bío Educates and Innovates”). The regional government is thus not only fully aware of the benefits of the decentralisation process, but also of the potential role that the higher education institutions can play in achieving these goals.

With 1.9 million inhabitants, the Bío Bío Region is the second most populated region in Chile. It is also the second most important region in terms of its contribution to the Gross Domestic Product. The regional economy relies on manufacturing, services and low value added products from primary industries, agriculture, fishery and forestry. Furthermore, the region is characterised by a “dual economy”: on one side, there are big, productive firms in forestry and in the steel industry, and, on the other, a wide array of small and medium-sized enterprises which represent 80% of employment. The few leading edge companies tend to be located in the central city of Concepción or controlled from outside of the country. There are few spill-overs from big firms in terms of job creation and supply chains. The rate of firm creation is one of the lowest in the country. The rate of unemployment is higher than the national average and there is also evidence of brain drain.

In this context, the region faces a triple challenge:

- How to promote new business formation?
- How to support the development of the existing SME base?
- How to address the hard core problems of poverty and inequity by creating opportunities for growth.

To face these challenges, the Bío Bío Region and its higher education institutions need to be involved in joint efforts to develop a long term strategy for the region. A reform is necessary in higher education institutions to facilitate more professional institutional management and student-centred learning experience. In order to improve regional development outcomes, evidence-based decision making at all levels and institutions needs to be adopted. In addition, job creation should be seen as the primary goal of innovation and human capital development.

Human capital development in the Bío Bío Region

The Bío Bío Region has made impressive progress in widening access to education. The increase in higher education participation has included students from all sectors of the society...

The Bío Bío Region is a “human capital factory”, second only to the Metropolitan region, in terms of number of higher education institutions, student enrolment, teachers and researchers. In 2007, the region concentrated 11.9% of the supply of undergraduate programmes, 12.8% of the national higher education enrolment and 12.7% of all the headquarters of higher education institutions in Chile. Recent decades have witnessed rapid progress in education. For example, the adult literacy rate in the region almost doubled in the last decade, and now stands at well over 90%. Likewise, levels of educational attainment have increased significantly, with 21% of the population having completed some form of higher education – an increase from 13% in the last decade. Between 1983 and 2007, the number of enrolled higher education students in the Bío Bío Region expanded more than threefold, growing from 21 000 to 94 000. Finally, the higher education participation rate in the region among the 18-24 year-old age increased to 39.9%, constituting a significant increase from less than 14% in 1990. The participation rate is three percentage points higher than the national average.

Considerable progress has been made in widening access to higher education, particularly in terms of students from lower socio-economic background. The increase in higher education attainment is correlated with reduced poverty rates in the Bío Bío Region. The rate of poverty has fallen by over 50% in recent decades, with the most significant reduction occurring at the lowest income levels. However, 21% of the population is classified as poor or indigent, compared to a national average of 14%. Furthermore, low-income potential students continue to be less likely to enrol in higher education than those from the upper-income strata of the society.

...but challenges remain in order to continue and consolidate the gains accomplished while better aligning the education system to the region's needs...

The rate of unemployment in the Bío Bío Region is consistently higher than the national average: 8.7% in 2008 as compared to 7.7% nationally. At the beginning of 2009, the region's average unemployment had grown to 11%, reaching 18% in some rural areas. Unemployment is structural in nature and linked to shifts in the regional economy. Wage levels are lower in the region and higher education graduates earn less than their peers elsewhere in Chile. This may suggest that the region is over-supplied, on a relative basis, with higher education graduates. It may equally suggest a misalignment between what higher education offers and what regional labour market needs. These factors may have contributed to Bío Bío Region's high "brain-drain" rate: the region today is a net exporter of undergraduates to other parts of the country, mainly to the Metropolitan Region. In 1997-2002, net migration was of 19 000, or about 1% of the regional population.

The rapid increase in higher education enrolment has contributed to high dropout rates. Throughout Chile, 58% of all students drop out before completing a degree, in comparison with the OECD average of 29.6%. The reasons for the high drop-out rates are manifold, ranging from insufficient preparation of students in primary and secondary education to inadequacies in the university admission systems, overly long degree programmes, inflexible curricula and outdated classroom practices. Detailed student data about dropout and academic progress is lacking both at the regional and institutional level.

...and reforms are necessary to reduce the dropout rates...

Most higher education institutions also have remedial courses to reduce the dropout rates. Some institutions, for example Universidad Católica de la Santísima Concepción, have adopted comprehensive institution-wide responses addressing the social, financial and learning difficulties of their students. Recent experience shows that reducing dropout rates is a challenge that can be overcome. For example, the University of Bío Bío is collecting and analysing data to address the dropout problem as a part of the Programme for the Quality and Equity Improvement of Higher Education (MECESUP). The university has reached measurable results in reducing the dropout rate from 48% in 2008 to 37% in 2009. Also, policies that tie student graduation rates to institutional financial obligations under the State-Guaranteed Student Loan Program (CAE in its Spanish acronym) should help decrease dropout.

Educational reforms at the secondary level are necessary to ensure better preparation of all students. In the first instance, it is up to the school

authorities to work towards improving the quality of education in Chile. Higher education institutions can, however, reach out to local schools to improve the preparation for higher education. The higher education institutions in the Bío Bío Region, supported by a special funding from the Ministry of Education, are running an impressive number of school outreach projects to raise aspirations and academic performance of students at local schools and to improve the quality of teaching and school management.

...to improve graduation rates and labour market relevance of education and to boost entrepreneurship...

Several larger higher education institutions in the Bío Bío Region are primarily focused on national labour markets and career-focused education provision. There is a need to move away from supply-driven orientation to more demand-led education provision, to strengthen the development of competencies of the students and to build stronger links between higher education institutions and labour market. This could be achieved through a wide range of measures, including credit bearing work-based learning for students, expansion of problem-based learning methods in collaboration with the local industry and other employers as well as participation of employers in the curriculum and course design. In addition, the use of local private sector employees as instructors and supporting the movement of university researchers/teaching staff on a temporary basis to the private sector would be useful ways of improving the labour market relevance. Furthermore, improving active language skills of all students and faculty are necessary if the region wishes to position itself in the global market. Positive development in improving the labour market relevance is taking place in a handful of institutions, including the leading private universities, for example the Universidad del Desarrollo and INACAP which have developed its educational approach based on “learning by doing”. At the national level, higher education reform is facilitated by the Ministry of Education’s MECESUP programme. It is, however not accessible to all accredited institutions; technical tertiary institutions, for example, have only limited access to MECESUP funding, which focuses mostly on universities. As a consequence, initiatives to improve labour market relevance of higher education remain in most instances discipline-based rather than institutionally driven.

The Bío Bío Region has a low rate of business creation in comparison to other regions of Chile. Finding ways of increasing entrepreneurship could be an effective strategy for job creation. Higher education institutions in the region have taken steps to boost university spinoffs and graduate

entrepreneurship, mainly through incubators, but there is limited collaboration between the institutions. There is, moreover, limited offer of entrepreneurship training to students. Provision of entrepreneurship programmes should be scaled up, focusing on growth-oriented entrepreneurship while not neglecting social and cultural entrepreneurship, and by using interactive and experiential teaching methods.

Due to the rapidly changing skill requirements, skills upgrading, re-skilling and other forms of lifelong learning are becoming increasingly important. To date, the higher education institutions in the Bío Bío Region remain more oriented to meet the needs of traditional students than those of adult learners. While the institutions are aware of the needs of adults and have some programmes in place for them, not enough robust data is available to understand the needs of this population or the efficacy of higher education in meeting them. Flexible ways of provision should be scaled up for the benefit of non-traditional learners, who often combine work and study.

...and to address the fragmented governance architecture and the segmentation of the education system.

One of the main issues impeding human capital development in the Bío Bío Region is the fragmented governance architecture and the absence of a region-wide coordinating structure and mechanisms to articulate a long term vision and implement an integrated development strategy for all educational institutions.

Transparent pathways for students through the education system are required. This involves the development of stronger credit recognition schemes, course and programme articulation agreements, clear and enforceable policies related to credit transfer and increased support for joint and collaborative programmes.

The segmentation of university and non-university sectors acts as an impediment for student mobility and human capital development. Immediate measures are needed to raise the attractiveness and prestige of technical tertiary education. A potential step in this direction could be the establishment of a national qualifications framework to facilitate progression from one degree type to another, to allow credit for previous academic and job-related experiences and competencies, and to ease transitions between areas of study. The transition toward a national qualifications framework would benefit from including a review of all tertiary curricula, to make them

more flexible and address excessive study hours and theoretical content in degree programmes.

The following measures would promote human capital development in the Bío Bío Region:

- Regional government, higher education institutions, other educational institutions and key stakeholders of the economy and society should work together to establish a Regional Human Capital Development System to define region-wide goals, policies and priorities extending from primary to tertiary education. As part of this system, higher education institutions and regional government should consider establishing a higher education coordinating body that would define goals, policies and priorities within the region. A major function of this body would be to evaluate how well the higher education system is delivering the amount and quality of skills needed by the labour markets.
- Higher education institutions and regional government and interested parties should work together to improve the data on labour market needs and trends. Higher education institutions should systematically monitor student progress as well as students' labour market outcomes and graduate destinations (out-migration). The most effective region-wide graduate labour market systems are based on the collection of comprehensive labour market intelligence and the on-line publication of the data in a single place to improve students' ability to make rational choices about their studies and to help graduates and employers come together and move toward employment. Also a key is to use the data strategically to identify regional priorities and at an institutional level, to respond to the data in terms of course provision and the supply of employer specific skills.
- Higher education institutions and regional government should take steps to significantly expand higher education opportunities for working age adults. These steps should create clear and transparent pathways to advanced education for adults, including the ability to attend multiple institutions, obtain short-term education and training that can later be applied to degrees, and re-skilling and up-skilling courses and programmes designed around the needs of adults who often combine work and study. This involves the development of a qualifications framework: strong credit recognition schemes, course and programme articulation agreements, clear and enforceable

policies related to credit transfer and increased support for joint and collaborative programmes.

- Higher education institutions and regional government should continue to expand efforts to increase the enrolment and success of students who are the first in their families to pursue higher education degrees. This includes building upon existing models of academic and social support services for students, increasing institutional and state aid to students as well as moving away from teacher-centred learning methods.
- Higher education institutions should continue to strengthen their efforts to improve completion rates. The efforts of several higher education institutions in the region have shown genuine promise, and these efforts should be supported, expanded, and disseminated as models to other institutions.
- Higher education institutions should focus on the employability and entrepreneurial skills of graduates; providing them with the skills and competences needed in a globalised knowledge economy. Work and problem-based learning methods and programmes to build entrepreneurship skills would improve retention after graduation in the region. Similarly, efforts in language learning could help the region in its internationalisation efforts. All degree programmes should include compulsory English.
- Employers and regional government should acknowledge the increasing relevance and importance of education in technical employment fields. There is clear evidence that needs and opportunities are growing in these fields, but that these trends are under-recognised in the region and within higher education.

Regional innovation in the Bío Bío Region

The Bío Bio Region has been a pioneer in incorporating the concern for innovation capacity and performance into its overall regional economic development efforts...

The Bío Bío Region is a clear leader in Chile in making innovation a pillar of its economic development and future prosperity. It has excelled in numerous areas of planning, co-ordination, analysis, goals setting, prioritisation and consensus building. It has a coherent plan with well

articulated long term goals. It has used systematic analysis to convert long-term strategy into short- and medium-term targets in specific sectors. It has pioneered new agencies and organisational arrangements, some of which have become national models. These include the regional development agency (Regional Agency for Innovation and Productive Development), *Innova Bio Bío*, a co-operative venture between the Production Development Corporation (CORFO) and the regional government which was used as a model for the creation of the national agency *Innova Chile*. In addition, Chile's first regional council for science and technology *CORECYT*, was established in the Bío Bío Region. Recently, the region has also taken steps to mobilise the leading higher education institutions for its development through “Bío Bío Educates and Innovates” programme. Significant investments have been made to enhance universities' role in innovation.

... its higher education sector is above national standards in terms of innovative capacity...

Today, the Bío Bío Region is the second region in Chile in terms of R&D on the basis of a number of indicators such as funding, staffing and publications or patents. The research scene is heavily dominated by the University of Concepción, while other institutions are strengthening their capacity from a low base. In terms of knowledge generation, the Bío Bío Region produced in 2008 a greater proportion of published papers than would be predicted by its share of national population (13.1% versus 12%). The rate of production in the region has grown significantly faster than the national average over the past two decades. With respect to patents, the Bío Bío Region over performs, thanks to the University of Concepción, the country's top higher education institution for patent production: In 1995-2007 the region accounted for 29% of all patents from universities across the country. There are 24 active research centres based at higher education institutions, involving five different institutions. The region, mainly through the University of Concepción, is also represented in six of 19 recognised innovation consortia. Specific centres are devoted to regional priorities, such as fisheries and forestry, with growing ties with the industry sector. The region has a significant percentage of Chile's PhD programmes, enrolment and PhD-holding faculty. The University of Concepción has an Office for Technology Development in place since 1996. Universidad del Desarrollo maintains an active Centre for Innovation and the Promotion of Entrepreneurship.

...but so far their focus has been on knowledge production rather than on knowledge transfer...

However, the overall capacity to absorb technological innovation is low in the Bío Bío Region. Much of the research carried out in the higher education institutions in the region is destined for transferral to other more technologically advanced regions, due to the structure of the regional economy. There is a gap between the higher education sector and market needs. Particularly, the linkages between higher education institutions and small and medium sized enterprises (SMEs) need to be strengthened, for example through the establishment of a single entry point for the SMEs within a group of higher education institutions or the development of sector based approaches to address the needs of the SMEs. Currently, SMEs have limited information about the capability of higher education institutions to assist them and higher education institutions lack the information, resources and data bases to respond in a sensitive and timely manner. There is some support to new business formation in the form of incubators, but limited collaboration across higher education institutions.

...furthermore, there is a large public role in the Bío Bío Regional Innovation System that can influence entrepreneurship attitudes...

The Bío Bío Region is investing in the order of tens of millions of US dollars per year in innovation with the expectation that this investment will pay back through the generation of increased private sector activity. There is a need to foster a sense of greater responsibility to show an overall positive return to the public investment. There is also a risk that the large public role in the regional innovation system may lead to the funding of innovations which are commercially not viable or that the publicly-driven innovation system undercuts its own goals of developing entrepreneurship.

The following measures would promote regional innovation in the Bío Bío Region

- The strong public presence in the innovation model should be recognised and its potential deficiencies should be reviewed. Innovation authorities should take explicit actions to diminish potential negative consequences of the large role of public agencies as direct service providers, i.e. funders of innovation, and ensure

that this presence does not discourage the emergence of private sector actors.

- Concern to monitor the rate of return on public investments should be increased, for its own sake and as a means of encouraging high calibre entrepreneurship and competitiveness.
- The balance between key informant data and more neutral statistical measures of innovation performance should be revisited as it affects policymaking. Key informant information should in all cases be complemented with views from outside the region, and selection and other tendencies toward biases should be mitigated.
- A wider portfolio of data related to the characteristics and performance of firms should be developed in conjunction with the promotion of cluster-building strategies and evidence based decision making in general.
- Efforts to unify the main goals for innovation in the region in the short-to-medium-term should seek to identify a central focus. Innovation authorities should guard against pursuing too many goals simultaneously and/or dispersing energy and efforts.
- The incentives for higher education institutions should be continuously reviewed to find ways of influencing these toward more concrete participation in innovation activities and move from knowledge production to knowledge transfer and to perceive job creation as one of the goals of innovation.
- Higher education institutions should step up their innovation and knowledge transfer activities and share good practices among themselves in a systematic manner. Furthermore universities should learn from good examples provided by the leading technical training centres, professional institutes and private institutions to improve labour market relevance of their learning programmes.
- Co-operation among private sector businesses, public administration, regional development agencies and higher education institutions should be expanded. Three courses of action could be followed: i) address the needs of local enterprises that are capable of exploiting research results; ii) encourage local industry to diversify in activities in promising new fields; and iii) focus on sector-based cluster development in order to approach the small and medium sized enterprises (SMEs). In addition, establishing single entry points for SMEs within a single higher education institution or a group of institutions should be encouraged.

Social, cultural and environmental development in the Bío Bío Region

The challenges in the Bío Bío Region are manifold, ranging from poverty and indigence, ethnic diversity, environmental degradation and urban-rural divide...

The social conditions in the Bío Bío Region have improved considerably in the last two decades. Still, in a national comparison, it is one of the regions with the highest proportion of poor (20.7% versus 13.7%) and indigent (5.2% versus 3.2%) families. Several municipalities in the region count among the poorest in the country, although their situation has improved over recent years. The Bío Bío Region is also culturally diverse. Of the total regional population 7.8% declare to belong to one of the eight officially recognised ethnic groups, most importantly the Mapuche population who have recently enforced their campaign to regain land and stand in conflict with the energy and forestry companies. Furthermore, economic growth has led to increasing pressures on the environment.

...higher education institutions see widening access as their key contribution to regional development. They also provide a wide range of services in the health and social sector.

The higher education institutions in the Bío Bío Region see widening access and increasing participation of students from lower socio-economic backgrounds as their key social contribution to regional development. They have been instrumental in the increased access of the lower income quintiles to higher education. Supported by the Ministry of Education, higher education institutions have each developed their own projects and approaches to collaborate with the schools to raise aspirations and improve learning outcomes among students and to improve management of these institutions. Higher education institutions also provide a wide range of services to different communities, usually in the health and social sector. Valuable work is carried out, not the least in rural areas where many higher education institutions reach out to the low income population segments in particular. Most initiatives are based on social innovation and address sector-specific issues, but they lack a more integrated approach to local economic and social development in the region. Furthermore, much of this outreach, for example by San Sebastián University, is conducted by students through internships which are in general not credit bearing. In addition,

while widening access will contribute to outmigration if the best and brightest leave the region to find work opportunities elsewhere, and service delivery will address the symptoms of poverty and indigence, but not the causes, there is a need to develop more sustainable ways to collaborate with the “harder to reach” communities.

... there is a need to reach out and empower communities to address their own challenges by strengthening the social economy, cultural identity and environmental development...

Community development programmes aim to build capacity by enabling communities to respond to change and emerging social, economic and environmental challenges. The Universidad Católica de la Santísima Concepción has taken on an important role in supporting sustainable community development in the two rural areas of Coronel and Arauco. In Coronel, the university supports the local communities to move away from capture fisheries to aquaculture. In Arauco, the university has launched the Agricultural Technology Transfer Centre to support sustainable economic development of the Mapuche population. In addition, some institutions, for example the University of Bío Bío, provide significant contributions to local development by bringing in the training and the knowledge required for the definition and implementation of regional strategies. However, higher education institutions, in collaboration with local and regional authorities, could also play a more prominent role in training community development practitioners, providing lifelong learning and re-skilling and up-skilling opportunities, conducting research into specific issues and best practices and developing co-operation and research opportunities. There is also considerable underused potential in environmental and cultural development as well as international collaboration beyond Spanish speaking regions.

The following measures would enhance the contribution of higher education institutions to the social, cultural and environmental development in the Bío Bío Region:

- A systematic exchange of information and experience should be put in place between higher education institutions in social, cultural and environmental matters facilitated by the regional government in order to bring greater efficiency. Such a forum could organise thematic events, with regular information retrieval and exchange facilitated by a dedicated website. As a first step, higher education institutions’ current connections, initiatives and projects involving

stakeholder collaboration, community development and/or outreach should be mapped and published in the collaboration platform.

- In addition to widening access and providing services to various communities, higher education institutions should engage in long-term community development seeking ways to empower communities to find their own solutions to various economic, social, cultural, environmental challenges which are global, national and local in nature. They should consider ways to move away from combating poverty to fostering wealth and job creation through social entrepreneurship. The region should be seen as a “laboratory” for developing research, students’ work-based and experiential learning and development projects in many different fields.
- The region should, in collaboration with the higher education institutions and other stakeholders, develop a strategy that sees arts and culture as an agent of development through: i) direct benefit in enhancing the quality of life of the diverse population; ii) indirect economic benefits in attracting and retaining talent which can drive the knowledge society, and iii) a direct contribution to the creative industries through enterprise formation, growth, productivity and employment. This strategy should address the needs of the diverse populations in the region and enhance the internationalisation of the region.
- The region should, in collaboration with higher education institutions and public and private sector increase efforts to support sustainable environmental and economic development through a comprehensive strategy bringing together diverse regional actors to sustainability process. Higher education institutions should scale up their efforts to provide learning and further education programmes in sustainable development; to act as a source of expertise through research, consultancy and demonstration; to demonstrate good practice through campus waste management and development activities, strategic planning, building design, waste minimisation and water and energy efficiency practice, responsible purchasing programmes and good citizen type initiatives like “Green Campus”.

Regional capacity building

The Bío Bío Region has pioneered in building capacity for regional engagement...

Traditions of partnerships within the region between higher education institutions, businesses, regional agencies and government bodies, acting in concert with each other, is a critical factor in attracting foreign direct investment and partnering with other regions and higher education institutions globally. The Bío Bío Region has been a national leader in building capacity in regional development and innovation. *Innova Bío Bío* and CORECYT have contributed to regional growth within the regional development strategy and the regional agenda has interpreted territorial strategies with participation of higher education institutions. The higher education institutions in the Bío Bío Region as well as students and staff engage in wide ranging collaboration including knowledge transfer, collaborative efforts with business and industry, community outreach and volunteering. There is evidence of innovative programmes and projects, strong civic leadership and increasing collaboration of higher education institutions in regional development.

... but collaboration remains a challenge as limited resources are spread thin and there is often a lack of critical mass to generate projects which will have real impact at the local and regional level and create multiplier effects...

While there is an abundance of initiatives and projects and evidence of excellence, the work is often project-based and/or driven by the action on the initiative of individuals or single departments. Collaborative mechanisms among higher education institutions to build capacity and foster joint efforts for regional development remain limited in scope and representation. In spite of broader initiatives such as the Programmes for Improvement of Competitiveness (most notably PMC on “Bío Bío Educates and Innovates”), the picture of the diverse programmes and projects with participation of higher education institutions is one of fragmentation built on generally separate and non-coordinated initiatives stemming more from specific circumstances than an overarching vision of needs and possible converging efforts. New promising initiatives include the establishment of a health cluster in the region in collaboration between the University of Concepción, Universidad Católica de la Santísima Concepción and

San Sebastián University. This initiative holds much promise for regional development and the region's low income population but care should be taken to ensure that all relevant accredited higher education institutions, for example the Universidad del Desarrollo and University of Bío Bío, have the opportunity to participate in the collaboration.

... and incentives to mobilise higher education institutions and their staff for regional and local development remain limited...

Higher education institution's culture, capacity for change, leadership and the appropriate co-ordination mechanisms and oversight regionally play an important role in their capacity to engage with partnership building and collaborative action. In Chile, the incentive structures for mobilising higher education institutions for regional and city development are limited. There is no explicit third task or regional development task assigned to higher education institutions and regional engagement is left to the initiative of the individual institutions. In terms of institutional management, Chile's public universities give a major role in institutional decision-making to academic staff, but very little influence is given to external partners. Higher education institutions should be encouraged to build their capacity, allowing them to recruit rectors from outside the university and to encourage them to adopt modern management practices and free them from cumbersome civil service controls and regulations.

... some national level initiatives help reform higher education and could also have stronger impact on regional development...

The Government of Chile has taken steps to reform higher education. MECESUP (Programme for the Quality and Equity Improvement of Higher Education) was launched by the Chilean Ministry of Education in collaboration with the World Bank. It is a national top-down initiative involving the central government's thrust to improve the quality of higher education. The 18% cap of funding for a single institution has guaranteed that 70% of the funds have been directed to higher education institutions outside of Santiago and that higher education institutions outside the national capital also benefit from the programme. The recent efforts to involve also institutions outside of the traditional universities in some activities are commendable. Of particular interest are the performance agreements which require institutional improvement plans and enhance accountability and transparency. Ensuring that the critical reform initiatives

are scaled up throughout the system is part of the challenge facing the Government of Chile. To improve management capacity, transparency and accountability across the higher education sector, the performance based agreements should be made available to all accredited higher education institutions.

While it was outside the scope of the review to assess the Chilean higher education funding system, the Chilean government should take steps, in line of the recommendations of the recent OECD/World Bank review of tertiary education in Chile (2009) to address the considerable financial burden that the education system currently places on students and their families as well as the fact that public funding for higher education is not available for all accredited institutions.

The following measures would build capacity for regional development:

- Chile should continue and deepen the decentralisation process and enhance capacity building in its regions. Experience in OECD countries shows that increased decision-making power at sub-national levels of government combined with adequate co-ordination mechanisms can unleash the potential in the regions. As regional capacities are built through “learning by doing”, increased responsibilities at the regional level are necessary to build skills and develop problem solving approaches.
- Regional and local engagement and more specifically its wide agenda for economic, social and cultural development should be made explicit in higher education legislation. Regional engagement should be encouraged through strengthening the National Commission of Accreditation Process. In addition, performance agreements should be made available to all accredited higher education institutions.
- Incentives for higher education institutions should be created to engage in local and regional development through long term core funding and additional strategic incentive-based funding schemes. In addition, local and regional engagement of higher education staff should be acknowledged and rewarded by higher education institutions in their recruitment, hiring and reward systems.
- Evidence-based decision making should be strengthened in the region by focusing on a dashboard of key indicators that the key regional stakeholders can monitor over time. This can result in a

shared local knowledge base which will galvanise the development of a strong local strategy for change.

- The capacity for regional engagement should be improved in the region among key agencies and higher education institutions through forums for communication where good practices can be fostered and through targeted training programmes with focus on practical problem solving.
- The joint resources of the higher education institutions should be mobilised for the preparation and implementation of regional strategies.
- A regional strategy platform should be developed to complement the current project-based approaches with a more system-based approach.
- Higher education institutions should establish modern administration with human resources and financial resources management systems. In addition, they should review recruitment, hiring and reward systems to include regional development agenda.

Chapter 1: The Bío Bío Region and its higher education institutions

Over recent years Chile has enjoyed economic growth and institutional stability and reform. This chapter presents the profile of the Bío Bío Region with its main economic activities and its socio-economic characteristics as compared to other Chilean regions. It examines the expansion of higher education institutions in the region and their role in regional development. It identifies the main strengths and weaknesses of the region and analyses the major challenges in the context of the increasing participation of higher education institutions in the definition and implementation of regional development strategies.

1.1 Bío Bío Region and administrative organisation

The Bío Bío Region is one of 15 administrative regions¹ in Chile. It enjoys a central position in continental Chile, between the regions of Maule to the North and Araucanía to the South. The distance between Concepción and the national capital of Santiago is of 500 km. The region comprises four provinces (Ñuble, Concepción, Bío Bío, and Arauco) each led by an appointed governor, and 54 communes.² The Province of Concepción with its 12 communes, including the capital city (Concepción), is the most populated. It represents 36% of the regional territory and is the second largest province. Ñuble (capital: Chillán) is the largest province with 40% of the regional territory comprising 21 communes. The Province of Bío Bío (capital: Los Ángeles) is subdivided into 14 communes. In the southwest of the regional territory, Arauco with its 7 communes (capital Lebu) encompasses only 8% of the regional population and 15% of the regional area. The longest distance between two provincial capitals is not greater than 250 km. The region also comprises ten “Planning Territories” representing groups of communes with common economic and social characteristics, on the basis of voluntary agreements favouring integrated territorial strategies and projects with critical mass.

The Chilean administrative system is characterised by strong centralisation, although decentralisation trends have begun to emerge in recent years (see Section 1.6).³ Regional governments are led by an “*intendente*”, designated by the President of the republic. The *intendente* is also the president of the regional government’s general council. In the Bío Bío Region, this council is composed of 22 members, elected for 4 years by the municipal council members of the 54 communes. The general council members are elected by provincial quotas (The situation will change after the forthcoming regional elections in 2010 or 2011 when the members will be elected, for the first time, through direct popular vote). Presently the Province of Concepción has 9 members, Ñuble 5 members, the Province of Bío Bío 5 members and Arauco 3 members. The regional government prepares and approves regional development policies, plans and programmes; prepares the regional budget proposal; decides assignment of resources from sector funding sources; develops territorial planning, training, technological, social, cultural, environmental actions; offers advice to municipalities and prepares for emergency situations. The *intendente* represents the President of the republic, develops duties related with the maintenance of public order and coordinates and controls public services. The governance structure of the Bío Bío Region’s is shown in Table 1.1.

Table 1.1. The governance structure of the Bío Bío Region

Bío Bío Region	<p>a) The government of the region – national government line</p> <ul style="list-style-type: none"> • Intendant (<i>Intendente</i>): the direct representative of the President of the Republic in the region. The <i>intendente</i> is named by the president of the republic and is maintained in the office at the discretion of the president. The <i>intendente</i> directs the government of the region according to the guidelines given directly by the president. <p>b) The regional government – territorially decentralised line</p> <ul style="list-style-type: none"> • Intendant: acts as the executive head of the regional government and presides the Regional Council. • Regional Council: supervises the <i>intendente's</i> duties; 22 members elected for four years (according to quotas) by the members of the 54 municipal councils. In 2009, a reform was launched to elect regional councillors through a direct popular democratic election. This change will come into effect in the forthcoming regional elections in 2011 or 2012. <p>Main functions:</p> <ul style="list-style-type: none"> • Design programmes and policies for regional development and productivity. • Approve the regional development plan. • Define and take investment decisions regarding use of resources from regionally defined public investments, especially from the National Fund for Regional Development. • Advise municipalities. • Build and administer the paving of sidewalks and roads in rural areas. • Carry out various tasks related to land management, human settlements and infrastructure equipment. <p>c) Other public administration units in the region:</p> <ul style="list-style-type: none"> • Ministerial regional secretaries: national ministries' regional representatives who coordinate the public services under their responsibility. The Regional Planning Secretariat is a key institution in the investment process.
Provinces (4)	<ul style="list-style-type: none"> • Governor: appointed by the President. Governor represents the <i>intendente</i> in the province. • Provincial Economic Council: headed by the governor, acts as an advisory institution to the provincial governor. <p>Main functions: supervise public services provided in the province. Maintain public order and citizens' safety.</p>
Municipalities (54) Public corporations, with both legal personality and private assets, whose end is to satisfy the needs of the local community	<ul style="list-style-type: none"> • Mayor: highest authority in a municipality; chair of the municipal council. • Municipal council: advises, regulates and supervises the mayor's performance. It is in charge of ensuring the effective participation of the local community. • Economic and social council: composed of representatives of civil organisations of the municipality. <p>Both the mayor and the council are chosen through popular elections every four years.</p> <p>Main functions:</p> <p><i>Exclusive functions:</i> to develop, approve and modify the communal zoning plan; to promote local development; to enforce all measures regarding transport; to implement provisions regarding construction and the planning and urban regulation of the commune.</p> <p><i>Shared responsibilities:</i> public health, primary and secondary education, culture, work training and economic development, tourism, traffic regulations, social housing development and sanitary infrastructure, citizen safety.</p> <p>Municipalities can collect fees for municipal services, concessions or licences; enforce taxes on activities or goods with a clear local identity to be used for local development; award grants to public or private non-profit organisations; acquire or transfer moveable properties or real estate.</p>

Source: adapted from OECD (2009a), Territorial Reviews: Chile, OECD Publishing, Paris, p. 47

1.2 Demography and society

The Bío Bío Region is the second most populated region, after the Metropolitan region. According to the 2002 census it comprised 1.9 million inhabitants (12% of the population). It is the region with the highest percentage of rural population (18%). It is also one of the most densely populated (50 inhabitants per km²), surpassed only by the Metropolitan and Valparaíso regions. Most of the population lives in the coastal zones of the Province of Concepción. Half of the regional population (912 889) live in this province in which the communes of Concepción, Hualpén, and Talcahuano concentrate 25% of the region's population. The urban agglomeration known as the Greater Concepción, also including Penco, San Pedro de la Paz and Chiguayante, represents 36% of the population living in the Bío Bío Region. Besides the coast, there is another important population concentration in the Province of Ñuble, home to 24% of the regional population (483 103 inhabitants). Around the central highway, Chillán, Chillán Viejo, Bulnes and San Carlos comprise 255 000 inhabitants, (almost 14% of the region's population). The third most populated province is Bío Bío, with 19% of the regional population (353 315 inhabitants). Its capital, Los Ángeles has over 150 000 inhabitants.

The population in the Bío Bío Region grew in the last inter-census period (1992-2002) by 7% (national growth rate was 21%). In terms of migration, the region has been a net exporter of population. Net migration was of 19 000 in 1997-2002, about 1% of the regional population. The main reason appears to be lower wages, with departure after completion of secondary education but also after tertiary education (Aroca, 2004; Dresdner *et al.*, 2005) (See Section 2.10). Around half of emigrants move to the Metropolitan Region. Other destinations are the Valparaíso, Araucanía, Los Lagos, and Antofagasta regions. Moreover, the migratory process from rural areas to urban areas continued, with the proportion of urban dwellers increasing from 67% in 1962 to 82% in 2002 (Self-Evaluation Report, SER). Within the region (2002 census) the communes receiving net immigration (Province of Concepción) are San Pedro de la Paz, Chiguayante, and Coronel whereas Concepción, Talcahuano, and Lota have lost population. Within the other provinces, Chillán Viejo and Los Ángeles exert a strong attraction. Chillán instead experienced net out migration.

The Bío Bío Region is culturally diverse. Of the total regional population 7.8% declare to belong to one of the eight officially recognised ethnic groups, although the great majority of these are Mapuche⁴. Most have moved to urban centres, living in conditions of poverty and indigence. They are mainly located in Cañete, Talcahuano, Concepción, Tirúa, Coronel and San Pedro de la Paz. Alongside ethnic identity there remains in Bío Bío the

heritage of certain activities that have evolved like coal mining, forestry, fishing and agriculture, textiles and steel. There is however an insufficient recognition of cultural heritage that could contribute towards shaping a stronger regional identity.

As the rest of Chile, the region has experienced enormous improvement in social conditions in the last two decades. At the national and regional levels the proportion of families that cannot satisfy their basic needs with their own income has fallen by a half between 1994 and 2006, while the proportion of indigents, depicting more serious poverty, was reduced by a third between 1992 and 2006. In a national comparison, Bío Bío is however one of the regions with the highest proportion of poor (20.7% versus 13.7%) and indigent (5.2% versus 3.2%) families (MIDEPLAN, 2006), alongside Araucanía, Maule and Coquimbo, agriculture intensive regions whereas Bío Bío, although strong in the primary sector is mostly characterised by its manufacturing profile.

Chile has experienced remarkable improvements in literacy rates over the last two decades, now putting it at levels close to those of most OECD countries. The Bío Bío Region is no exception to this national trend. The percentage of the regional population that can write and read increased from 49% to 88% between 1992 and 2002. Considering only the population over 15 years of age the increase is even higher, with literacy rates jumping from 47% to 94% in the same period. The average number of schooling years has also increased, with 15% of the population having 12 years of education in 2002 (less than 12% 10 years earlier). However, a national comparison shows that schooling levels are slightly lower in the region than in the rest of Chile (16% with 12 years of education) because age groups over 40 years present lower schooling rates in the region. Nonetheless, the overall gap tends to disappear, because these age groups now have schooling rates comparable to national averages.

1.3 The regional economy

The Bío Bío Region is the second most important region in Chile behind the Metropolitan Region (47.2% in 2004) by its contribution to the national product, providing slightly over 10% of GDP in 2004 (OECD-World Bank, 2009). Sustained growth in economic activity in the region and country has allowed the per capita income to increase steadily between 1990 and 2006. The regional economy grew 60% in this period, increasing the per capita income from USD 2 500 to USD 4 000 (RSC, 2009), which puts the Bío Bío Region in the 9th position of the 15 Chilean regions. However, the national per capita income grew faster than the per capita income in the region. From the perspective of the Chilean economy, the contribution of the Bío Bío

Region is very important for manufacturing (20.3% of the national GDP generated by this activity in 2005, second region behind Santiago), for fishing (with 20.6%, second region behind Los Lagos) and for agriculture and forestry (third position behind O'Higgins and Maule with 15.1% in 2005) (OECD-World Bank, 2009).

The most important sector of activity in the regional economy is manufacturing. It represented in 2003 35% of regional GDP as compared to 15.8% for the national average. (OECD-World Bank, 2009). Natural resource based activities (agriculture, fishing, forestry, energy production) also represent a significant share of regional GDP, as indicated above. Agriculture remains an important economic activity: wheat and the traditional crops continue to have great significance in the regional product in spite of the development of forestry. Currently 16% of the regional area is allocated to intensive use (annual crops, fruit and vineyards, vegetables and flowers, artificial grassland and fallow), 44% is used by prairies and 40% by forest plantations. The generation of electric power is another productive activity of national importance. It has been developed significantly in the last decades, due to the exploitation of the hydroelectric potential of the Bío Bío basin. Finally construction, financial services and commerce have experienced considerable growth in the last decade of the 20th century, as in the rest of Chile.

The entry of the Bío Bío Region into international markets has strongly contributed to changing its economic structure. This is reflected in the significance that the region's exports have in the national context. At present, it exports products representing a value of over USD 4 billion (FOB) that corresponds to 8% of the deliveries that Chile sends abroad. Its regional export development has been closely related to the manufacturing industry that processes forest and fishing resources. In 2006, 630 firms exported 855 different products to 130 countries. The three most important export markets for the region were the United States (25.3%), China (9%) and Peru (7%). 57% of exports are directed towards North and South America, 25% to Asia and 14% to Europe.

Forestry has considerable importance for the regional economy: it concentrates 50% of the planted surface in the country. Three quarters of the planted surface are covered by the Monterrey pine, while eucalyptus plantations occupy 20% of the rest. Forest growing is fast developing in the provinces of Ñuble, Bío Bío and Arauco, sharing homogeneously 97.5% of the planted surface. This activity has been facilitated by the opening to global markets and by subsidies supporting plantations and forest management. This has resulted in an annual decrease of agricultural land over recent years of around 3%. However, in the recent period the growth rate of plantations has decreased, in part because of the strong demand for

new lands, which has made the cost of land more expensive. This has led to an increase of reforested areas with a decrease of the deforestation rate. Wood industries (paper, paper products including cellulose, building supplies and furniture) have developed in parallel, now representing a third of manufacturing and 66% of regional exports. Round log and pulp chunk exports have decreased considerably as production efforts are being re-oriented to more elaborate products.

In 2008, the average labour force in the Bío Bío Region was of 760 000 workers, with slightly more than 91% employed and a participation rate of 49%. Labour force and occupation in the Bío Bío Region constitute one tenth of the labour force and occupation at the national level. Two-thirds of the employed are dependent workers and one quarter are independent workers. The major contribution to employment comes from the tertiary sector (62% in 2007). The other main employment sectors are agriculture and fishing (15%) and manufacturing (also 15%) (RSC, 2009). The most important change since 1986 is the reduction of the share of the primary sector in employment: by one half for agricultural and fishing activities and from 3% to 0.5% for mining, whereas the construction and tertiary sectors have increased their share (RSC, 2009). The rate of unemployment in the region is systematically higher than the national average: 8.7% in 2008 as compared to 7.7% on the national level. In some periods the unemployment rate gap between the region and the country average has even been superior to 2%. One explanation is the big increase in the female labour force that the regional economy has not been able to absorb (Bruhn and Inostroza, 1997).

The Bío Bío Region is characterised by a “dual economy”: on one side, big, highly productive firms (forestry, steel) and on the other a wide array of small and medium sized enterprises, with low absorptive capacity. 82% of regional firms had sales of less than USD 100 000 in 2007 and these represent more than 80% of employment. The rate of firm creation is also one of the lowest in the country, according to Benavente *et al.* (2008). Although no figures were made available to the review team, it is also generally recognised that firm linkages are limited, with few supply chains or innovation spillovers.

1.4 Higher education in Chile

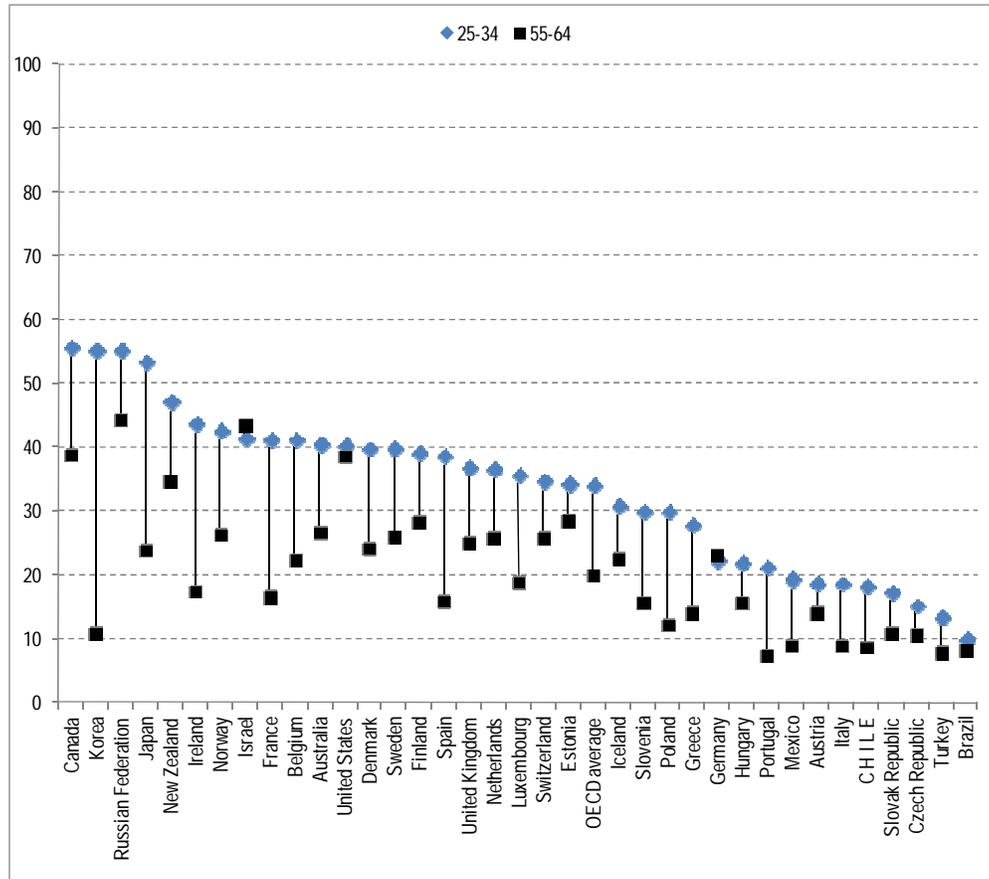
Chile has enjoyed significant progress in tertiary education over the last decades, moving successfully from an elite to a mass higher education system: “In the span of one generation, enrolment rates for students from the two lowest income quintiles have risen by a factor of five.” (OECD-World Bank, 2009) This major step has been taken thanks to bold policy innovations within a system where public and private institutions both play

important roles. In spite of the success, the percentage of graduates remains below OECD average levels (13% versus 27% in 2004). The 2009 Tertiary Education Review of Chile (OECD, World Bank) also notes a number of challenges that need to be the focus of second generation higher education reform: the high cost of education is mainly carried by students and their families, while public spending per student is low by OECD standards. Equity in access to higher education has not been achieved as it is linked to differences between public and private secondary schools, the latter providing better secondary graduation rates and preparation for university entrance. Student aid, although it has increased substantially, is still not available to all those who should be able to benefit from it. The relevance of higher education requires attention as there is a need to move away from career based approach towards competence building. In addition, all higher education institutions which have been accredited should have access to public funding.

There are three types of higher education institutions in Chile: technical training centres (CFTs), professional institutes (IPs) and universities. The universities are divided in two categories: those belonging to the Council of Rectors of Chilean Universities (CRUCH universities),⁵ also known as “traditional universities” and the newer universities known as “private universities”.⁶ Technical training centres can only deliver titles of “Higher Level Technicians”, the professional institutes can only give “Professional Titles” while the universities exclusively have the right to confer “Academic Degrees”.⁷ All these institutions are granted autonomy covering academic, economic and administrative fields after assessment of curricular plans, graduation mechanisms and quality of education. Three public sources of financing, complementary to funds received from other sources, exist:

- The Direct Public Contribution, (*Aporte Fiscal Directo* or AFD) granted exclusively to CRUCH universities (distribution responding for 95% to historical standards).
- The Indirect Public Contribution (*Aporte Fiscal Indirecto* or AFI), a competitive subsidy assigned according to the number of new students enrolled in the institution that count among the 27 500 students with the best results in the University Selection Test (PSU).⁸
- The Institutional Development Fund (*Fondo de Desarrollo Institucional* or FDI) targeting CRUCH universities, aiming to improve internal resource assignment.

Figure 1.1. OECD population with at least tertiary education (2007)



Countries are ranked in descending order of the percentage of 25-34 year-olds who have attained at least tertiary education. The year of reference for Chile is 2002 and for the Russian Federation is 2004.

Note: For technical reasons, these figures use Israel’s official statistics, which include data relating to the Golan Heights, East Jerusalem and Israeli settlements in the West Bank.

Source: OECD (2009b), Education at a Glance: OECD Indicators, OECD Publishing, Paris. StatLink  <http://dx.doi.org/10.1787/664024334566>

Higher education institutions may also apply for competitive funding from the Programme for the Quality and Equity Improvement of Higher Education (MECESUP), designed to increase the effectiveness of public higher education institutions funding. Currently, MECESUP funding is available to CRUCH universities. In addition, other types of higher

education institutions have access to certain parts of the programme. MECESUP programme will be discussed in detail in Chapter 5.

The number of enrolled students in Chile grew spectacularly between 1990 and 2007 (202%). Undergraduate enrolment increased by 197%, post professional by 268% and postgraduate enrolment by 840% during this period. In 2007 national enrolment in higher education institutions comprised 726 285 undergraduate, 7 105 post-professional and 20 153 postgraduate students. This translates into a national coverage of 38.4% of the population aged 18 to 24 years. In 1990 this percentage was only of 14.4%, underlining the huge increase in access to higher education of this age group. In parallel, the number of higher education institutions (RSC, 2009) has been seriously reduced between 1990 and 2007, dropping from 248 institutions to 205, a trend affecting mostly technical training centres (CFTs) and professional institutes (IPs). Universities maintained their numbers relatively stable, with a higher number of private universities in comparison to CRUCH universities. Regarding institutional regimes, in 2007, 93.4% of universities, 65.9% of professional institutes, and 21% of technical training centres had obtained autonomy.

The regions with the highest national enrolment shares in 2007 were the Metropolitan region (48.9%), the Bío Bío Region (12.8%) and Valparaíso (12.5%). The same year, universities had 67.6% of the total, while professional institutes (IPs) and technical training centres (CFTs) represented 20.8% and 11.6% respectively. Universities concentrating enrolment were the University of Chile (5.8%), Universidad de las Américas (5.1%), Andrés Bello University (4.9%), University of Concepción (4.4%), Universidad del Mar (4.4%) and the Pontificia Universidad Católica de Chile (4.3%). In professional institutes (IPs) enrolment in 2007 was distributed mainly between DUOC-UC (27.6%), the former University Department for Peasants and Workers of the Catholic University of Chile, now an independent entity, INACAP Professional Institute (15.7%), the National Institute of Professional Training linked to the main Chilean business association (*Confederación de la Producción y del Comercio*), and AIEP (9.9%), a professional institute linked to the Andrés Bello University. Within technical training centres (CFTs) student enrolment is concentrated in CFT INACAP (27.3%) and CFT Santo Tomás (19.5%).

Availability of financial resources grew rapidly from 1990 to 2007. The Direct Public Contribution (AFD) resources were multiplied by five while the Indirect Public Contribution (AFI) tripled. Total public contribution to higher education in 2007 (CLP 180 billion) was about eight times the amount spent in 1990. In 1990, five CRUCH universities concentrated 60.7% of all AFD resources (53% in 2007). AFI resources are almost exclusively absorbed by universities (99.1% in 2007), while professional

institutes got 0.49% and technical training centres 0.12%. Amongst universities, CRUCH members concentrate most AFI resources. In 1990, six of these received 60.1% (77.6% in 2007). The University of Concepción belongs to the AFD and AFI groups indicated above. Among the private universities, a few institutions concentrate AFI resources. In 1990 three institutions received almost 71% of these AFI resources. In 2007 five institutions obtained almost 64% of resources. Within professional institutes and technical training centres, there also exists a high concentration of AFI resources amongst a limited number of institutions.

Higher education institutions' staff in teaching, research, or extension programmes was estimated by the National Information System of Higher Education (SIES) at 47 022 in 2007. Of these, 30.3% had a postgraduate degree (master or doctorate). The CRUCH universities had 9 455 and the private universities 5 747 staff with postgraduate degree.

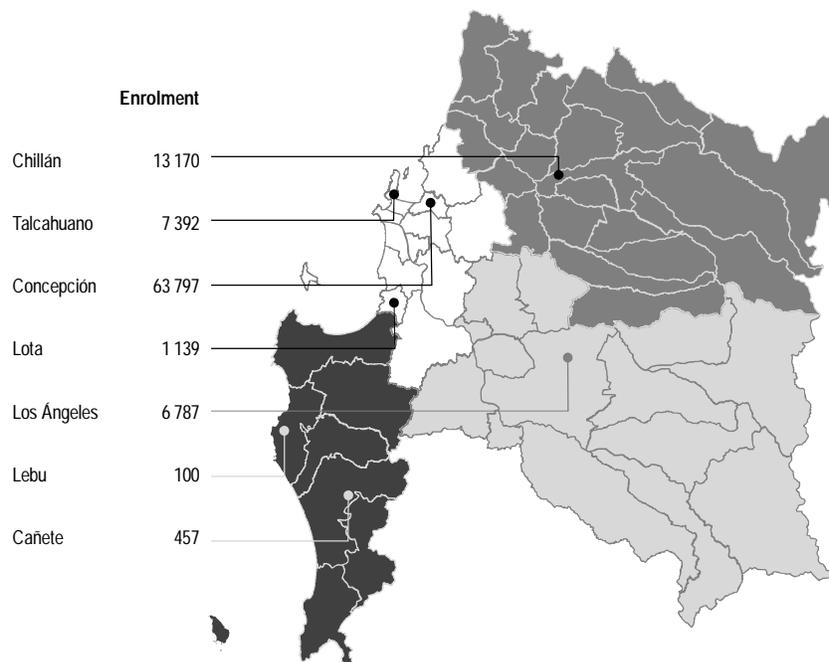
1.5 Higher education in the Bío Bío Region

Following national trends, tertiary education in the Bío Bío Region has registered significant progress between census years. The population share with higher education increased from 13% to 21% between 1992 and 2002 in the region, slightly less than the national share for 2008. Also, the socioeconomic background of university students has shown an increasing share of those coming from the lowest income quintile (quintile 1). Today, at least 70% of higher education students in the Bío Bío Region have reached an educational attainment level higher than that of their parents. According to the information recovered from the survey relating to higher education institutions in the Bío Bío Region conducted by the regional self-evaluation team, it appears that of the students entering the system in 2008, 36.5% belonged to the first quintile, 28.1% to the second quintile, 18.2% to the third quintile, 13.1% to the fourth quintile and 4.1% to the fifth quintile. This means that the higher education system in the Bío Bío Region has an important equalising effect in the study opportunities of young people from lower income groups. Unfortunately, the data also suggests large number of students with the financial means to do so are choosing to leave the region for their studies (see Chapter 2).

The Bío Bío Region is the second, behind the Metropolitan Region, in terms of higher education offering and student enrolment, which undeniably constitutes a strong asset in terms of regional development potential. The region concentrated in 2007 12.7% of all the higher education institutions headquarters in Chile, 12.8% of the national higher education enrolment, and 11.9% of the supply of undergraduate programmes. Higher education in the Bío Bío Region is provided mainly in Concepción and Talcahuano,

which concentrates three quarters of the total regional enrolment, but also in Chillán and Los Ángeles and to a lesser degree in Lota, Cañete and Lebu, where some higher education institutions have their seats (see Figure 1.2). The number of higher education institutions with seats in the region has in effect increased rapidly over the last years: from 44 in 2000 to 70 in 2007, with a high growth rate of professional institutes (IPs) and private universities, while the technical training centres (CFTs) share decreased.

Figure 1.2. Enrolment in HEIs in the Bío Bío Region, 2008



Source: RSC (Bío Bío's Regional Steering Committee) (2009), "The Bío Bío Region, Chile: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, www.oecd.org/dataoecd/1/59/43694606.pdf

The growth of higher education capacity has enabled the region to support a four-fold increase in enrolment between 1983 and 2007, from 21 000 to 94 000. However, the share of the Bío Bío Region in national enrolment remained stable at around 12%, as all regions experienced growth of higher education over the same period. In 1990 13.7% of the age group 18-24 years attended undergraduate education and in 2007 the percentage had increased to 39.9%, surpassing the national average by three percentage

points (RSC, 2009). Moreover, the evolution shows an accelerating pattern over the last decade. Undergraduate enrolment expanded by 82% in universities, 149% in professional institutes (IPs), and 52% in technical training centres (CFTs) between 2000 and 2007. In 2007 the total regional enrolment was of 96 732, with 62 205 in universities as undergraduate students. The increase in enrolment is concentrated around the main knowledge centres: Concepción has 58.8% of technical training centres, 77.9% of professional institutes, and 74.6% of university enrolments, followed by Chillán and Los Ángeles (20% and 11% of technical training centres; 11.8% and 10.3% of professional institutes; 13.3% and 6.4% of university enrolments respectively).

Postgraduate enrolment almost doubled between 1999 and 2007, from 1 500 to 2 880 students, but remains at low levels. The growth rate was slightly less than the national one, so the regional share of postgraduate students decreased from 11.5% to 10.2%. Of all enrolled students in higher education institutions in the Bío Bío Region, 68% are in universities, 21% in professional institutes (IPs) and 11% in technical training centres (CFTs).

Most of the students enrolled in the regional higher education institutions come from the Bío Bío Region, with an average of only 6% of them coming from other regions (RSC, 2009) but a significant number leave the region after graduation. The largest proportion attended municipal secondary schools. The composition of student enrolment in CRUCH universities with regional presence deteriorated in terms of the national higher education entrance examination (PSU) scores. The share of incoming students with average scores higher than 700 points represented 8.6% of total entrances in 1998. By 2008 it had fallen to only 4.4%.⁹ This, and the fact that the higher education institutions have not reformed their education delivery to better respond to the needs of the new type of students, may explain high drop-out rates (around 50% after two years).

The number of academic staff, measured in equivalent hours,¹⁰ was approximately 3 868 in 2009. Of these 83% was hired by universities, 13% by professional institutes (IPs) and 5% by technical training centres (CFTs). The University of Concepción represents 32% of the total, the University of Bío Bío 12%, the Universidad Católica de la Santísima Concepción 9%, the San Sebastián University 8% and the Universidad del Desarrollo 4%. The University of Concepción, the University of Bío Bío and the Universidad Católica de la Santísima Concepción, *i.e.* the CRUCH universities in the region, obtain the biggest part of the public funding resources: In 2007, these three institutions obtained 10.1% of the Direct Public Contribution, AFD (CLP 12 438 million), 11.2% of the Indirect Public Contribution, AFI (CLP 1 737 million) and 34.2% of the Institutional Development Fund, FDI - MECESUP (CLP 1 641 million) on a national basis.

Finally, in terms of research and development (R&D), the Bío Bío Region is the second region behind the capital city area on the basis of indicators such as funding, staffing, publications or patents. The research scene is dominated by University of Concepción, but other universities are also strengthening their capacity. High quality research of international excellence is conducted in different fields such as oceanography and chemistry (University of Concepción), wood industry (University of Bío Bío), and aquaculture (Universidad Católica de la Santísima Concepción) and it boasts a Centre for Advanced Polymer Research, a joint venture between the University of Concepción and the University of Bío Bío, with regional and national funding.

1.6 Regional development perspectives

Following its tradition of strong administrative centralisation, Chile's regional policy has been largely defined and implemented in a top down fashion, leaving little leeway for regional initiative. As in OECD countries, the links between regional development and decentralisation have been increasingly recognised during this decade. This has resulted in policy measures since 2006-07 transferring new responsibilities to regional governments:

- Funding: over 50% of specific funds (10% including sector funds) are now decided in regions
- Definition of regional development strategies
- Creation of regional development agencies

Although not specifically targeting regional development, the National Innovation Strategy launched in 2007, provides a framework for innovation and competitiveness policies within regions. This strategy draws up guidelines until 2020 that include increased R&D spending, improved levels of educational attainment and entrepreneurial innovation. The Bío Bío Region has been in the forefront of these developments. As early as 2001, "*Innova Bío Bío*" was launched on the basis of an agreement between CORFO (a national public agency linked to the Ministry of Economy) and the regional government, to jointly support actions fostering competitiveness. This unique initiative served as model for what would be later known as "*Innova Chile*" (see Chapter 3). Likewise, in 2004, CORECYT (Regional Council for Science and Technology) was created in the Bío Bío Region, the first such council in the country, based on a public-private partnership between regional government, business and universities,

aiming to design regional strategies and policies that promote research and create knowledge networks.

Within the Regional Development Strategy of the Bío Bío Region for 2008-2015 education, science, technology and innovation are amongst the regionally defined strategic priorities. Strategic Line number three relates to “*Education of quality at the service of individuals, social mobility, economic competitiveness and democratic participation*” and Strategic Line number four refers to “*Science, technology and innovation for a dynamic and competitive regional economy and social development*”.

The implementation of these strategic goals is the responsibility of the regional government. The definition and implementation of the Agenda for Innovation and Regional Competitiveness are carried out by the regional development agency,¹¹ the board of which comprises representatives of regional government, national agencies such as CORFO and business. The agenda is defined and implemented in association with public and private actors, including higher education institutions and civil society.

The three strategic sectors within the agency’s agenda are food and agriculture, tourism and higher education, science and technology. These areas are funded on the basis of PMCs¹² (Programmes for Improvement of Competitiveness), now representing at least 10% of the resources of national public agencies involved in productive development, according to the budgetary law and to which national agencies such as CORFO and funds such as FNDR (National Fund for Regional Development) or FIC (Innovation and Competitiveness Fund) contribute alongside regional funds. The PMC for Education, Science and Technology aims to reinforce the “higher education cluster” in the Bío Bío Region by a series of diverse actions including the creation of a Centre for the Improvement of Firm Competitiveness, support to aquaculture, the development of a pole for the health sector and support to improving social skills among first year university students. The OECD Review of Higher Education in Regional and City Development in the Bío Bío Region is one of the components of the Programme for Improvement of Competitiveness.

1.7 The role of higher education institutions in regional development

In Chile there is no explicit “third mission” or regional development task assigned to higher education institutions. Regional engagement is left largely to the initiative of the individual institutions. However, some aspects of national policies and programmes support regional orientation. For example, the national accreditation system involves a strand for outreach (*vinculación con el medio*) that assesses the institutional policies and

mechanisms that link the higher education institutions with the local businesses and community and also aim at enhancing the academic and professional development of the staff and fulfilling institutional goals. In addition, some public funding, most importantly MECESUP (Programme for the Quality and Equity Improvement of Higher Education) includes requirements, which in practice guarantee that part of the funding will benefit higher education institutions outside the Metropolitan region and indirectly also their regional economies.

In the Bío Bío Region, a survey was conducted on this subject for the purpose of the regional self-evaluation for the OECD/World Bank Review. Amongst the respondents, regional engagement (strong links to the community and provision of research of regional pertinence) is considered as a priority and mentioned explicitly in the statement of the institution's mission in 2 out of 4 CRUCH universities, in 3 out of 11 professional institutes (IPs) and 4 out of 9 technical training centres (CFTs). Market research, reference to the Regional Development Strategy, studies relating to economic and social needs and labour market analysis are used by higher education institutions to define courses and academic programmes. Specific links with the private sector are in the form of internships for students, research in topics of regional interest, joint R&D programmes with firms and training programmes for employees. Some institutions also facilitate the labour market insertion of graduates by providing support and advice within specialised departments.

In spite of these efforts, the Bío Bío Region, the second pole of higher learning in Chile behind the Metropolitan area, experiences unemployment rates that are higher than national averages and is a net “expeller” of undergraduates to other parts of the country. In 2006, there was a net migration of university, professional institutes and technical training centres undergraduates, respectively of more than 2000, close to 1 500 and 1 000 (MIDEPLAN, 2006). This seems directly related to the level of wages in the Bío Bío Region, lower than the national average but also to the lack of sufficient skilled job opportunities. The situation is quite different for postgraduates who tend to remain in the region that even attracts postgraduates from other parts of the country. It seems relevant to put this data in parallel with recent trends in higher education in Bío Bío, as presented in Section 1.4 above: in 2007 39.9% of the age group 18-24 years attended undergraduate education, surpassing the national average by 3%. This means that the increase in higher education coverage contributes, at least in part, under present conditions, to a regional “brain drain”.

In this context, important issues arise. How can higher education institutions increase co-operation and better tailor their educational offering to the needs of the regional economy? Can stronger links with the private

sector be developed to facilitate better integration with the labour market? Can regional innovation and R&D benefit firms better, in particular small and medium sized enterprises, with more impact on the local economy? To what degree and how can the regional government steer such a process, in close cooperation with higher education institutions and the private sector? The following chapters will seek to develop these issues and provide possible answers.

Notes

1. The number of regions in the country, formerly 13, was increased to 15 in 2007 by the creation of Los Ríos in the south and Arica-Parinacota in the north.
2. Mayors and Communal Councils are elected by universal suffrage.
3. In spite of this, major public and corporate decisions are still taken in Santiago where management of most firms resides, remaining close to government. The Corporation for the Regionalisation of Bío Bío (*Corporación para la Regionalización del Bío Bío*, CORBIOBIO), a regional association, is actively pursuing a decentralisation agenda, advocating the sharing or transfer of more decision-making power to regions in strategic areas of economic development.
4. Pehuenches and Lafquenchés are the other major groups in some parts.
5. The CRUCH is an autonomous public institution, created in 1954 to “coordinate the academic activity of its 25 members, protecting their quality and academic excellence, by generation of university and public policies, defining under and postgraduate training guidelines and promoting scientific, humanistic, and technological research of excellence, sustained activities with the community and support to the country’s culture...” There are three CRUCH universities in Bío Bío: University of Concepción (UDEC), University of Bío Bío (UBB) and the Universidad Católica de la Santísima Concepción (UCSC). In the Metropolitan Region there are five, in Valparaíso four.
6. This distinction is misleading as within the CRUCH universities there are some that are privately held but the terms “private universities” are widely used for non CRUCH institutions.
7. Academic degrees recognised by law, and exclusively given by universities: *licenciado*, *magister* and *doctor*.
8. The results of this test are requested only by the universities belonging to the CRUCH. These universities establish minimum requirements of performance in this test in order for admittance.

9. Information from the “*Encuesta a Instituciones de Educación Superior en la Región del Bío Bío*” (Survey of Higher Education Institutions in the Bío Bío Region) carried out by the Bío Bío’s Research Team in 2009.
10. Full time plus half time and part-time measured in equivalent hours.
11. The ARIDP (Agencia Regional de Innovación y Desarrollo Productivo) is the regional agency for innovation and productive development, the first agency in Chile including the term “innovation” in its name.
12. Programme for Improvement of Competitiveness (Programa de mejoramiento de competitividad, PMC).

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Chapter 2: Contribution of higher education to human capital development

This chapter examines how effectively higher education institutions in the Bío Bío Region contribute to meeting the social and economic needs of the population in terms of opportunities to study and the relevance of qualifications offered. It highlights the linkages between the regional economy and higher education, as well as recent trends in demography and human capital development. It sheds light on the positive outcomes of increasing participation rates and widening access to higher education. Finally, it identifies major challenges facing the regional higher education system including high dropout rates, limited alignment of higher education to the regional labour market and the absence of region-wide governance structures and mechanisms to articulate a long term vision of human capital development in the region. The chapter closes with a series of recommendations on how to improve human capital development in the region.

2.1 Regional economic issues

Chile has made impressive economic progress since 1980, with per capita income in Chile increasing fivefold over that period. During this time, the regional economy also expanded significantly, but at a rate somewhat slower than that of the nation as a whole. As a consequence, the Bío Bío Region now accounts for a somewhat smaller percentage of total national economic activity than it did in 1980 (9% vs. 13%).

The overall growth pattern of economic activity in the Bío Bío Region has been accompanied by significant shifts in activity between sectors. These economic shifts have resulted in the dislocation of workers, contributing to chronic unemployment in certain sectors. Improving the effectiveness of systems to move dislocated workers into employment sectors where growth is occurring is a challenge in all advanced economies and regions, and the Bío Bío Region is no exception. In the Bío Bío Region, the impact of economic shifts is complicated by the fact that unemployment is consistently higher in the region than the national average.

Another factor that has significant impact on higher education's role in human capital development is the preponderance of small to medium-sized firms in the regional economy. Approximately 82% of firms in the Bío Bío Region have annual sales of less than USD 100 000. Small businesses present unique human capital needs, and responding to them effectively is a significant challenge. The large role played by small businesses in the regional economy also suggests that the role of entrepreneurship is of critical importance in the Bío Bío Region. The region has a low rate of business creation in comparison to other regions of Chile, which suggests that finding ways to increase entrepreneurship could be an effective strategy for job creation.

In this context, this chapter examines the following three dimensions to assess the effectiveness and coherence of human capital development policies in the Bío Bío Region:

- Widening access: do the existing higher education providers offer adequate learning and training opportunities to the local population?
- Demand for skills: are existing higher education institutions and programmes adequately aligned with the skill needs of the local economy and do they support entrepreneurship in the region?
- Governance framework: is higher education in the Bío Bío Region coordinated and governed in an appropriate way for the needs of the region?

2.2 Regional demographics and human capital development

The general demographic profile of the Bío Bío Region is that of a relatively stable population of about 1.9 million. Over the last decade population growth in the region has been significantly less than in Chile as a whole (7% vs. 21%). Two major factors contribute to the low rate of population growth. The first is that the Bío Bío Region is a net exporter of population to other regions of Chile. The second is that birth rates in the region are lower than the national average. The combined effect of these factors is that the population of the Bío Bío Region is both stable and growing somewhat older. This is a consequence of relatively limited economic opportunities for young adults, causing significant numbers to migrate to other regions of Chile.

The Bío Bío Region has experienced impressive improvement in educational levels in recent decades. The adult literacy rate almost doubled in the last decade, and now stands at well over 90%. Likewise, levels of educational attainment have increased significantly, with 21% having completed some form of higher education – an increase from 13% in the last decade. Educational attainment levels are slightly lower than in the rest of Chile due to the older age profile of the population while attainment rates for young adults are as high as the national average.

Higher education participation rates among the 18-24 year old age group is now over 42%; constituting an increase from less than 14% in 1990. The rate of higher education participation in the Bío Bío Region is 4 percentage points higher than the national average.

Certain demographic characteristics of the region have implications for human capital development. The most important of them is poverty: 26% of the population is classified as poor or indigent, compared to a national average of 17%. An increase in educational attainment – particularly higher education – is associated with reduced poverty rates in Chile and in the region. The rate of poverty in the region has fallen by over 50% in recent decades, with the most significant reduction occurring at the lowest income levels. It is likely that further improvements in educational attainment will also produce further reductions in rates of poverty.

The Bío Bío Region is home to one of largest concentrations of indigenous populations in Chile – namely, the Mapuche, Pehuenche, and Lafquenche peoples. While there has been some improvement in both the economic and educational conditions of these groups in recent years, they continue to lag non-indigenous Chileans. Improvement in the economic conditions of indigenous peoples is closely tied to the successful implementation of rural development strategies, which are discussed in Chapter 4.

2.3 Higher education participation and expansion of higher education sector

The human capital development of the Bío Bío Region is closely aligned with the production of the region's higher education institutions. Increases in higher education participation and the addition of significant numbers of higher education graduates to the regional population have contributed to the region's economic, social and cultural development. The challenge is to continue and consolidate the rates of growth while better aligning the higher education system to the region's needs.

Over the past 25 years, higher education enrolment in the Bío Bío Region has more than tripled reaching close to 100 000 students today. In spite of the reduction in the region's proportion of the national population over this period, the Bío Bío Region has maintained its share of total national higher education enrolment. At least 70% of higher education students in the Bío Bío Region have reached an educational attainment level higher than that of their parents.

A major factor driving the growth in higher education participation has been the expansion of the capacity of the regional higher education system; both through the opening of new institutions and the expansion of existing ones. In the last two decades, the Bío Bío Region saw the creation of several new private universities; including San Sebastián University and the Universidad del Desarrollo, both of which have grown into large and respected higher education institutions in a relatively short period of time. Likewise, professional institutes have significantly expanded their role through growth of institutions such as INACAP and DUOC that have been part of the regional higher education landscape for several decades, as well as the establishment of new institutions. Technical formation centres have also expanded significantly in recent years, and are beginning to play a more significant role in the regional human capital development system.

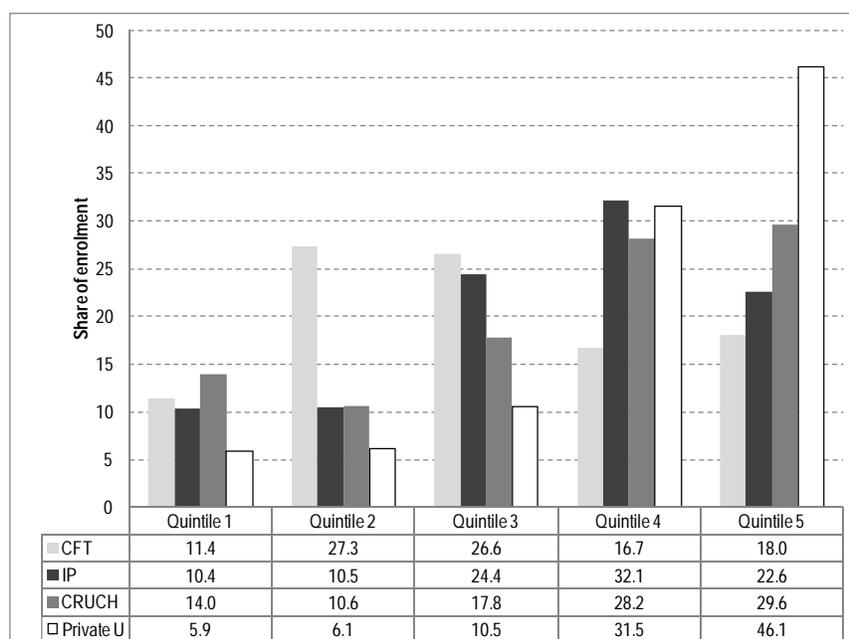
Existing higher education institutions in the region have also expanded their role significantly in recent years. About 20 years ago, the University of Concepción established the Virginio Gómez Professional Institute, with branches in Los Ángeles, Chillán and Concepción. Likewise, the University of Bío Bío and the Universidad Católica de la Santísima Concepción have both seen significant increases in enrolment in recent years. The expansion of capacity has enabled the region to support an increase in enrolment of more than 200% in the last 18 years. Furthermore, the rate at which enrolment is increasing has actually accelerated in more recent years.

2.4 Expanding opportunity for all income strata, first-generation students and rural students

While the performance of the Bío Bío Region’s higher education system in expanding opportunity is remarkable, significant challenges remain both to consolidate the gains that have been made and continue progress in an increasingly competitive situation within the higher education system. The rapid increase in higher education participation in recent years has included all students from all sectors of the society and has contributed to an improvement in overall levels of educational attainment. However, low-income potential students (quintiles 1 and 2) are less likely to enrol in higher education than those from the upper-income strata of the society. Figure 2.1 shows the percentage of each income quintile in the total enrolment of each sector of higher education in Chile:

Figure 2.1. Share of enrolment by income quintile and type of institution

In percentage, Chile, 2006



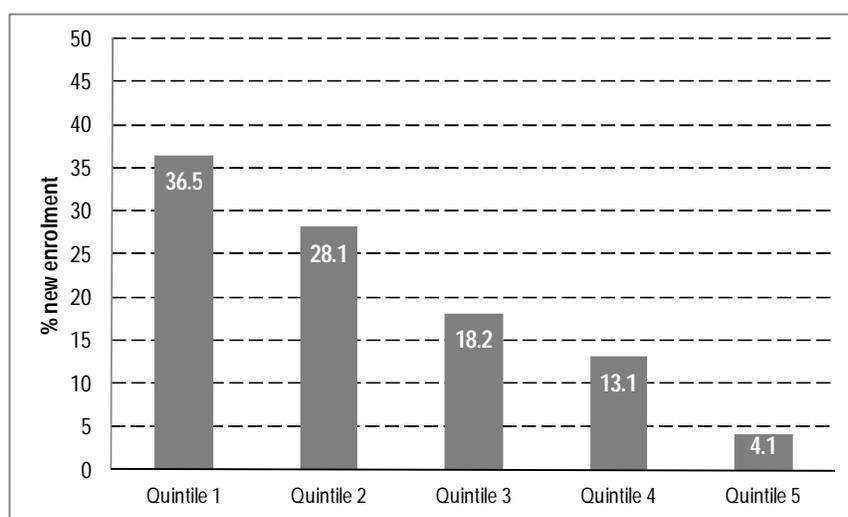
Source: Bío Bío’s Regional Steering Committee (2009), “The Bío Bío Region, Chile: Self-Evaluation Report”, OECD Reviews of Higher Education in Regional and City Development, IMHE, www.oecd.org/dataoecd/1/59/43694606.pdf

The data shows that students from lower socio-economic backgrounds are more likely to enrol in higher education in the Bío Bío Region, particularly in the traditional CRUCH and private universities.

There is some evidence that higher education in the Bío Bío Region is enrolling more students from the lower socio-economic strata of the region. Within the Bío Bío region, higher education therefore playing a “levelling” effect in terms of income inequality related to higher education enrolment. Figure 2.2 makes this relationship clear:

Figure 2.2. Share of new enrolment, by income quintile

In percentage, Bío Bío Region, 2008



Source: Bío Bío’s Regional Steering Committee (2009), “The Bío Bío Region, Chile: Self-Evaluation Report”, OECD Reviews of Higher Education in Regional and City Development, IMHE, www.oecd.org/dataoecd/1/59/43694606.pdf

Similar patterns of enrolment are seen in all types of higher education institutions in the region, including CRUCH universities. Unfortunately, the data also suggests that a large number of students with the financial means are choosing to leave the region for their studies. This pattern will contribute to a “brain drain” from the region if these students do not return to the region upon graduation.

A significant proportion of potential low income students come from rural areas where higher education is not easily available and the quality of

preparation and support services is likely to be lower. Expansion of the role of technical formation centres is one strategy for improving access to higher education among rural populations, as well as extending the benefits of higher education to rural communities. Many higher education institutions are already addressing the human capital development needs of rural communities. These efforts should be stepped up and good practices should be disseminated more widely. At the same time it is necessary to acknowledge that educating rural students is likely to contribute to brain drain if other efforts are not made to address the challenges in the rural areas. These issues will be discussed in Chapter 4.

Moreover, as noted in the OECD/World Bank Review of Chilean Tertiary Education (2009), access and equity issues are not limited to just participation; they involve the ratios of aspirants to admitted students by income group, the relative success of male versus female students, participation of students by income and type of institution, and the distribution of student aid. The OECD/World Bank team encourages the higher education institutions in the region to continue their efforts to address the equity and access issues.

2.5 Increasing participation by adults

The growing economic necessity to complete some form of higher education in order to fully participate in the economic, social, and cultural life at the national, regional and local levels applies equally to working age adults as it does to younger students. Due to rapidly changing skill requirements in working life, lifelong learning, skills upgrading and re-skilling are becoming increasingly important. The importance of skills upgrading is felt most urgently at the local and regional level. Upgrading the skills of the adult population is likely to have a more direct effect on the region's economic performance since adult learners are generally less mobile than younger students due to family commitments. For non-traditional learners, who often combine work and study, and their employers, flexible ways of provision need to be in place through work-based, e-learning and distance education. In addition, attendance on the basis of non-formal and informal learning should be allowed (OECD, 2007; 2008).

While the higher education institutions in the Bío Bío Region are aware of the needs of adults and have some programmes in place for them, limited hard data is available to understand the needs of this population or the efficacy of higher education in meeting them. While in general, the higher education institutions in the region are more oriented to meeting the needs of

traditional students, there are encouraging signs that the situation is slowly changing.

Most institutions identified continuing education programmes as their primary mechanism for meeting the needs of adults. By making courses available to non-traditional students at night or on weekends, these programmes may offer a significant benefit for adult learners. It is unknown, however, whether the availability of courses and programmes is sufficient to meet the needs and demands of adult learners. Other approaches that have demonstrated effectiveness with adults, such as work-based programmes and on-line courses targeted to adults were of limited evidence. However, the development of a special admissions process for adult students at the University of Concepción is an example of how processes and systems can be adapted to better meet the needs of adult learners.

An increasing number of potential students have family obligations that present a severe challenge to their ability to enrol and persist in higher education. Large numbers of current and potential students are responsible for small children, and cannot afford day care that could allow them to attend higher education. Generally, these potential students either do not apply to or attend institutions of higher education, even though many of them would choose to do so if a viable option existed.

An excellent example of how higher education can successfully address this issue is the Day Care Centre operated by the School of Education at University of Concepción. It offers high quality day care for the children of students right in the centre of the campus, so students can easily drop off and pick up their children, and also check on them during the day if necessary. In addition, the Centre offers students in the University's School of Education opportunities to gain direct experience in working with children. This type of synergy is a result of addressing the social needs of students in creative ways. The Centre is an excellent model that should be extended in scale and expanded throughout the region. Currently, the programme is the exception rather than the rule. The Centre at the University of Concepción is not large enough to meet the demand from current students (the Centre has a lengthy waiting list), much less all those who might be able to enrol in higher education if such a service were widely available.

2.6 Improving retention and completion in higher education

The rapid increase in higher education enrolment has contributed to relatively high rates of attrition from higher education, as students drop out rather than complete a degree. Throughout Chile, 58% of all students drop

out before completing a programme of studies leading to a degree, in comparison with the OECD average of 29.6 (OECD, 2009a). This problem is potentially solvable, which would result in a significant increase in the real benefits for both students and the society.

The reasons for high drop-out rates are manifold. The Review Team heard evidence of *i*) insufficient levels of preparation of incoming students; *ii*) inadequacies in the current university admissions systems that do not reflect the needs of students, society or higher education institutions themselves; *iii*) overextended degree programmes, *iv*) inflexible curricula; and *v*) outdated classroom practices. There was also evidence that some faculty see high dropout rates as evidence of quality rather than as a sign of the failure of higher education to address student needs and provide quality education.

One of the challenges to reducing higher education drop-out rates is assuring that students are adequately prepared for the academic challenges of higher education studies. A recurrent concern among faculty and administrators was the deficient social skills and low competence level of students, due to quality and equity problems in secondary education. The elementary and secondary schools of the region (and Chile as a whole) were cited as inadequately preparing students for higher education. This appears to be a particular problem in the case of public schools, from which an increasing number of higher education students are being drawn.

Educational reform at the secondary school level is necessary in order to align secondary school graduation standards with higher education admission standards, to establish programmes to assure that all primary and secondary students (and their families) get the information they need to prepare for higher education and to improve the preparation of teachers in the schools. Overcoming quality and equity gaps in secondary schools is not the direct responsibility of local higher education institutions. The primary responsibility lies with school authorities to work towards improving the quality of education in Chile. They will need to address the challenges in a comprehensive way and mobilise appropriate levels of financial resources to support public education.

At the same time, however, higher education institutions can and do more to reach out to local schools to raise aspirations and academic performance of students and to improve the quality of teaching. Promising work to address this need has been supported by national level funding. In 2006, the Ministry of Education in Chile identified 768 out of 1 199 public secondary schools that required a comprehensive strategy to improve students' learning outcomes. These secondary schools serve students from low-income families and the parents have low educational attainment. The

schools also have high drop-out and repetition rates. To begin the first phase of intervention the Ministry prioritised 120 schools and provided funding to higher education institutions to support schools (MINEDUC, 2006).

Box 2.1. The San Sebastián University and vulnerable schools

The San Sebastián University (USS) is a private, multi-campus university founded in 1989. The University has nearly 17 000 students enrolled in 33 programmes and 2 220 faculty members. In Concepción, the university has three campuses serving about 8 900 students in 32 programmes in study fields ranging from health sciences, medicine, veterinary sciences to education.

In 2007, based on the prioritisation of vulnerable schools, the Ministry of Education in Chile concluded an agreement with the San Sebastián University's Faculty of Education to support five prioritised secondary schools in the province of Concepción for a 3-year period. The university's intervention consisted of *i*) identification of pedagogical methodologies used by teachers, *ii*) development of teachers' pedagogical competencies and *iii*) enhancement of schools' management and leadership. University faculty and students have collaborated with external experts in pedagogy to achieve these goals.

The actions usually include three stages: *i*) analysis of the situation; *ii*) training, for example in terms of learning outcomes planning, conflict management, mediation and personal development; and *iii*) improvement of processes. To reinforce the activities, the University has involved also parents of the students in some of the learning-related activities. Challenges in the implementation of the programme have been associated with persuading schools' leaders and teachers to change classroom methodologies and practices and the use new technologies.

University students have also supported the preparatory training for the Chile's national test for admission to universities (PSU), reinforcing math and language skills. The Ministry of Education supported the university with USD 267 500 for the 3-year intervention, while the University's Office for Student Affairs and the Faculty of Education provided match funding.

In the Bío Bío Region, the problem of insufficient preparation is recognised by most higher education institutions in the region and an impressive number of school outreach programmes at individual higher education institutions and their departments are already in operation supported by the national funding (see Box 2.1). There is, however, little evidence of collaboration between higher education institutions in the region to address this challenge. The OECD/World Bank Review Team encourages all higher education institutions to step up their important outreach efforts and share good practices among themselves in a systematic manner.

Remedial courses in higher education institutions are another type of response of higher education institutions to the challenges posed by inadequate preparation. In some cases higher education institutions have moved toward a comprehensive institution-wide response addressing social, financial and learning difficulties of their students. Some higher education institutions have also taken steps to modernise their teaching and learning methods and to address the overextended degree programmes. These efforts should be stepped up and widely disseminated throughout the higher education system.

Box 2.2. El Paso, TX: widening access to higher education

The ability of the higher education institutions in the region to widen access and increase educational attainment depends significantly on preparation in primary and secondary education. The El Paso Collaborative is a long term multi-stakeholder public-private effort to improve educational attainment and retention from the first year in school through the college or university degree programme. The Collaborative includes membership from the business community, all levels of educational institutions (from primary through University), the public sector and a non-profit organisation concerned with improving educational achievement.

The goal of the collaboration, which started in 1991, was to make systematic changes in educational policy and curriculum in all of the twelve El Paso School Districts that would produce measurable results in performance in key areas of the curriculum. A specific goal of the El Paso Collaborative for Academic Excellence was to decrease the achievement gap across ethnic and socioeconomic groups.

The approach of the collaborative has been measurably successful, particularly in improving the performance of Hispanic students, a group with the largest proportion of low-income students and for whom English is usually a second language. Test results for Hispanic students in the critical 11th grade, (a year before college entry) show improvement in performance from the 33rd percentile in 1993 to the 72nd percentile in 2008. Hispanic students show increases in enrolment in science, technology, engineering and mathematics related curriculum over the period of Collaborative activities and a graduation rate of 76.7%, which is the highest among school districts in the State of Texas. Given that Hispanic students make up 89% of the student population in the El Paso school district, improvement in their educational achievement has had a significant effect on the overall performance of the school districts.

Box 2.2. El Paso, TX: widening access to higher education (continued)

Higher education institutions can benefit from the efforts to improve college readiness in the primary, secondary institutes. El Paso Community College, with five campuses in the region, is critical to the effort of widening access to higher education. The community college system is the primary entry point to tertiary education for low-income students who are unable to pay for a four-year degree programme. As a result of direct efforts to widen access and increase educational attainment, *e.g.* by obtaining grant funding to improve remedial education, enrolment rates increased by 35% between 2002 and 2008 and graduation rates increased by 92% during the same period. Programmes to increase college readiness and thus potential success in a four year degree program have resulted in significant improvements in math, reading and writing measures, with, for example, the percentage of students assessed as ready for college with respect to writing skills, improving from 35% in 2003 to 74% in 2008. One of the most innovative programmes undertaken at El Paso Community College to improve educational attainment and to increase the knowledge base of the region is the Early College High School Programme. This programme enables high school students to obtain credit for College level courses and thus to shorten the time and money needed to complete a college degree.

The University of Texas at El Paso (UTEP) has undertaken its own programmes to widen access and improve student performance and completion rates. The relationship between the broadened community programmes to improve college readiness and the ability of the University of Texas at El Paso to respond are integrally related because over 70% of the UTEP students come from within the region. UTEP has increased its enrolment by approximately 40% since the late 1990s and the vast majority of the increase has been with Hispanic students, who have increased from below 40% of the student population to over 75%. Degree award has risen from approximately 2 000 in the late 1990s to 3 500 in 2008. Attesting to a commitment to serve the bi-national and bi-cultural region, approximately 10% of UTEP's students are Mexican citizens who cross the border every day to attend classes at the University.

The University of Texas at El Paso has also taken specific steps to make college affordable and accessible to students who almost universally have to work and study. It has undertaken programmes to change course scheduling, enable students to borrow books needed for courses during the semester, and pay for their education as they acquire the funds to do so. These programmes are particularly important given the low-income levels of the college age population and their households, their lack of familial experience with higher education, their need to work while learning and their propensity to avoid borrowing to invest in higher education.

Source: OECD (forthcoming), Review of Higher Education in Regional and City Development. Peer Review Report for the Paso del Norte Region

Data about higher education dropout rates and academic progress of higher education students is lacking at the regional and institutional level. As a part of the MECESUP's Performance Agreement Programme, which provides support from the national government if lower dropout rates are reached, the University of Bío Bío has begun collecting and analysing its own data to better understand and address the dropout problem. The university reports that they have reduced the dropout rate from 48% in 2008 to 37% in 2009 year, compared to the national rate of 58%. To focus their efforts, the university has set a target dropout rate of 24%. The MECESUP programme and the Performance Agreement of the University of Bío Bío are discussed in detail in Chapter 5.

Improving retention and completion in higher education will also require improved pathways between schools and higher education institutions and among higher education institutions. In this respect, there are international examples that Bío Bío Region could use involving collaboration across institutions and education sectors. El Paso in Texas, US has a high concentration of low-income people, many with very low educational attainment. When children from these households enter school they face significant challenges in: *i*) remaining in school; *ii*) obtaining the skills necessary to increase their employability and productivity; and *iii*) obtaining a college degree. The higher education institutions in El Paso have addressed these issues in a comprehensive way and achieved notable success in widening access to higher education and in educational attainment. Underlying individual institutional efforts is the College Readiness Consortium, which connects efforts in all primary and secondary education institutions (school districts) in the region to college level programmes to increase access and attainment.

2.7 Alignment of higher education to regional labour markets

Due the continuous outmigration of talent from the region, the question of alignment of higher education to regional employment deserves attention. The increasing inter-dependence between regional economies and higher education systems means that their alignment is an issue of increasing importance. So far, this issue has received only limited attention in the Bío Bío Region.

Given the analytical difficulties and a lack of robust data, what conclusions can be drawn about the alignment of higher education in the Bío Bío Region to regional labour markets? Based on the materials reviewed by the Review Team and discussions with regional authorities, business leadership and higher education, the following conclusions can be made:

- There is limited capacity to identify labour market needs and trends on a regional basis. Consequently, most evidence about labour markets is anecdotal and/or addresses tightly focused industry sectors (*e.g.* agriculture) or specific companies.
- There is a lack of robust data on labour markets. Data is lacking from the national, regional and local levels. There is also a lack of good data about student labour market outcomes (*e.g.* employment after graduation, salary and career paths) and graduate destinations.
- Many, if not most, of the existing university degree programmes cannot be aligned with specific occupational clusters in any meaningful way. Curricula remain focused on career-based rather than competency-based. There is a lack of participation of employers in curriculum and course design.
- Several large higher education institutions in the Bío Bío Region are primarily focused on national labour markets rather than regional ones.
- Available evidence suggests that there is a stronger alignment between higher education institutions and labour market needs in the larger metropolitan areas of the region, particularly Concepción.

Higher education graduates in the Bío Bío Region earn less than their counterparts in other parts of Chile. This may suggest that the region is over-supplied (on a relative basis) with higher education graduates. However, it may equally suggest a misalignment between higher education offerings and regional labour market needs and between supply and demand of higher education graduates.

The general conclusion that can be drawn from the available evidence is that not enough robust data is available about regional labour markets to fully align higher education programmes to regional needs. Part of the problem stems from the relatively large number of higher education institutions, their high degree of autonomy and the decentralised nature of the higher education system of the Bío Bío Region. These characteristics provide advantages and strengths to the system as a whole, but have a negative impact on the ability of individual institutions to address the regional labour market needs.

2.8 Enhancing employability

The OECD/World Bank Review of Chilean Tertiary Education (2009) found that the length of university degree programmes are problematic in

Chile for a range of reasons, including: *i*) for equity, because it raises the financial and opportunity costs of getting a degree; *ii*) for relevance, because it unnecessarily delays students' entry into labour markets and disproportionately emphasises theoretical content rather than more professionally pertinent material; *iii*) for quality, as it helps maintain a focus on the number of hours spent in study rather than on competencies acquired; *iv*) for system governance, because it helps sustain the belief that a (longer) university degree must be more valuable than shorter non-university degrees; *v*) for financing, as it depresses graduation rates and erodes the internal efficiency of institutions; *vi*) for research, because students who average 7 or more years to obtain their first degree may be dissuaded from pursuing advanced degrees; and *vii*) for transparency and accountability, because the persistence of high drop-out rates appears at least partially responsible for the reluctance of institutions to analyse and share detailed data on key indicators such as enrolment and graduation rates.

In addition, the OECD/World Bank review (2009) found that employers in Chile generally have significant misgivings about the relevance of the knowledge, competencies and skills that university graduates bring to the labour market. Employers also lack the ability to make the kind of regular, systematic input into universities' curriculum content, teaching practices, and institutional governance that would enable them to argue for changes. Employers claim to be happier with the quality of graduates from the non-university institutions, including the professional institutes (IP) and technical training centres (CFT). However, employers are unhappy with the quantity of these graduates, which they see as insufficient to meet the country's economic needs.

The Review of the Bío Bío Region confirms the findings of OECD/World Bank review of Chilean Tertiary Education. Close links between labour markets and higher education institutions were, in general, not in evidence. Some encouraging steps in this direction have been taken, but in most instances they were discipline-based rather than institutionally driven. INACAP, however, has built experiential educational approach on the basis of "learning by doing" that has direct positive effect on the employability of its graduates (see Box 2.3).

Internationally, many universities and higher education institutions are building closer, more systematic links with the world of work. In the United Kingdom, Knowledge Transfer Partnership programme (Former Teaching Company Scheme) provides a grant to cover part of the operation cost to transfer and embed knowledge into business via a strategic project. SMEs represent about 90% of industry partners. Cooperative education in

Canadian universities helps students complete work terms in industry as part of their curriculum. Some universities, such as the University of Aalborg in Denmark, have also taken steps to embed employability and transferable skills in their core curriculum (see Box 2.3).

Box 2.3. Embedding employability in learning process

INACAP Technical University is the largest educational community in Chile. It has 25 campuses throughout Chile with around 82 000 students in more than 100 educational programmes. Its study programmes are offered at CFT-, IP- and university-level range from 2.5 to 5 years in length. In the Bío Bío Region, there are three INACAP campuses in Chillán, Los Ángeles and Talcahuano in the metropolitan area of Concepción, with around 9 900 students and 470 faculty.

INACAP maintains close labour market links with Chile’s “business and industry” and “professional and business organisations” to ensure labour market relevance of its study programmes. Almost 40% of faculty come from the business sector. The heads of educational programmes participate in business and professional organisations. INACAP’s educational approach is based on “learning by doing”: it combines theoretical knowledge through practical application in laboratories and internships in order to build work-related competencies. Its global partners include University of Texas at Austin’s IC², Monterrey Tech, Harvard University and the Paul Bocuse Institute. The network facilitates professional development of the faculty and up-to-date academic programmes and contents.

INACAP collaborates actively with local businesses and municipalities. In the Bío Bío Region it has carried out different projects to regenerate former coal mining zones in Lota and Arauco. For example, four INACAP professors and 80 students have developed “a gastronomic route” for Lota and Arauco. In partnership with the local government and Fundación Chile, INACAP has also developed marketing strategies to foster tourism in the two distressed communities.

All this has contributed to the employment outcomes of INACAP graduates. The INACAP’s 2008 graduate follow-up study shows that 91% of the INACAP graduates find employment during the first 6 months after graduation and 36% within a month. 45% of those graduates who were in employment said that job preparation was the most important factor in obtaining employment.

Aalborg University was established in 1974 after years of popular campaign in the region to establish a university in northern Jutland in Denmark. The campaign formed the basis for a close dialogue with the surrounding society relying on cooperation with the business sector, trade unions and cultural life. An important early decision was to base research and educational activities on interdisciplinary integration, problem orientation and group work.

Box 2.3. Embedding employability in learning process (continued)

In project oriented problem-based learning, study programmes are organised around interdisciplinary project work in groups. Up to 50% of the study is problem-oriented project work: student work in multidisciplinary teams to solve real-life problems which have been defined in collaboration with firms, organisations and public institutions. At any one time, there are 2 000 to 3 000 ongoing projects to ensure a high degree of collaboration with the society and private sector.

The Aalborg model is based on a win-win situation: It provides students with transferable skills and authentic work experience while enterprises benefit from a clearer picture of what the university stands for and how students might fit in as prospective employees. Finally, the university gains feedback from the world of work and also benefits from access to instructive cases and ideas for research and teaching.

Source: OECD (2007), Higher Education and Regions: Globally Competitive, Locally Engaged, OECD Publishing, Paris, p. 157.

2.9 Building entrepreneurship skills

The Bío Bío Region has a low rate of business creation in comparison to other regions of Chile, which suggests that finding ways to increase entrepreneurship could be an effective strategy for job creation. The Universidad del Desarrollo, in partnership with the Global Entrepreneurship Monitor (GEM) and three other Chilean universities,¹ publishes an annual assessment of the regional level of entrepreneurial activity. According to the Bío Bío 2008-09 regional report (GEM-Chile, 2009), 58% of the 18-64 year-old population in the Bío Bío Region consider themselves to have the skills and knowledge to start a new business. This figure is slightly lower than the national average of 62.6%. More importantly, the lack of effective policies to foster entrepreneurship and limited knowledge transfer from universities to business and industry are identified as weaknesses in the region.

Higher education institutions have made some initial steps to boost university spinoffs and graduate entrepreneurship in the region. For example, three universities (University of Concepción, University of Bío Bío and INACAP) have their own business incubators to support entrepreneurs through mentoring and access to funding opportunities and equipped spaces. In the case of INACAP the incubator is linked to the national INACAP's network of incubators. There was limited evidence of

entrepreneurship training to students although private universities appear to be leading the way. The OECD/World Bank Team encourages higher education institutions to step up their entrepreneurship activities that are currently at early stages and share good practices among themselves (see Table 2.1).

Table 2.1. HEIs' business incubators in the Bío Bío Region

Incubator	Institution	Year of establishment	Outcomes (Sep 2009)
IdealIncuba	University of Concepción	2001	12 companies graduated (158 jobs) 10 companies in incubation (54 jobs) 17 companies in pre-incubation (25 jobs)
Business Development Centre	University of Bío Bío	2001	11 companies graduated (28 jobs) 15 companies in incubation (31 jobs)
Inetec	INACAP	2007	24 companies in incubation (32 jobs)

Source: University of Concepción, University of Bío Bío and INACAP

Recent OECD work on entrepreneurship recommends that university provision of entrepreneurship programmes should be scaled up, focusing on growth-oriented entrepreneurship using interactive and experiential teaching methods. International experiences in Mexico and Germany highlight two different approaches that the region and its higher education institutions could benefit from in stepping up their entrepreneurship activities. Monterrey Tech, Mexico, has made entrepreneurship training compulsory to all students (see Box 2.4). The institution has supported a wide portfolio of high-tech spin offs, but also has an impressive record in support of social entrepreneurship, including notable work in remote, rural areas. In Brandenburg, Germany, universities and other higher education institutions collaborate together and with the regional development agency in order to pool resources and gain critical mass in advancing entrepreneurship (see Box 2.5). These and other examples show that higher education institutions can make a big difference in supporting the development of entrepreneurship in a region.

Box 2.4. Enhancing entrepreneurship in Mexico

The Monterrey Tech (Tecnológico de Monterrey or ITESM) is a private institution of higher education founded in 1943 by Mexican business leaders. Today, Monterrey Tech has 33 campuses throughout Mexico and 6 academic centres in Latin American countries. It also has international offices in North America, Europe and Asia.

Monterrey Tech has pioneered entrepreneurship education in a wide range of disciplines and is using interactive methods to provide all students with the skills that they need to create and develop their own businesses. Entrepreneurship is a mandatory requirement for graduation in all study programmes and interdisciplinary open innovation spaces are available in most areas of study. Moreover, each campus provides business incubators for for-profit enterprises as well as for ventures seeking improvement in social and community development.

The *Programa Emprendedor* (Entrepreneur Programme) was launched in 1985 to develop entrepreneurial skills in students as part of the curricula. In addition, in 2002 an entrepreneurial certificate was launched as an option in several campuses. In 2007, a bachelor degree in business creation and development was launched and today it is been offered in 16 campuses with minors in consulting, research & innovation and social development and with an opportunity to focus on business in Asia, business culture in China or globalisation. There are also three graduate programmes in entrepreneurship: master in innovation and entrepreneurial development through virtual university, master in entrepreneurial and technological innovation in partnership with Babson College and master in family business creation.

The Monterrey Tech's Institute for Entrepreneurial Development (*Instituto para el Desarrollo de Emprendedores*, IDE) was established in 2006 to coordinate efforts in business creation and development. IDE has 26 business incubators, 14 business accelerators and 12 technology parks. In 2009, altogether 1 318 firms were involved in the IDE business development programmes; 1 068 of them in incubation phase ranging from pre-incubation to post-incubation, 198 in acceleration and 52 in technology parks. The Centre for Intellectual Property and Technology Transfer supports faculty members, students, investors and businesses with intangible asset and intellectual property valuation, commercialisation of technology developed by Monterrey Tech and acquisition of technology to create high-tech companies. The Angel Investors' clubs Network of Monterrey Tech integrates more than 130 private investors within the 10 regional clubs that have been established. In addition, Sustainable Social Development Institute is running 60 incubators for social entrepreneurship in different parts of Mexico to support regional development and the creation and development of micro-businesses in the community.

Box 2.4. Enhancing entrepreneurship in Mexico (continued)

In 2009, altogether 8 900 Monterrey Tech students took part in entrepreneurship education provided by 118 professors. Year after year, Monterrey Tech boasts the highest number of patent requests in Mexico. In 2007-2008, the research centres generated 23 spin-off companies and the network of business incubators and accelerators created 4 700 direct jobs in Mexico making Monterrey Tech the most productive deal flow source in Mexico. Universities throughout Latin America are following the Monterrey Tech curriculum and best practices in business formation and regional economic development.

Box 2.5. Co-ordinated entrepreneurship efforts in Brandenburg, Germany

The Brandenburg Institute for Entrepreneurship and SMEs (BIEM) is the entrepreneurship institute of the regional development agency and nine public higher education institutions including universities and universities of applied sciences. BIEM was founded in 2006 as a registered non-profit organisation. One of its main objectives is to reinforce, complement and co-ordinate the entrepreneurship support activities offered by Brandenburg's higher education institutions (HEIs) by pooling resources and enhancing collaboration and exchange. BIEM helps to achieve the "critical mass" needed to realise projects with wide ranging impact.

The annual budget of EUR 100 000 is financed by the European Structural Funds, the Ministry of Economics of Brandenburg and other project-related revenues (*e.g.* fees for services). BIEM has eight employees. Each partner organisation runs additional projects and employs additional personnel according to project needs or the overall management of an entrepreneurship institute/centre.

BIEM's activities include entrepreneurship education, start-up support, entrepreneurship research and networking with business support organisations and other universities. It focuses on the expansion and better integration of entrepreneurship education into curricula, including innovative teaching methods, broad communication of activities, and an expansion of co-operation beyond BIEM's core partners (*e.g.* by involvement of university staff and external experts, agencies and companies). Partner benefit from rising numbers of students participating in entrepreneurship education activities and an increase in the number and variety of courses available for their students.

Box 2.5. Co-ordinated entrepreneurship efforts in Brandenburg, Germany (continued)

HEIs have established “entrepreneurship location managers/animators” (*Standortmanager*), who act as “one-stop-interlocutors” for would-be entrepreneurs. This structure contributes to building stronger linkages between the university’s internal and external support services and to integrating entrepreneurship education and start-up support services. Other projects include “Entrepreneurship ACs”, that evaluate entrepreneurial potentials and learning needs before start-up and match them with adequate mentoring during start-up, “Team Competency Lab” that focused on team building and coaching at the BTU Cottbus or “GO:Incubator” at the University of Potsdam.

In 2009, BIEM generated 370 initial consultations to would-be entrepreneurs. In addition, 203 were referred to external business support structures and 86 business start-ups were supported. The key elements for the institute’s success is the multidimensional co-operation between all HEIs and their external partners, the involvement of HEIs in regional leadership and a phase approach to entrepreneurship.

Source: OECD (2009b), *Universities, Innovation and Entrepreneurship: Criteria and Examples of Good Practice*, OECD Publishing, Paris, pp. 56-57.

2.10 Human capital development and the higher education system of the Bío Bío Region

One of the main issues impeding human capital development in the Bío Bío Region is the fragmented governance architecture and the absence of a region-wide coordinating structure and mechanism to articulate a long term vision and implement an integrated development strategy for all higher education institutions. The OECD/World Bank team recommends that the authorities and interested parties in the region work together with the other regions in Chile to propose the establishment of a higher education coordinating body that could define region-wide goals, policies and priorities.

The higher education system of the Bío Bío Region encompasses around 40 higher education institutions, offering technical, professional and university level studies. This is a large number of institutions in comparison to the rest of Chile. These institutions, many of which have been established in the last 20 to 30 years, are thriving in terms of enrolment. But the fact remains that these institutions are highly decentralised, that there is limited

capacity for regional coordination, and that institutions often see each other more as competitors than potential collaborators. Is the large number of institutions in the Bío Bío Region an advantage or a disadvantage?

The organisational characteristics of the regional higher education system are likely to come into greater importance in coming years as the system absorbs and consolidates the rapid growth it has experienced in recent years. The pressures that the system will experience will result from the way organisational structures affect students, employers, and the system's responsiveness to regional needs.

One issue that can be expected to increase in importance is the mobility of students between higher education institutions and across institutional sectors. As noted earlier, higher education in the Bío Bío Region, like elsewhere in Chile, is organised into three sectors: universities, professional institutes (IP) and technical training centres (CFT). This approach to organising the system offers clear advantages in terms of assuring capacity to respond to a wide range of educational and labour market needs. The organisational structure has also encouraged institutions to focus on discrete missions and student markets.

As the higher education market matures, the segregation of the higher education system into discrete levels presents challenges. The main challenge is that student mobility between institutions is often difficult. Different institutions, particularly at different levels, typically have different systems for admitting students, different academic programs structures, and different standards of assessment. All of these can complicate or inhibit student mobility. Students will increasingly desire to move from one level to another as their careers and interests develop. Having a simple and transparent regional articulation system is in the public interest.

There is a need to develop more transparent pathways for students through the higher education system, particularly when the logical pathway for students is through multiple institutions. This involves the development of stronger credit recognition schemes, course and programme articulation agreements, clear and enforceable policies related to credit transfer and increased support for joint and collaborative programmes. All these approaches should include both university and non-university sectors, since their marked separation acts as an impediment for student mobility and human capital development.

Immediate measures are needed to raise the attractiveness and prestige of technical tertiary education and diminish the segmentation between university and non-university institutions. A potential step in this direction could be the establishment of a national qualifications framework to facilitate progression from one degree type to another, to allow credit for

previous academic and job-related experiences and competencies, and to ease transitions between areas of study. The transition toward a national qualifications framework would benefit from inclusion of a review of all tertiary curricula, to make them more flexible and address excessive study hours and theoretical content in degree programmes.

An interesting project is the effort of CRUCH universities to develop a new national system of academic credit transfer based on a student workload model, rather than traditional models of faculty contact hours. This approach, similar to models now under development in Europe as part of the Bologna Process, and an outgrowth of the highly collaborative Tuning Latin America project, is a potential model not just for Chile but more many other countries and regions. Another noteworthy initiative has been launched in INACAP to improve articulation between its technical training, professional institute and bachelor level education. The University of Concepción has articulation systems in place within its technical training centre (CFT) and professional institute. The ability of higher education institutions to act as a *system* to address pressing regional needs will be of increasing importance to the region in coming years. The current initiatives, while commendable, are limited. These and other efforts should scaled up and extended to cover all accredited institutions.

Recommendations

The Bio Bio Region has made strong progress in widening access to higher education and reaching out to students from lower socio economic background. The higher education institutions have significant activities underway to raise aspirations and academic performance of students, the quality of school education and for the promotion of human capital and skills development in general.

The OECD/World Bank Review Team recommends that following measures are taken in promoting human capital development:

- Regional government, higher education institutions, other educational institutions and key stakeholders of the economy and society should work together to establish a Regional Human Capital Development System to define region-wide goals, policies and priorities extending from primary to tertiary education. As part of this system, higher education institutions and regional government should consider establishing a higher education coordinating body that would define goals, policies and priorities within the region. A major function of this body would be to evaluate how well the

higher education system is delivering the amount and quality of skills needed by the labour markets.

- Higher education institutions and regional government and interested parties should work together to improve the data on labour market needs and trends. Higher education institutions should systematically monitor student progress as well as students' labour market outcomes and graduate destinations (out-migration). The most effective region-wide graduate labour market systems are based on the collection of comprehensive labour market intelligence and the on-line publication of the data in a single place to improve students' ability to make rational choices about their studies and to help graduates and employers come together and move toward employment. Also a key is to use the data strategically to identify regional priorities and at an institutional level, to respond to the data in terms of course provision and the supply of employer specific skills.
- Higher education institutions and regional government should take steps to significantly expand higher education opportunities for working age adults. These steps should create clear and transparent pathways to advanced education for adults, including the ability to attend multiple institutions, obtain short-term education and training that can later be applied to degrees, and re-skilling and up-skilling courses and programmes designed around the needs of adults who often combine work and study. This involves the development of a qualifications framework: strong credit recognition schemes, course and programme articulation agreements, clear and enforceable policies related to credit transfer and increased support for joint and collaborative programmes.
- Higher education institutions and regional government should continue to expand efforts to increase the enrolment and success of students who are the first in their families to pursue higher education degrees. This includes building upon existing models of academic and social support services for students, increasing institutional and state aid to students as well as moving away from teacher-centred learning methods.
- Higher education institutions should continue to strengthen their efforts to improve completion rates. The efforts of several higher education institutions in the region have shown genuine promise, and these efforts should be supported, expanded, and disseminated as models to other institutions.

- Higher education institutions should focus on the employability and entrepreneurial skills of graduates; providing them with the skills and competences needed in a globalised knowledge economy. Work and problem-based learning methods and programmes to build entrepreneurship skills would improve retention after graduation in the region. Similarly, efforts in language learning could help the region in its internationalisation efforts. All degree programmes should include compulsory English.
- Employers and regional government should acknowledge the increasing relevance and importance of education in technical employment fields. There is clear evidence that needs and opportunities are growing in these fields, but that these trends are under-recognised in the region and within higher education.

Notes

1. Universidad Católica del Norte (North Catholic University), Universidad Técnica Federico Santa María (Federico Santa María Technical University) and Universidad de La Frontera (University of La Frontera)

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Chapter 3: Contribution of research to regional innovation in the Bío Bío Region

Innovation and the commercialisation of research are considered increasingly important drivers of long-term economic growth. As such they receive considerable policy attention. This chapter will examine the effectiveness of innovation policy in the Bio Bio Region and role of research conducted by the region's higher education institutions. The chapter will first consider the strengths of Bio Bio innovation policy and efforts made by the regional government, regional development agencies and higher education institutions. It will then examine where the policies and practices can be improved identifying four key issues: i) review of the public sector role in innovation; ii) continuous improvement of empirical inputs into policy; iii) building of the central focus for regional innovation; and iv) alignment of incentives in the higher education institutions. The chapter concludes with specific recommendations to improve the regional innovation.

3.1 The strengths of the innovation system in the Bío Bío Region

The Bío Bío Region has been a pioneer in incorporating the concern for innovation capacity and performance into its overall regional economic development efforts. The Regional Agency for Innovation and Productive Development (*Agencia Regional de Innovación y Desarrollo Productivo* or *ARIDP* in its Spanish Acronym) was the first of such agencies in Chile to include the word “innovation” in its name and, more importantly, to seek to integrate the promotion of innovative capacity within its overall approach to promoting economic development. *Innova Bío Bío*, a co-operative venture between the Production Development Corporation (*Corporación de Fomento de la Producción*, or CORFO) and the regional government, pre-dates the creation of the *Innova Chile*. In fact, the CORFO created the national agency *Innova Chile* as the operational agency for innovation using the *Innova Bío Bío* as its model.

A noticeable strength of the Bío Bío Region are the existing and emerging clusters in industries in which the region has a high comparative advantage. The two most notable examples are the fisheries and forestry clusters. With respect to fisheries, there is strong co-operation between different actors, including union leaders, shift managers, marine biologists, university-based researchers and state government officials. The co-operation has produced important and sophisticated analysis of where the Bío Bío Region has a comparative advantage and why – *e.g.* in what quality and temperature conditions favourable for a specific type of aquaculture. The re-training of the workforce away from capture fisheries to aquaculture appears to have been an important result of collaboration within this cluster. The region should build on this experience as a model for cluster development. This collaboration will be discussed in detail in Chapter 4.

With respect to forestry, the nature of the cluster is more varied and its research activities seem to be more diverse and upstream, but the cohesiveness of the stakeholders is similarly commendable. A high degree of appreciation of the need for diversification of production and “creation” of new comparative advantages for the Bío Bío Region particular endowment of forest resources seems to be driving research toward focused solutions. For example, the Wood High Technology Centre (*Centro de Alta Tecnología en Madera*) at the University of Bío Bío is expanding graduate enrolment and research in areas of fundamental research with clear commercial implications. The clusters members also demonstrated knowledge of industry dynamics and the relative strengths of the Bío Bío Region with respect to other countries producing forest products. The cluster

should collaborate to transform these elements into concrete commercial opportunities exploitable in the short- to medium-term.

The Bío Bío Region has hence created admirable advantages in its incipient cluster strategy. It has been particularly successful in generating political commitment and stakeholder involvement in cluster activities. The challenge is to have these cluster members work towards cluster development plans of increased technical relevance and quality. An example of such a plan in the area of fisheries comes from Humboldt County, California, United States (see Box 3.1). Adopting this type of approach could provide significant advantages to the Bío Bío Region’s cluster development.

Box 3.1. Cluster development plan in fisheries: Humboldt County, CA

The docks of Humboldt Bay in California have changed dramatically since the 1970s boom of populous fisheries and limited regulation. Still, fishing and aquaculture continue to employ about 400 people, some of them second and third generation fishermen, and generate hundreds of other jobs in Humboldt County.

The “Prosperity! The North Strategy” is the title of the overall economic development strategy that Humboldt County has developed with the direction of more than 300 business and community people. The strategy aims to bring forward growth and sustainability and build capacity to compete in the global market place. It contains action lines for *i*) finding new sources of funding for marine fisheries-related research; *ii*) addressing the regulatory complexity faced by businesses for environmental compliance; *iii*) developing a Centre of Excellence for research, public education, and tourism from the counties coastal waters; *iv*) stimulating product development aimed at both the broader regional commercial markets and emerging local niche markets (farmer’s markets, organic markets, etc.); *v*) increasing harvesting and processing cohesion; *vi*) improving transportation for market access; *vii*) upgrading port facilities; *viii*) reviewing zoning regulations relevant to marine industries. The eight areas of action follow directly from a well-articulated vision and analysis of existing opportunities.

In 2005, there were 67 establishments within the fishing and aquaculture cluster. While the number of employees decreased in two years (2003-2005), the average wages rose by 21.7%. The cluster represents 1% of the total economy and 2% of the base economy in Humboldt County. The export industries of the Humboldt County grew wages 11.2% and drive the local economy.

Source: The North Coast Prosperity Network (2003), “Fisheries, Fish Processing & Aquaculture Industry Cluster Work-Plan 2002-2007”, Draft Document, <http://northcoastprosperity.com/files/webfm/contents/fishworkplan.pdf>, accessed 30 September 2009

The Bío Bío Region was among the first regions to establish a regional co-ordination committee for science, technology and innovation, taking advantage of the newly-added concern for regional economic development by CONICYT, the National Commission for Scientific and Technological Research. The result was the creation of *CORECYT (Consejo Regional de Ciencia y Tecnología)*, Chile's first regional council for science and technology. CORECYT's mandate is to co-ordinate, promote, articulate and implement the regional dimensions of science, technology and innovation policy. In practice it has played a role in bringing more inputs from higher education institutions into the policy process, and, along with *Innova Bío Bío*, promoting the identification of regional research priorities. The results of these early efforts have been to send a strong signal about the importance of innovation for regional economic development and the commitment of the Regional Government.

A notable strength of innovation in the Bío Bío Region is the high degree of willingness of regional stakeholders to participate in the dialogue on public policy for innovation and to engage their institutions in the policy formulation processes which creates the conditions for a widely shared commitment to innovation as a principal tool for regional development.

As a result of the vigorous policy dialogue, the region finds itself with an articulated strategy for innovation, and a clear set of long-term goals (ARIDP, 2008). These include:

- Raising the quality of human capital
- Increased level of innovation and technology development
- Increased decentralisation
- Growth, diversification, improved competitiveness and employment
- Increased regional integration

The Agenda for Innovation and Regional Competitiveness seeks to integrate specific innovation goals with the overall plan for economic development, whose time horizon extends through 2015. In addition, the overall agenda has a short and medium term complement in the Programme for Improvement of Competitiveness (*Planes de Mejoramiento de la Competitividad*, or *PMC's* in their Spanish acronyms). These plans pertain to specific sectors, set concrete goals, contain targets and indicators, and have assigned specific responsibilities for implementation to organisations and individuals. Furthermore, the PMCs were created through systematic attempts to translate the vision into effective practice. The ARIDP initiated two important consultancies, one with a regional and one with an international firm, which led to the identification of priority sectors. These

consultancies sought to maximise the use of empirical data in the determination of the most appropriate targets for policies and interventions. The commitment to empirical analytics is a strong advantage of the Bío Bío Region's approach to innovation, and one that will serve it well if it is continued and refined in the future. Finally, the identification process was participatory and drew on the expertise of and inputs from a wide range of stakeholders from business, higher education institutions, government, and civic organisations.

The systematic and empirical nature of the identification of priority sectors deserves commendation; many national governments that claim concern for innovation are unable to translate their general intentions into specific plans and agendas. The Bío Bío Region deserves recognition for its concern to make innovation effective at the micro-level through specific actions.

Later parts of this chapter will critique specific aspects of the PMCs: these critiques should serve to reinforce their importance, their central role and the need for their continuous improvement. They should not be considered a criticism of the instruments or their achievements to date. It should also be noted that the effectiveness of higher education institutions in contributing to innovation cannot be seen separately from the quality of innovation policy itself. The analysis and recommendations will consider both subjects.

Finally, the Bío Bío Region has been one of the first regions outside of the OECD member countries to avail itself of a review of the contribution of higher education to regional development. This is further signal of the seriousness and dedication of the region's policymakers to taking full advantage of the potential of innovation-based growth.

3.2 Specific strengths and contributions from higher education institutions

In Chile, innovation investment focuses on public R&D: 40% of the total R&D expenditure is carried out by universities mainly located in the metropolitan region of Santiago where two largest research intensive universities account for a large share of university performed R&D.

Many indicators designate the Bío Bío Region as the country's second strongest region for higher education and research. This is supported by a variety of empirical measures.

In knowledge production, the Bío Bío Region produced in 2008 a greater proportion of published papers than would be predicted by its share

of national population (13.1% versus 12%). More importantly, the rate of production in the region has grown significantly faster than the national average over the past two decades. Publications have increased in Chile by a factor of 34 since 1988, but by more than a factor of 50 in the Bío Bío Region. The Citation Impact is slightly below national averages, which are heavily influenced by the large research universities in Santiago. With respect to patents, the Bío Bío Region over performs; it accounted for 29% of all patents from universities in the period 1995-2007. The University of Concepción continues to be the country's top higher education institution for patent production.

The region has 24 active research centres based at higher education institutions, involving five different institutions. The region is also represented in six of 19 recognised innovation consortia, although here again the presence of the University of Concepción is the critical factor. Specific centres are devoted to regional priorities, such as fisheries and forestry, and these exhibit strong and growing ties with industry. Schools of business administration take an active interest in economic development and innovation issues, contributing expertise to policy dialogues and seeking increasingly large roles within projects.

Table 3.1. Number and distribution of patents registered by Chilean universities by institution (1995-2007)

Universities	Number	National share %	Regional share %
University of Concepción	77	26.6	90.6
Federico Santa María Technical University	52	17.9	
University of Chile	38	13.1	
Pontificia Universidad Católica de Chile	30	10.3	
Universidad de Santiago de Chile	21	7.2	
University of Antofagasta	12	4.1	
Pontificia Universidad Católica de Valparaíso	10	3.4	
Universidad Austral de Chile	8	2.8	
Universidad Tecnológica Metropolitana	6	2.1	
Universidad Católica del Norte	5	1.7	
University of Bío Bío	4	1.4	4.7
Universidad Católica de la Santísima Concepción	4	1.4	4.7
Others	23	7.9	
Total	290	100.0	100.0

Note: The Universidad de Concepción had more than 100 patents as of April 2009.

Source: Departamento de Propiedad Industrial (DPI), Ministerio de Economía.

University administrators are committed to the innovation agenda. The University of Concepción has an Office for Technology Development

(*Unidad de Desarrollo Tecnológico*, or UDT) functioning continuously since 1996. Universidad del Desarrollo maintains an active Centre for Innovation and Entrepreneurial Development (*Centro de Innovación y Desarrollo Empresarial*, or CIDE). Again, thanks largely to the presence of the University of Concepción, Bío Bío has a significant percentage of Chile's PhD programmes, enrolment and PhD-holding faculty.

Most science, technology and innovation indicators in Chile are collected only at the national level and show that Chile is lagging behind international comparisons in many measures. This has provoked a national policy response through the creation of the National Council of Innovation for Competitiveness (*Consejo Nacional de Innovación para la Competitividad* or CNIC in its Spanish acronym). The higher education sector in the Bío Bío Region is above national standards in terms of innovative capacity but so far the focus has been on knowledge production rather than on knowledge transfer. In addition, there is a strong desire within higher education institutions to be major contributors to innovation and growth in the Bío Bío Region.

3.3 The innovation system in the Bío Bío Region – areas for improvement

The inclusion of innovation as a priority in the Bío Bío Region originates with the realisation that the region's growth rates were consistently lagging behind national averages. As a result, the region's ability to reduce poverty and raise living standards was not keeping pace with those of Chile as a whole. Although these national averages will be strongly influenced by specific growth spurts in mining, fisheries, fruit, wine, and other agricultural products, keeping pace with national growth is a reasonable goal for the Bío Bío Region and one it should be able to reach.

Effective innovation strategies need to be implemented consistently over the medium-to long-term basis before benefits appear. While at the time of the review visit in August 2009 it was premature to judge the overall effectiveness of the Bío Bío Region's innovation strategy and to confirm whether it helps the region to converge on national growth rates, it is important to examine the effectiveness of initiatives to date in order determine that the region is moving in the right direction. It is also important to lay the foundations for rigorous evaluation of the innovation strategy over time.

The Bío Bío Region has made impressive progress in the formulation and implementation of innovation policy. Many steps taken to date have been commendable. These include *i*) the construction of a long-term vision,

ii) the linking of innovation policy to overall economic development policy, *iii*) the translation of policy goals into specific actions plans and *iv*) the participatory nature of the process. The long-term goals are also solid and well articulated. These include: *i*) raising the quality of human resources; *ii*) raising the rates of technological innovation; *iii*) strengthening the decentralisation process; and *iv*) strengthening the productive sector, competitiveness and rates of value added in the regional economy. These achievements put the Bío Bío Region ahead of many regions and nations whose innovation policies do not move past general statements of intentions.

The region can strengthen the effectiveness of policy and deepen a rigorous evaluation process whose results can provide feedback for policy adjustment through:

- Review of the public sector role in innovation and maximising efficiency
- Continuous improvement of empirical inputs into policy
- Building the central focus for innovation in the region
- Aligning incentives in the higher education institutions

3.3.1 Review of the public sector role in innovation and maximising efficiency

In many of the most innovative regions of the world, economic dynamism is based on the agility of private sector actors operating in highly competitive environments. Innovation in these contexts is necessary for firm survival, success is generously rewarded in monetary terms and firms that cannot compete do not survive. In this environment, governments fund knowledge creation/basic research and provide a strong judicial system to ensure fair adjudication of property rights (Pontin, 2008).

In the absence of private sector partners, the innovation model in the Bío Bío Region has a strong focus on the national and regional governments as main actors. Beyond setting goals, funding basic research, and ensuring a competitive environment with a level playing field, the public sector in the region determines the priorities for innovation, and is the principal funder of innovation.

While public and private support for R&D may be complementary in the long term, there is a dearth of evidence to suggest that in developing countries innovation models with strong reliance on public actors have the same track records of success as those that are driven primarily by actors from the private sector (David, Halle, and Toole, 2000). While justifications

often exist for a larger role for the government in the “initial phases” of the implementation of an innovation strategy, it is useful to consider the following implications associated to the strong government role:

- The Bío Bío Region is investing in the order of tens of millions of US dollars per year in innovation. It is expected that these investments will generate a positive return and produce more than their time-adjusted value in future benefits. It is expected that the investments will “payback” the public investment through the generation of increased private sector activity (and valuable publicly-provided advances) that would not have come to be without the initial government investments. As long as public resources are being invested in innovation, the agencies should foster a sense of greater responsibility to show an overall positive return to the public investment. At the time of the review, there was limited evidence of a “payback” mentality among public officials involved in innovation, clients and beneficiaries. It is important for the ARIDP, *Innova Bío Bío*, CORECYT and other regional actors to counter the idea that any positive return, regardless of whether it exceeded the government investment, is a success.
- The large public role in the regional innovation system may lead to the funding of innovations which are not commercially viable without subsidies. This may distort the idea of innovation away from its core as “commercially useful knowledge” toward a broader definition of “new knowledge.” Measures should be put in place to ensure that government funding for innovation mimic as closely as possible a reasonable approximation of private sector conditions. No benefits are gained by funding uneconomic innovations, unless the innovation has a value as a public good that clearly justifies its subsidisation. At the same time, higher education institutions must go beyond their traditional role of knowledge producers and embrace a more robust conception of innovation in which the responsibility for both knowledge creation and commercialisation is more evenly shared among actors.
- There is a danger that a publicly-driven innovation system undercuts its own goals of developing entrepreneurship. By creating expectations of national or regional government subsidies to innovation, the government sends signals to potential entrepreneurs about the levels of competition they are likely to face. There is evidence that the strong government presence in the Bío Bío Region is influencing entrepreneurship attitudes. The risk is that the measure of success becomes its ability to attract public funding for

an idea, not its eventual successful expression in the market as a product people want to buy.

- The most important drawback of a publically-centred system is that it is likely to miss a crucial technical element: the dynamic role of the funders in determining the value of an innovation. By deciding whether to continue to fund an innovation, using their own money, venture capitalists and other financiers provide a key service. Funders are often the most important vehicle that keeps innovators focused on achieving success in the shortest time possible, or abandoning the idea. When innovation systems are funded with public money, this source of pressure disappears, and with it an important element of competitive stimulation. Some public programmes have found successful substitutes, through “sunset” clauses, tight deadlines, rigorous multi-stage review of proposals or other explicit attempts to mimic private sector funders, but these are the exception rather than the rule. Requirements for private sector counterpart contributions seldom provide solutions to this problem, as it is almost impossible to determine whether these funds are really “fresh” or additional spending. Over the longer term, this substitution of public for private financing deprives innovators of specific expertise and may also delay the emergence of private sources of capital for innovation. As long as the government is providing equal or better financing conditions, private funders of innovation will have no incentive to enter the market.
- Even when a large public presence exists and is considered necessary in the short-to-medium term, there is a need to find out whether it is using a full range of available instruments in the normal public sector portfolio. These may include tax subsidies for R&D, “research in industry programmes,” provision of technical services, vouchers for consulting, low interest loans, etc. The Bío Bío Region has an over-reliance on projects as the main vehicle for stimulating innovation and a tendency to measure success in innovation by the amount of (public) investment made, not the amount of commercial return generated. For example in the 2008 *Informe de Gestión* of *Innova Bío Bío* report, measures of investment are used as the yardstick of success, while it contains no indicators of output or impact.

Despite these caveats, the public model is appropriate for the Bío Bío Region now and will remain so in the immediate future. It is unrealistic to expect the emergence of private sector financing entities and other players in the short- and medium-term. It is, however, important that those managing

the public model be aware of its inherent disadvantages over a private model (see Box 3.2), and take active steps to mitigate or eliminate these. The best means of keeping this on the policy agenda is through the construction of efficiency/performance indicators for public agencies including higher education institutions involved in innovation. These indicators could include:

- Time to process project applications
- Cost to the proponent (in time and resources) of applying to various public programmes
- Administrative costs for the programmes, etc.

The indicators should be measured and benchmarked against a set of credible comparators that include good private sector actors as well as top public sector agencies. Speed is of the essence for innovation, so if authorities create programmes and instruments to substitute for the absent private sector, these should seek the highest levels of efficiency.

Box 3.2. Perceived weaknesses of government promotion programmes

- Poor co-ordination between institutions
- Lack of flexibility
- Lack of information
- Duplication of effort
- Inadequate design of incentives
- Excessive delays and bureaucracy
- Lack of definition of baseline data or characteristics of target populations
- Weak monitoring and evaluation
- Inadequate programme management and oversight
- Low user satisfaction rates
- Few indicators of overall success or successful process management
- Limited impact on evaluation

Source: Universidad Católica de la Santísima Concepción (2008), “Identification of Competitive Sectors in the Bío Bío Region” Consultancy Report presented to the Regional Agency of Innovation and Productive Development, Concepción, 2 July, p. 66 and Annex 2.

3.3.2 Continuous improvement of empirical inputs into policy

The Bío Bío Region has made considerable progress in seeking to underpin innovation policy with a strong foundation of empirical data. The ARIDP and other stakeholders have gone significantly farther in this than many regional agencies worldwide. The quality of the work achieved to date is a reflection of this commitment to evidence-based policymaking. The UCSC Consultancy, the Agenda 2008-2012, and the PMCs all make significant use of the available data and seek to ground decisions in fact-based analysis.

The UCSC consultancy serves as the basis for the agenda and for the selection of the three priority sectors – agriculture/food processing, tourism, and higher education – for first elaboration of the PMCs. As such it is critical to understand in detail the criteria used.

The conceptual framework for analysis is robust, but there is an over-reliance on key informant information. Moreover, the report does not provide information on the sample size, nor the professional profiles or backgrounds of the key informants. Nor does it mention the means of resolving inherent conflicts of interest: those who have the greatest specific knowledge of a given sub-sector are also those who are likely to be biased toward its future potential, and they are the ones who would benefit from the sub-sector being chosen as a target for a competitiveness improvement programme.

In addition, an examination of the selection process shows that the selection was not based on neutral empirical data. Three criteria were used for selection: *i*) potential economic impact; *ii*) competitiveness; and *iii*) potential for future growth. The UCSC Consultancy Report shows 25 criteria in an index used to select the sectors. Of these 25, fifteen are “qualitative” assessments. However, beyond stating that these are the opinions of business leaders and experts, no information is given regarding about who made the qualitative judgments or on what basis. Additional two factors relate to the number of projects approved in the respective areas. While this indicator is important in some respects, it serves to reinforce the supply-driven approach to innovation. The more empirical indications like level of employment, average salary levels, and most importantly, level of growth and profitability of firms are swamped by the qualitative measures. Finally, information provided by the ARIDP states that of the three sectors chosen, economic impact was taken into consideration in only the food processing sector. Higher education and tourism were selected on the basis of competitiveness and potential for growth, the two categories where the criteria are almost exclusively qualitative and based on key informant information.

The analysis of the competitiveness of the higher education sector is based on the findings of regional experts, including a workshop attended by 30 representatives of universities, institutes, businesses and the public sector. The competitiveness analysis in the higher education sector suffers from the lack of key empirical data and over-reliance of key informants from the sector and the region. Several key factors have been overlooked:

- Historical data on enrolment increases has been used without noting that Chile is beginning to approach the saturation point for new entrants into tertiary education (national enrolment is now at 42% of the age group, while government goals are to reach 50% of the age group). There has been no discussion what will happen when this additional 8% of the age group matriculate or whether the achievement of a “steady state” rate of enrolment (at 50% of the age group) would be sufficient for the Bío Bío Region to realise its goals in the higher education area.
- Most higher education growth is taking place among first generation students with relatively low PSU (national university entrance exam) scores who are likely to study in technical training centres (CFTs). In fact, the comparative advantages in higher education are connected to universities, advanced training, and research. Two radically different strategies would be needed to serve these two different goals, but the differences are not discussed.
- The existence of the *Becas Chile* Programme has been ignored. *Becas Chile* has greatly expanded (by a factor of 10) the number of scholarships available for students to pursue PhDs in high quality universities abroad. The result of this national policy will be to create significantly greater competition among universities for the pool of talented graduate students to populate research-based doctoral programmes.
- There are strong differences in the views of the value of tertiary education between university stakeholders and stakeholders from the business sector. These surveys showed a marked tendency for tertiary education stakeholders to have a much higher opinion of the value added of their products than employers or members of the business sector. The resulting biases needed to be controlled in order not to overstate the potential value of tertiary education.

By looking mostly at historical data and by over-reliance on key informants from the region, the analysis appears to have failed to consider some potentially crucial issues in competitiveness. To improve the situation the region should:

- Seek a balanced view of key informants from outside the region as well as from inside the region
- List the institutional affiliations and professional profiles of key informants to provide a picture of who is giving their opinion
- Seek to limit the number of qualitative parameters within the constructed indices or combine these into a single index that is then balanced by more objective data

No perfect science exists for selecting priority sectors, nor can one find any foolproof formula for mixing key informant and qualitative data with neutral statistical analysis. However, given the role of clusters in the Bío Bío Region's innovation strategy, the need for larger amounts of better data on firm characteristics and performance should be a key priority. Only limited detailed information on firm characteristics and performance was included in either the regional self-evaluation report for the OECD review or the basic documents for innovation policy. For instance, given the prominence of forestry in producing the regions exports, it is necessary to develop a complete analyses of the number of firms in the sector (disaggregated by subsector), the number of employees per firm, measures of human capital per employee, employee tenure and wage data, longitudinal analysis of firm creation and survival rates, measure of overall profitability, profitability per employee, productivity growth and inter-firm sales.

The Bío Bío Region performs very poorly in creating new firms from the research. In fact, only two regions in Chile have worse figures for firm creation. For the regional authorities to understand this large potential obstacle to a cluster strategy, more and better firm-level information is necessary.

Very few regions start with high levels of good quality data readily available. In most cases a learning process occurs through which regional innovation authorities and stakeholders:

- Educate themselves about sources of key data needed for analysis (tax authorities are the most frequently “discovered” source of this type of information).
- Begin working with national and regional statistical agencies to improve the amount and quality of information collected from standard industrial and innovation surveys.
- Commission independent studies to systematically collect complementary data.

The degree of resources, time and dedication devoted to improving data sources testify to the complexity of the process of encouraging the emergence of cluster and strengthen value chains. Without detailed information on sector and sub-sector performance, there is a risk to fall back into anecdotal evidence to substitute for the analysis which should underpin policy.

There is also a need for stronger monitoring and evaluation of innovation outcomes and impacts. It should become the norm for cost-benefit and cost-effectiveness evaluations to accompany projects. Innovation funding agencies may wish to require a certain percentage of resources (as much as 3%) to be spent on monitoring and evaluation. Projects whose proponents do not complete evaluations should be prevented from seeking additional funding. As data sources are improved, they should be incorporated into and consequentially used for monitoring and evaluation.

3.3.3 Building the central focus for innovation in the Bío Bío Region

The Bío Bío Region has articulated a strong set of long-term goals for its innovation policy. The third area for potential improvement involves how the region translates these long-term goals into short-and medium-term plans. The ARIDP has made commendable efforts to do this in a systematic manner, using competent consultancies and broad stakeholder involvement. This has been successful in many aspects, and has positioned the Bío Bío Region beyond many regions which find themselves in pursuing innovation goals.

However, a few additional factors require more in-depth consideration. The first is to identify a central focus for the short-and medium-term goals in innovation goals. International experience shows the particular importance for small regions – the Bío Bío Region has less than 2 million inhabitants – to be judiciously selective in their innovation goals and to stick to these goals over time. Small regions that have successfully implemented innovation policies have found a “central focus” or a “unifying theme” that ties their long-term goals to their short-and medium-term strategies. These may range from export-oriented advanced manufacturing (Catalonia), machine tools, aerospace, and transport (early Basque Country strategy) or advanced health services and telecommunication and electronic equipment manufacturing (Meuse-Rhine Triangle of Belgium, the Netherlands, and Germany) to university-based biomedical research (Research Triangle, North Carolina, United States). By narrowing their focus to specific areas, these regions sustained their commitment to successful innovation. As they

built success in the initial areas, they were able to expand the strategy over time.

The Bío Bío Region has created the conditions for this unifying theme to emerge, but has not yet successfully identified the theme. The selection of nine strategic sectors by the ARIDP Strategic Council in November 2007 would have been an appropriate time to consider and choose the best central focus for the Bío Bío Region. However, the three sectors chosen for initial emphasis represent a diverse range of goals and approaches which are displayed in Table 3.2.

Table 3.2. ARIDP strategic sectors and their implications

Sector	Goal	Business focus	Caveats	Human capital needs
Tourism	To improve the infrastructure and marketing of the region's existing advantages. To capture a larger market share of meetings, conventions and expositions.	Natural advantages. "Head-to-head" competitiveness. No sustained focus on technology upgrading.	Considerable efforts needed to upgrade the quality of natural amenities, hotel facilities and hotel personnel to attract tourists. Large business and investments necessary.	Human capital upgrading among secondary school and CFT graduates.
Agriculture / food processing	To develop an agricluster (berries, honey, milk and meat).	SMEs and smaller producers.	Considerable efforts needed to forge an identity as a national agro-alimentary production pole. Potentially competing goals with forestry in terms of land use.	Human capital requirements focus on the lower spectrum of skills gained in secondary and technical education.
Higher Education, Science and Technology	To expand HE enrolment. To develop science, technology and innovation and research capacity within nationally-recognised universities.	Transversal across many sectors.	Necessary to capture increasing amounts of national research resources.	Considerable requirements for advanced human capital.

The Bío Bío Region is hence seeking multiple goals through its innovation policies and it is difficult to identify what are the most important directions needed to be taken: Is innovation in the region a jobs strategy for low-income workers? Is it a knowledge-based business strategy, where a few leading firms create massive amounts of value added? Or is it mostly

concerned with technology upgrading in the small and medium sized enterprises? Is it essentially an export-oriented strategy? Or is its essence to build up knowledge and research through educational institutions. For more effective outcome, a more focused policy is needed.

More effort should also be put into identifying the most important facets of innovation in the region. This could have three potentially beneficial effects: *i)* it can avoid the potential to disperse effort over too many goals and initiatives; *ii)* it can allow for more in-depth treatment of a smaller number of sectors and subsectors, potentially increasing chances of success; *iii)* it helps solidify the Bío Bío Region's external reputation as excellent in a given area. The last criterion has been successful in creating regions which are "known for" given areas of expertise and hence more easily attract investment and complementary industries in clusters.

3.3.4 Aligning incentives in the higher education institutions

A fourth issue for the Bío Bío Region in the revision of innovation policy is greater attention to the alignment of incentives in higher education institutions and the reduction of the perceived gap in quality between employers and providers.

The region's leading research institution, the University of Concepción, competes on a national level for resources, faculty, recognition and prestige. It responds first to policies and priorities emanating from Santiago and from national agencies like CONICYT or the MECESUP programme. The Bío Bío Region has gone a long way in seeking greater local control over resources, but even agencies like CORECYT recognise that they can play only a complementary role for the foreseeable future. Therefore, regional authorities must make efforts to ensure that the regional priorities for research are aligned with national incentive policies. There is, however, also a need to ensure that the highly successful knowledge production in the leading university also links to the regional economy and that more focus is placed on knowledge transfer.

The faculties of business administration demonstrate a consistent desire to contribute to overall commercialisation activities, adding a needed dimension to the traditional knowledge creation function. Indeed, there is evidence that co-operation between sectoral research and business faculties is increasing. This trend should be strongly encouraged.

Finally, higher education institutions, employers and innovation agencies should co-operate to stem the divergence in perception on the value of the skills imparted to graduates. This may involve greater differentiation between the efficiency and connectedness of technical training centres

(CFT) and professional institutes (IP) with employers and that of universities, which have traditionally been more distant. The universities should learn from the good practices provided by the CFT and IP sector in order to increase relevance.

Conclusions and recommendations

The Bío Bío Region is a clear leader in making innovation a pillar of its economic development and future prosperity. It has excelled in numerous areas of planning, co-ordination, analysis, goals setting, prioritisation, and consensus building. It has a coherent plan with well articulated long term goals. It has used systematic analysis to convert long-term strategy into short- and medium-term targets in specific sectors. It has pioneered new agencies and organisational arrangements, some of which have become national models. It has had particularly notable success in uniting stakeholder and leveraging significant amounts of co-operation across agencies and institutions.

The Bío Bío Region has significant activities underway for the promotion of innovation with high hopes for success. The OECD/World Bank Review Team recommends that the chances for success can be increased if the following measures are taken:

- The strong public presence in the innovation model should be recognised and its potential deficiencies should be reviewed. Innovation authorities should take explicit actions to diminish potential negative consequences of the large role of public agencies as direct service providers, *i.e.* funders of innovation, and ensure that this presence does not discourage the emergence of private sector actors.
- Concern to monitor the rate of return on public investments should be increased, for its own sake and as a means of encouraging high calibre entrepreneurship and competitiveness.
- The balance between key informant data and more neutral statistical measures of innovation performance should be revisited as it affects policymaking. Key informant information should in all cases be complemented with views from outside the region, and selection and other tendencies toward biases should be mitigated.
- A wider portfolio of data related to firm characteristics and performance should be developed in conjunction with the promotion of cluster-building strategies and evidence based decision making in general.

- Efforts to unify the main goals for innovation in the region in the short-to-medium-term should seek to identify a central focus. Innovation authorities should guard against pursuing too many goals simultaneously and/or dispersing energy and efforts.
- The incentives for higher education institutions should be continuously reviewed to find ways of influencing these toward more concrete participation in innovation activities and move from knowledge production to knowledge transfer and to perceive job creation as one of their tasks.
- Higher education institutions should be encouraged to step up their innovation and knowledge transfer activities and share good practices among themselves in a systematic manner. Furthermore universities should learn from good examples provided by the leading technical training centres and professional institutes to improve labour market relevance of their learning programmes.

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Chapter 4: Social, cultural and environmental development

Social, cultural and environmental development underpins and stabilises economic growth and improve community health and welfare, social cohesion as well as clean, healthy and sustainable environment. This chapter will review the contribution of the higher education institutions of the Bío Bío Region to its social, cultural, and environmental development. Due to the fact that the region has the highest percentage of a rural population in Chile, the chapter will have a special focus on rural development, where social innovation aiming to foster local initiative is one of the features of sustainable rural economies. The chapter concludes with recommendations.

The social conditions in the Bío Bío Region have improved considerably in the last two decades. Still, in a national comparison, Bío Bío is one of the regions with the highest proportion of poor and indigent families. Rural poverty is more prominent than in cities: several municipalities in the region count among the poorest in the country, although their situation has improved over recent years.

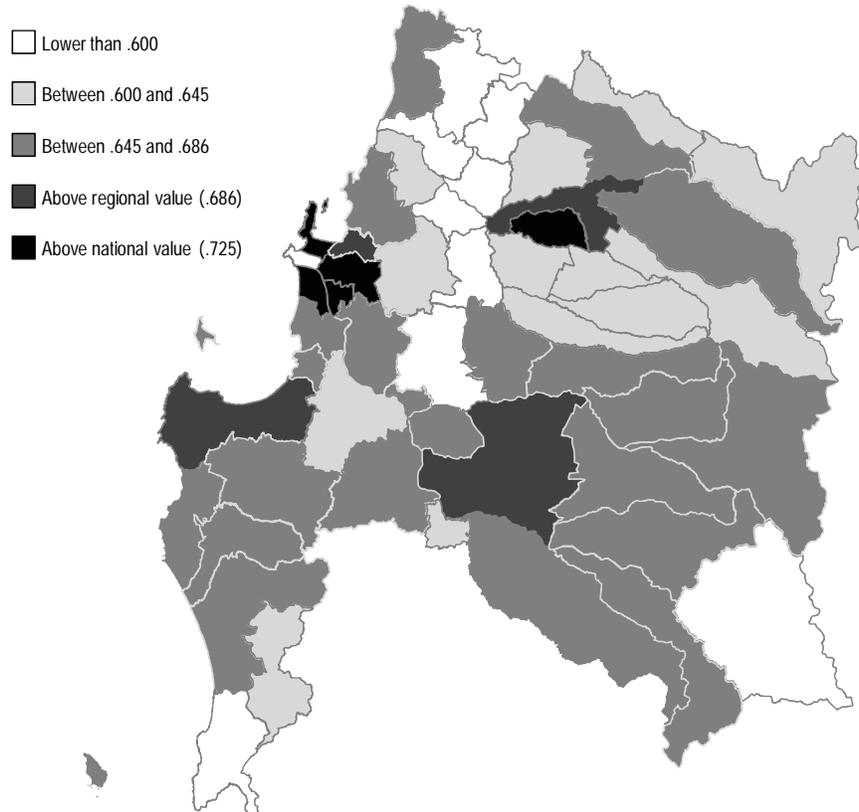
Despite the improvement over time, in terms of the UNDP HDI (Human Development Index)¹ that combines life expectancy, education attainment and per capita income, the Bío Bío Region continues to under-perform. In 2003, the Bío Bío Region ranked number 10 in Chile with the value of 0.686 which is lower than the national average of 0.725 (UNDP, 2004).

Nine out of the 54 municipalities have HDI scores above the regional value (0.686) and only five municipalities (Talcahuano, Chillán Viejo, Concepción, Chiguayante and San Pedro de la Paz) are above the national value (0.725) (see Figure 4.1).

The Bío Bío Region is the third densely populated region in Chile with Greater Concepción representing 36% of the regional population. At the same time, it has the highest percentage of rural population (18%) in the country. This share has diminished over years with increased urbanisation and its corollary, rural out-migration. Out-migration, usually resulting from reduced job opportunities in agriculture because of increased mechanisation and productivity, entails ageing of the population and a general loss of vitality of rural economies, a trend that has affected or is still affecting many rural areas worldwide.

Another characteristic of lagging economies relates to higher unemployment: in the Bío Bío Region average regional unemployment was at 11% at the beginning of 2009 but it reached 18% in some rural areas. Unemployment is structural in nature and linked to shifts in the regional economy. As a consequence, the region is a net exporter of population with half of the migrants moving to the Metropolitan Region.

The Bío Bío Region is culturally diverse. Of the total regional population 7.8% declare to belong to one of the eight officially recognised ethnic groups, although the great majority of these are Mapuche. Most have moved to urban centres, living in conditions of poverty and indigence. Alongside ethnic identity there remains the heritage of certain activities that have evolved like coal mining, forestry, fishing and agriculture, textiles and steel. Only 3.8% of the regional population participates in community organisations and in art and cultural events. In the case of indigenous populations, only 0.6% participates in ethnic and community organisations.

Figure 4.1. HDI in the municipalities of the Bío Bío Region

Note: No data are available for the municipalities of Hualpén and Alto Bío Bío (both created in 2004).

Source: Data from UNDP (United Nations Development Programme) (2004), *Las Trayectorias del Desarrollo Humano en las Comunas de Chile 1994-2003* (Human Development Pathways in Chile's Municipalities 1994-2003), UNDP/MIDEPLAN, Santiago de Chile.

Despite the improvements in recent years, there are various environmental risks, often due to economic activity in the region. These include soil degradation due to monocultures, reduced marine biomass due to polluted bays, air pollution from industrial activity, damage to ecosystems through the construction of hydroelectric power plants, risk associated with fuel distribution, garbage dump and stocking areas.

In the context of diverse population, growing rural-urban divide and environmental degradation, this chapter examines:

- What is the contribution of higher education institutions to the Bío Bío Region's cultural, social and environmental development, particularly in rural areas?
- Are the activities of the higher education institutions appropriately targeted to address the key challenges in the region? Are there gaps in delivery and or emerging areas and topics that would benefit from closer attention from the higher education institutions?
- What lessons can be learnt from international experience?

4.1 Rural development policies and higher education programmes

Chile has become a major agricultural export country and the Bío Bío Region is one of the main contributors to this segment of the economy. National policies seek to further develop the country's comparative advantages in this area. Of the eight clusters identified by the National Innovation Council in 2007, four concern agriculture and fishing (fish farming, pork and chicken farming, processed food and fruit industry) and one – tourism — has impact in rural areas.

The profile of the rural economy of the Bío Bío Region is contrasted. The region is leading in forestry with 37.3% of Chilean forest plantations and close to 60% of sawn wood production in 2007. The sector is dominated by a few highly productive export oriented firms but the share of higher added value transformed products remains modest compared to basic wood products (pulp and cellulose, sawn wood) accounting for two thirds of regional exports. The extensive development of planted forest land has entailed a decrease in agricultural land of around 3% per year, compensated by improved productivity, so overall production levels have increased while promising new developments (berries, asparagus) have appeared. Land tenure is mostly characterised by small size: close to 50% of farms in 2007 had less than 5 km² but more than 50% of cultivated land was within farms of more than 50 km². Lastly, fishing is an important component of the economy in the Bío Bío Region, the second region for this activity (20.6% in 2005). Depletion of resources and quota policies, have however led to reduced catches and increased unemployment in coastal areas, with new venues in aquaculture being sought. The Bío Bío Region has an important potential for aquaculture that is not exploited to this day, contrary to other Chilean regions.

The Regional Development Strategy of the Bío Bío Region for 2008-2015 aims to increased competitiveness in a certain number of sectors including agriculture while also emphasising education, science, technology and innovation. These policy priorities are well reflected in the “Agenda for Innovation and Productive Development of the Bío Bío Region for 2008-2012” with the first “Programmes for Improvement of Competitiveness” (PMCs) relating to education and innovation on one hand and to agriculture (first component: cattle breeding) on the other. Although most programmes relating to education and innovation do not directly concern the rural economy, these can be developed by capitalising on the presence of higher education institutions in rural areas, while the PMC targeting agriculture involves their R&D and training capacities. Higher education institutions are well placed to impact the PMCs: The management committees of the two PMCs include representatives from higher education institutions and the Education and Innovation PMC is presided by the Rector of the Universidad Católica de la Santísima Concepción.

The major higher education institutions, universities, professional institutes (IPs) and technical training centres (CFTs) maintain presence in the different provinces of the Bío Bío Region, including the most rural ones. In Chillán, the capital of the Province of Ñuble, a major higher education presence directly relevant for rural areas is maintained by the University of Concepción, the University of Bío Bío, the Universidad Católica de la Santísima Concepción and INACAP. The University of Concepción opened its Chillán campus in 1954 and has trained up to this day 1 500 agronomists, 1 000 veterinarians and 300 agricultural engineers, the only curricula of its kind in the country; it cooperates in different research projects with agri-food firms and has contributed to major productivity gains in the agricultural sector while helping in the launch of successful niche products such as berries, asparagus and medicinal plants (within Technology Transfers Groups relying on laboratory resources) in which the Bío Bío Region now enjoys the top position in terms of production in Chile. Quality wine production now developing in the Itata Valley is supported by means of a wine analysis laboratory. The University of Concepción in Chillán successfully cloned the first calf in Chile in 2008.

The Universidad de Bío Bío opened a food analysis (health and quality control, certification) laboratory in Chillán in 2000 (LECYCA) that cooperates with small and medium sized firms. Financing of the centre was ensured by the regional government with support from the FNDR (National Fund for Regional Development). The other major university institutions with impact in rural areas are located in Concepción. The University of Bío Bío has a Forestry faculty with different undergraduate (architecture, forestry, industrial design, civil engineering, etc.) and graduate programmes

(energy efficiency and sustainable habitat, wood construction, architecture and city planning, etc.). Laboratory facilities conduct research in wood genomics, composite materials and bio-deterioration in particular.

Teaching, training and research in the fields of fishing resources is carried out by the Universidad Católica de la Santísima Concepción with major strategic research and projects developed in the context of the important difficulties now facing the fishing industry (12 000 jobs in the region). Several higher education institutions, including the Universidad Católica de la Santísima Concepción, University of Concepción and IP Arturo Prat, also participate in a “Public-Private Roundtable” discussion on investigating future development strategies for the fishing industry in the Bío Bío Region.

4.2 HEIs widening access and providing services to rural communities

The higher education institutions in the Bío Bío Region see widening access and increasing participation of students from lower socio-economic backgrounds as their key social contribution to regional development. They have been instrumental in the increased access of the lower income quintiles to higher education. As seen in Chapter 2 on human capital development, with the help of funding from the Ministry of Education, they have each developed their own projects and approaches to collaborate with the schools by improving the management of the schools themselves and raising the aspirations and learning outcomes of students.

The University of Concepción has developed “Talent Programmes” in cooperation with the municipal councils of Hualpén and Talcahuano. The programmes aim to motivate secondary school pupils towards higher education and help them to determine their future study areas by bringing in top level professionals and scientists to speak about different careers during meetings organised in the schools. The University of Bío Bío has devised a programme in the Province of Arauco in favour of young people who have failed university entrance exams but accept to sign up for basic professional training in different fields. As seen before, the Universidad Católica de la Santísima Concepción is the only university to maintain a campus in the same province (the one with the highest percentage of indigenous population, mostly Mapuche), with 1 500 students attending its Cañete Agricultural Technology Transfer Centre. The San Sebastián University has identified five secondary schools in different parts of the Bío Bío Region presenting specific characteristics of social vulnerability, where targeted support programmes to ensure that students are better prepared for entry into the higher education system.

Most higher education institutions also provide a wide variety of services to different communities, usually in the health and social sector. Valuable work is carried out, not the least in rural areas where many higher education institutions reach out to the low income population segments in particular. In many cases students are involved in non-credit bearing outreach activities. While lack of doctors and particularly certain specialists in rural areas is a recurring problem, the region's low income population would also benefit from stepping up preventive health care. Both approaches are present among the higher education institutions in the region, as is evident in the examples below. Again, each institution has developed its own projects and approaches to collaborate with municipal government and/or other stakeholders and funding agencies to improve the social conditions in the region.

The University of Concepción has established a programme in ophthalmology whereby students receive financial support on the basis of an agreement to serve a minimum of three to five years in rural areas. This programme is now being opened up to other fields of medical practice. In addition, the university has started a programme in line with the national initiatives, which encourages university graduates in medical fields to stay and work in remote areas after graduation. The San Sebastián University has a special commitment to social responsibility and delivers this commitment through all study programmes. It has, for example five dental clinics in different parts of the region and has signed a series of agreements with municipalities to facilitate access of the poorest people to these facilities. The University of Bío Bío has implemented information campaigns to counter infant malnutrition in the countryside, contributing to a dramatic decrease in mortality rates (the infant mortality rate was reduced from 75 per 1 000 in the 1970s to 6 per 1 000 today).

Most of the higher education institutions' initiatives are based on social innovation and address sector-specific issues, lacking a more integrated approach to local economic and social development in the region. There are, however, some innovative approaches under way that will be both impactful and could be extended and scaled up. For example, the University of Bío Bío opened the Agri-business programme in Chillán at the beginning of 2009 that is creating a public-private regional network to train entrepreneurs in new marketing techniques and pricing strategies.

Another innovative approach to local economic social development is taking place in El Carmen with the help of the University of Concepción. El Carmen, situated 45 km from Chillán is home to 14 000 inhabitants and is the poorest municipality in the Bío Bío Region and one of the poorest in Chile. Since 1993, an integrated approach to local economic and social development in El Carmen has been implemented through education and

training with the support of the Faculty of Agronomy of the University of Concepción and INDAP (National Institute for Agricultural Development). Citizen participation in the different actions undertaken is ensured through the seventy “*Juntas de Vecinos*”² (neighbourhood associations) that exist in El Carmen. The university is helping to prevent further out-migration by supporting small farmers who receive training in specific areas (irrigation, new cultivation techniques which respect the environment as well as product diversification) with active participation of teachers and students from the faculty within two experimental centres. In addition, to facilitate increased access of young people to higher education certain basic health requirements during the period of primary and secondary schooling have been ensured with the help of the university. For example, the University’s dental clinic provides dental care free of charge to all pupils during the 12-year mandatory schooling period.

4.3 Community development in rural areas

While widening access will contribute to outmigration if the best and brightest leave the region to find work opportunities elsewhere, and service delivery will address the symptoms of poverty and indigence, but not their causes, there is a need to reach out and empower communities to address their own problems by strengthening the social economy and cultural identity. Community development programmes aim to build capacity by enabling communities to respond to change and emerging social, economic and environmental challenges. Higher education institutions, in collaboration with local and regional authorities, can play an important role in training community development practitioners, providing lifelong learning and re-skilling and up-skilling opportunities, conducting research into specific issues and best practices and developing co-operation and research opportunities. One of the most innovative examples to approach local development is the European Union LEADER programme which provides tools for bottom-up capacity building and assessment.

The Universidad Católica de la Santísima Concepción has taken an important role in supporting sustainable community development in two rural areas of Coronel and Arauco. In Coronel, the university supports a project of mussel aquaculture developed by a private sector company (Foodcorp) and is carrying out research in soft water fish farming. Collaboration encourages the local fishermen communities to move away from capture fisheries to aquaculture and builds value added segments. In Arauco, the Universidad Católica de la Santísima Concepción has launched the Agricultural Technology Transfer Centre to address the situation of the Mapuche population and their economic development. Mapuche have

recently enforced their campaign to regain land and are in continuous conflict with the leading energy and forestry companies. The two projects not only address the needs of local low income populations, but aim to collaborate with the communities to build their capacity to face the challenges of the changing world. Catholic university's social commitment and access to more flexible funding arrangements have been helpful in this work.

Box 4.1. LEADER: bottom-up local development in the EU

LEADER (*Liaisons entre Acteurs du Développement Economique Rural*) is a European programme based on an integrated and endogenous approach to local development. Since 1991, the LEADER initiative has had three different editions. The programme was first launched for a five year period in 1991 and applied in 220 rural areas of the former EU 15 countries. LEADER II (1994-99) spread to 1 000 rural areas and to more than 1 500 in the enlarged EU 27 countries. The LEADER+ (2000-06) was the last edition of the LEADER as an EU rural development initiative. It placed special emphasis on integrative strategies that connect together all aspects of rural life. The last phase of the LEADER focused on the use of knowledge and technologies, improvement of quality of life, added value to local products and the increase of value of natural and cultural resources.

This bottom-up programme based on a method for the definition, selection and implementation of small projects (many do not exceed EUR 2 000) in rural areas has met success and is now mainstreamed for the present EU programming period (up to 2013), many member countries having integrated LEADER principles and guidelines into their national rural development policies that are increasingly “place-based”.

LEADER is based on eight principles: an area-based approach, a bottom-up approach, local partnerships, innovation, multi-sector integration, inter-territorial cooperation, networking, and decentralised management and financing. Most of these principles can be found today in rural development programmes in different countries. LEADER not only pioneered these in local development strategies but devised a methodology combining these different features of processes at grass-roots levels. Implementation of LEADER is voluntary: the public and private actors within a self-defined area based on historical, geographical considerations and/or local assets and know-how get organised as a Local Action Group (LAG) that includes representatives of civil society such as NGOs. A local development strategy is then devised by the LAG on the basis of inputs from workshops and citizen forums. Projects are submitted to board approval within the priorities defined by the strategy. Choice of projects is ensured on the basis of objective criteria and funding is also decided by the board that disposes of an annual budget integrating EU, national and regional contributions. Beneficiaries deliver milestone reports; evaluation is conducted by independent experts and/or specialists and researchers from universities.

Box 4.1. LEADER: bottom-up local development in the EU (continued)

This participatory democracy approach has given new momentum to rural development: empowering people to think about their own future and how to use local assets amounts to recognising them as the best experts with knowledge of the local context and area. Unleashing the human capital potential of course requires capacitation and training, which is an integral part of the LEADER programme. Amongst the principles mentioned above, innovation in processes or content, including social innovation, is particularly important. Networking is embedded in LEADER that also seeks to promote mutual learning: LEADER projects are interconnected through regional, national and European networks to exchange experiences and promote best practices by on-line access to shared resources and regular events.

Amongst LEADER projects, it is worthwhile mentioning several areas: village renewal, youth clubs, promotion of female entrepreneurship, tourism as a second source of revenue for farming families, environmental protection, support to handicraft production, commercialisation of local products, etc. Among the main outcomes of LEADER are new governance practices with increased cooperation between the national, regional and local levels requiring more efficient vertical co-ordination; development of coherent local territorial development strategies promoting fruitful dialogue with regional authorities; a holistic vision of rural spaces going beyond traditional agricultural models, promoting sustainable economic diversification and social integration.

Source: OECD (2006), Rural Policy Reviews, *The New Rural Paradigm: Policies and Governance*, OECD, Paris.

Box 4.2. UCSC building sustainable communities

Coronel and move away from capture fisheries

The community of Coronel is located in the province of Concepción. Coronel has the highest concentration of fishery production in the Bío Bío Region. Unemployment and youth out-migration rates have been at high levels for several decades. In 2008, The Universidad Católica de la Santísima Concepción (UCSC) through its Regional Centre for Environmental, Maritime and Aquaculture Research and Technology Transference (CREAMAR) embarked on a project of mussel aquaculture in collaboration with the biggest local employer in the fishery industry (Foodcorp). The aim of the mussel farming project was to develop an economically efficient aquaculture system for *Mytilus Chilensis* in the micro areas of Llico and Dichato.

Box 4.2. UCSC building sustainable communities (continued)

In this collaboration, the university has conducted research in soft water fish farming and played an important brokerage role creating trust and confidence between the fishermen and the company. The fishermen's associations have provided farming spaces, raw materials, experience and work input. The company has provided commercialisation channels, purchasing capabilities, technology, and financing.

The costs, of USD 570 000 have been evenly divided between *Innova Bio Bio* programme and the company. Collaboration is built on a win-win basis for all participants: the university benefits from R&D work and practical learning experience for its students; the research team includes three students who are developing their thesis. The fishermen benefit from better income and improved quality of life. The company benefits from new business opportunities, production lines and markets and the region benefits from the economic and social impact through wealth creation, employment and move from capture fisheries to aquaculture.

The project has made rapid progress and yielded positive outcomes. The R&D results show that the mussel growth rate is faster and compare positively with the existing operations in Los Lagos Region. It is estimated that the production will amount to 72 tons of mussels per each centre. Job creation will be directly related to the level of mussel production. In order to exploit 20% of the sea area assigned (3.4 km²), 15 permanent jobs will be created and, in addition, 40 support staff functions will be added. So far, the collaboration has generated 10 new permanent jobs and 100 temporal positions.

The university's role is not only technical: it has functioned as a neutral broker to create trust between fishermen and the companies involved. The project has built strong co-operation between the different actors, including union leaders of the two fishermen's associations, shift managers, marine biologists, university-based researchers, students and state government officials. It has also produced important and sophisticated analysis of where the Bio Bio Region has a comparative advantage and why – in what quality and temperature conditions favourable for a specific type of aquaculture. Finally, the collaboration has contributed to the re-training of the workforce away from capture fisheries to aquaculture which is important to the future of the fisheries cluster. A new vocational education institution has been established in Coronel to support the development of aquaculture.

Box 4.2. UCSC building sustainable communities (continued)**Cañete Agricultural Technology Transfer Centre building sustainable rural development on Mapuche tradition**

The Bío Bío Region has the fourth biggest indigenous population in Chile (54 000 in 2002), mostly Mapuche (53 000). There is a high concentration of Mapuche in the Arauco province which is one of the poorest areas in Chile. While progress has been made in access to formal education, the generation gap among Mapuche is greater than among non-indigenous population. The Universidad Católica de la Santísima Concepción is the only higher education institution with a permanent presence and a campus in the province. Around 1 500 students attend the University's Cañete Agricultural Technology Transfer Centre.

In 2009, the centre launched technology transfer activities to serve 200 rural and Mapuche families. The aim is help improve graduate retention and build entrepreneurship based on Mapuche traditions. Based on a 70 hectare area, the centre aims to develop a productive cluster extending from environmentally sustainable cultivation, fertilisation technology and organic production to management and entrepreneurship training. The purpose is to develop and produce wine, livestock (beef and pork) and vegetable products for export purposes. The university has identified an export company that will support the pursuit.

While the project is at its early stages and too new to be evaluated, it holds much promise and represents the single most important response of the higher education institutions in the Bío Bío Region to collaborate with the Mapuche population.

4.4 Rural development: integrated approach to local economic and social development

Because of the reduced role that agriculture plays in employment, rural development requires diversification of the rural economy based on the analysis of existing and potential economic circuits targeting increased added-value. The capacity of local public officials to devise and supervise programmes with important public investment components aiming at diversification is a strategic element in this approach. Administrative divisions and local economic development requirements based on the recognition of links between firms (supply chains, complementary products, shared local know-how based on natural or historical assets) seldom

coincide. Strategic planning needs to bring together public and private partners from different areas, often astride administrative boundaries.

At the end of the 1990s, the creation of voluntary “Planning Territories” was authorised in Chile. They represent groups of communes with common economic and social characteristics, on the basis of voluntary agreements favouring integrated territorial strategies and projects with critical mass. There are ten of these in the Bío Bío Region, one of the first regions to apply the concept. AMDEL (Association of Municipalities for Local Economic Development),³ created in 2000, regroups six municipalities from the central-eastern part of the region, three belonging to the province of Concepción and three to the province of Bío Bío.⁴

Box 4.3. Universities supporting rural economic diversification

In 2003, on the basis of preliminary findings from a study carried out in 1998 in a single municipality of Bío Bío (Coelemu, Province of Ñuble), the University of Bío Bío, within its Centre for Urban and Regional Studies (CEUR), launched a study of local economic circuits within AMDEL territory with support of SERCOTEC (Technical Cooperation Service, Ministry of Economy) and the regional government. The study entitled “Networks and Opportunities for Development: the case of local economic circuits in the inner prairies of the Region of Bío Bío” (Gatica-Neira, *et al.* 2008) analysed the economy of the territory which is dominated by agriculture and forestry. It came forward with a number of conditions to unleash the territory’s development potential:

- A vision of education and training at the level of the territory aiming innovation and entrepreneurship
- Integrated management of tourism circuits within the territory
- Integration of big firms into territorial development projects linked with the production of local goods and services requiring incubation
- Creation of territorial information systems
- Development of human capital within local governments so as to carry forward local development strategies requiring partnerships.

The training component, carried out by the University of Bío Bío since 2008 within its public policy programme in favour of around 20 local civil servants up to now includes: *i*) elaboration and management of projects, *ii*) management techniques and *iii*) cooperative management. The creation of a diploma in strategic territorial management is now being planned by the university.

The new development practices introduced by AMDEL were awarded the first place in the new “*Territorio Chile*” prize in 2008. The methodology of the economic circuit study carried out by the University of Bío Bío is being replicated in another area of the Bío Bío Region and in the Region of La Araucanía.

On the basis of preliminary findings from a study carried out in 1998 in a single municipality of Bío Bío (Coelemu, Province of Ñuble), the University of Bío Bío started a follow-up study of local economic circuits. The study itself as well as the collaborative action and the subsequent capacity building that was achieved by the university can be considered as best practices in territorial development (OECD, 2006) based on close cooperation between different levels of government and local initiative akin to certain features of Place-based policies⁵ like LEADER⁶ deployed in OECD member countries (See Box 4.3).

4.5 Underutilised potential in environmental and cultural development

Two fields revealing underutilised potential in the region are environmental sustainability and cultural development. The outstanding economic growth of Chile over the past decades has led to increased pressures on the environment. While much of the economic growth has concentrated in urban areas, many rural and peri-urban areas have also been affected. Environmental risks in the Bío Bío Region include soil degradation, reduced marine biomass, pollution from industrial activity, damage to local ecosystems through the construction of hydroelectric power plants and risks associated with fuel distribution, garbage dumps and stocking areas.

The universities in the Bío Bío Region have a wide variety of study programmes and research activities in environmental sustainability, which are beginning to reach critical mass. A degree of specialisation exists among higher education institutions, each supporting different aspects of sustainability (see Box 4.4). The various programmes have impact on regional development through informing policy development to improve environmental protection (water and soil) and regulation, technology transfer linked to industrial processes, renewable energy sources, clean technologies, and through urban development analysis and strategies. There is, however, limited evidence of collaboration among higher education institutions in the region. In fact, it appears to be easier to forge such collaboration with partners outside the region, as the COPAS example shows. In addition, environmental sustainability is not yet integrated across study programmes but appears as an add-on. As a result, the research activity around sustainability has not yet generated green growth in the region.

While good policy design in advancing sustainable development is essential, implementing green growth strategy will go beyond the power of any government. Success will hinge upon profound changes in individuals' behaviour which can be encouraged by both "coercive" (*e.g.* regulatory or

fiscal measures) and “compliance” approaches, for example better information and understanding as well as awareness raising. Higher education institutions can play an important role in raising awareness among the local population.

Box 4.4. Universities supporting environmental sustainability

Universities in the Bío Bío Region have a wide portfolio of study programmes and research activities in the field of environmental sustainability. **Universidad Católica de la Santísima Concepción** has a Centre for Maritime and Harbour Research (CIMP) that focuses on research on how coastal border territories are organised, and a Regional Centre for Environmental Studies (CREA) that focuses on the study of marine populations and marine ecology. **University of Bío Bío** has a Centre of Wood Technology that contributes to the development of products with higher added value for the forest industry, and an Urban Laboratory, oriented towards territorial and urban management. The **San Sebastián University** has a Centre for Rescuing and Rehabilitating Wild Animals and a Recovery Project for the “Tres Pascualas” pond. Universidad del Desarrollo has a Centre for Environmental Engineering Studies (CEIA).

University of Concepción has a Programme for Renewable Energies that collaborates in the BIONERCEL Consortium to boost bio-fuel production using forest biomass. University of Concepción has also a Centre for Environmental Sciences (EULA), which develops research on environmental impacts and offers a doctoral programme in environmental studies with specialisation in aquatic systems, territorial planning and environmental engineering. EULA has generated 29 technology transfer projects to companies and other entities (contract budget of about USD 2.9 million) and 40 research projects (budget about USD 2.1 million). It has 20 PhD researchers, 61 postgraduate and 182 undergraduate students. EULA Centre has monitored the water quality in the region for many years and has contributed to the regulation in this field.

The University of Concepción (UDEC) also has created, in collaboration with the Universidad Austral de Chile, the Centre for South-eastern Pacific Oceanographic Research, COPAS. It initially started with funds from the Centres of Excellence programme of the National Commission for Science and Technology (CONICYT). It received additional financial support from *Fundación Andes*, MECESUP programme of the Ministry of Education and University of Concepción. Since its creation in March 2002, COPAS has generated 217 scientific articles (ISI), 2 books, 23 book chapters and more than 50 undergraduate theses (UDEC, 2009). In addition, COPAS runs an extensive outreach programme to disseminate knowledge on sustainable environmental development to inform the local community. The outreach programme includes school visits, regional meetings for water researchers, and workshops for elementary and high schools teachers. In addition, COPAS is building a knowledge base on the public domain to inform and support policy regarding oceans and climate change.

The Bío Bío Region would benefit from a stronger contribution of higher education institutions to sustainable environmental development. This could happen in many different ways, for example by *i*) generating human capital in areas of sustainable development through learning and further education programmes; *ii*) acting as a source of expertise through research, consultancy and demonstration; *iii*) playing a brokerage role in bringing together diverse regional actors to sustainability process; *iv*) demonstrating good practice through on campus waste management and development activities, strategic planning, building design, waste minimisation and water and energy efficiency practice, responsible purchasing programmes and pursuing good citizen type initiatives like “Green Campus” (OECD, 2007). For example, education buildings make a substantial direct contribution to carbon emissions through their construction, maintenance and use. Their use, for instance, the times during the day when they are open and the periods of the year during which they operate, also have significant indirect impacts on carbon emissions through generation of road traffic and energy use of the buildings.

Higher education institutions in the Bío Bío Region take pride in contributing to cultural assets and cultural development. Particularly, the traditional CRUCH universities offer a range of study programmes, cultural activities and spaces that are also open to a wider public. Most activities are concentrated in Concepción although there are also some efforts to reach out to more remote areas. The universities participate in the leading national and regional associations and funding agencies, including the National Art and Culture Council FONDART (National Fund for the Development of Culture and Arts), the Regional Cultural Secretariat and various consulting committees. In addition, faculty and students participate in community associations adding to the region’s stock of human and social capital. However, no systematic mapping of the links and networks has been made.

Despite considerable efforts and some impressive achievements in the cultural field (for example the opera productions by the University of Concepción), the approach remains traditional. In addition, the collaborative inter-institutional action in this field is in its infancy. The region would benefit from a strategy that sees arts and culture as an agent of development through: *i*) enhancing the quality of life of the diverse population; *ii*) indirect economic benefits in attracting and retaining talent which can drive the knowledge society and *iii*) contribution to the creative industries through enterprise formation, growth, productivity and employment.

Box 4.5. New Zealand and the Māori

New Zealand has a Māori minority of 652 900 inhabitants,⁷ representing 15.3% of the country's population. Higher education institutions in New Zealand have an important role in informing policy, increasing teaching and research related to indigenous interests and needs. Although Māori, on average, have higher poverty and unemployment rates than the rest of the New Zealand population, their conditions are improving. For example, by 2006 the value added by Māori enterprises was NZD 8.3 billion reaching 5.3% of the national GDP. The number of Māori entrepreneurs has increased by 21.8% since 2001, far more than non-Māori ones.

Māori people have made significant progress in maintaining their language. Many New Zealand schools now teach Māori culture and language and pre-school kohanga reo (language nests) have been launched to teach children exclusively in Māori. The language nests are now extended through secondary schools. The universities have increased the number of Māori academics and the amount of their teaching and research activities. They have also developed academic work to understand and promote Māori culture and activities, provided spaces and specific services oriented to Māori students and teachers, developed academic debate about political and business organisations for Māori and developed a Māori innovation framework.

Māori academic leadership has been promoted through the Manu Ao Academy, an inter-University Māori Academy that aims to promote Māori leadership, advance Māori scholarship excellence and strengthen the interface between Māori professionals and academics. The Māori Academy, in association with the eight New Zealand universities and supported by the New Zealand Vice-Chancellors' Committee, provides a wide range of activities, including weekly seminars, lectures, academic fora, leaders groups and other related events at each university campus. The focus is to strengthen the interface between professional practice and university education so that academic courses and research can be better aligned with workplace demands, and practitioners can engage with and contribute in a meaningful way to the university sector. This collaboration between Māori professional organisations and universities at local levels provides a focused and integrated approach to Māori achievement and participation in the society and economy.

Sources: Manu Ao Academy (2009), Presentation, www.manu-ao.ac.nz/content/files/manu_ao_presentation.pdf, accessed 17 January 2010; New Zealand's National Statistical Office (2009), Māori population estimates at 30 June 1991–2009, www.stats.govt.nz/methods_and_services/access-data/tables/maori-population-estimates.aspx, accessed 17 January 2010.

Higher education institutions can be major players in making their regions more international and multicultural. While there was some

evidence of growing interest and activity among higher education institutions to collaborate with Mapuche, the local indigenous population, these activities remain isolated and small in scale. Encouraging international examples come from, for example New Zealand where the universities have played an important role to promote Māori leadership development and participation in the society and economy (Box 4.5).

Higher education institutions in the Bío Bío Region are gradually increasing their international networking, mainly with Spanish speaking institutions and regions. While the number of international faculty and students is still modest, there is potential for talent attraction through joint marketing and better services. This area is being addressed in the current PMC (Programme for Improvement of Competitiveness) for Education, Science and Technology (Bío Bío Educates and Innovates). In future, more effective use of the higher education institutions' international linkages with international research and education should be made to benefit the region, for example by linking internal faculty and students with the region and its working life. For example the University of Granada in Andalusia, Spain, currently the most attractive Spanish university for exchange students, has taken steps to link the international students with the local businesses.

Conclusions and recommendations

Rural areas in the Bío Bío Region constitute an asset for the region because of their wealth in natural resources that put the region in top positions within the country in certain primary sector activities such as forestry, fishing or selected agricultural products. These rural areas also face important challenges in terms of unemployment, poverty, out-migration and environmental degradation. Ethnically diverse population is also an asset to the region because of their wealth of cultural resources that can help position the region as a diverse, tolerant and attractive place to live and visit.

Policies deployed at the national and regional levels focus on innovation in these areas and the three first PMCs defined by the Regional Innovation and Productive Development Agency (ARIDP) within the Agenda for Innovation and Regional Competitiveness (agriculture, tourism, higher education) relate directly to or have impact in rural areas. Higher education institutions in the Bío Bío Region are responsive to rural needs, whether in terms of their geographical spread, their areas of specialised learning and research that directly contribute to local employment and to the rural economy.

Higher education institutions have strongly contributed with their policies and projects to widening access to higher education to students from

the lowest income quintile families, many of which reside in rural areas. They render important services to local communities, particularly in the health sector. In addition, they provide significant contributions to local development by bringing in the training and the knowledge required for the definition and implementation of regional strategies. Many of these initiatives are built on innovative approaches to address the economic and social challenges of rural areas in the Bío Bío Region.

However, limited resources are spread thinly. There is a lack of critical mass to generate projects which will have real impact at the local and regional level and generate multiplier effects. Collaborative mechanisms among higher education institutions to build capacity and foster joint efforts for regional development remain limited in scope and representation. In spite of broader initiatives such as the PMCs, the picture of the diverse programmes and projects with participation of higher education institutions is one of fragmentation built on generally separate and non-coordinated initiatives stemming more from specific circumstances than an overarching vision of needs and possible converging efforts. There is considerable underutilised potential for example in environmental and cultural development as well as international collaboration.

To continue to deepen the higher education institutions' contribution to the social, cultural and environmental development in the Bío Bío Region the OECD/World Bank Team recommends:

- Respecting the freedom of each institution to engage in the programmes and projects of its choice, a systematic exchange of information and experience should be put in place between higher education institutions in social, cultural and environmental matters facilitated by the regional government in order to bring greater efficiency and balanced coverage. Such a forum could organise thematic events, with regular information retrieval and exchange facilitated by a dedicated website. As a first step, higher education institutions' current connections, initiatives and projects involving stakeholder collaboration, community development and/or outreach should be mapped and published in the collaboration platform.
- In addition to widening access and providing services to various communities, higher education institutions should engage in long-term community development seeking ways to empower communities to find their own solutions to various economic, social, cultural, environmental challenges which are global, national and local in nature. They should consider ways to move away from combating poverty to fostering wealth and job creation through social entrepreneurship and view the region as “a laboratory” for

developing research, students' work-based and experiential learning and development projects.

- The region should, in collaboration with the higher education institutions and other stakeholders, develop a strategy that sees arts and culture as an agent of development through: *i)* direct benefit in enhancing the quality of life of the diverse population; *ii)* indirect economic benefits in attracting and retaining talent which can drive the knowledge society, and *iii)* a direct contribution to the creative industries through enterprise formation, growth, productivity and employment. This strategy should address the needs of the diverse populations in the region and also enhance the internationalisation of the region.
- The region should, in collaboration with higher education institutions and public and private sector increase efforts to support sustainable environmental and economic development through a comprehensive strategy bringing together diverse regional actors to sustainability process. Higher education institutions should scale up their efforts to provide learning and further education programmes in sustainable development; to act as a source of expertise through research, consultancy, strategic planning and demonstration; to demonstrate good practice through campus waste management and development activities, strategic planning. Building design, waste minimisation and water and energy efficiency practice, responsible purchasing programmes and good citizen type initiatives like "Green Campus".

Notes

1. The Human Development Index (HDI) was introduced in the first UNDP's Human Development Report (1990) as a new way of measuring development by combining indicators of life expectancy, educational attainment and income into an index.
2. The first neighbourhood associations appeared in Chile in 1965. They are of a voluntary nature and have proved to be useful vehicles for citizen involvement in local decision-making.
3. Association of Municipalities for Local Economic Development (*Asociación de Municipios para el Desarrollo Económico Local, AMDEL*)
4. Province of Concepción: Florida, Hualqui, Santa Juana; Province of Bío Bío: San Rosendo, Yumbel, Cabrero
5. The OECD Territorial Review of Chile (2009) indicates that decentralisation trends in Chile need to be pursued, in particular by strengthening the role of regional governments. It also states that Chile is still lacking a true rural development policy as measures in favour of rural areas remain mostly oriented towards agriculture
6. See "A LEADER Dissemination Guide Book based on programme experience in Finland, Ireland and the Czech Republic", Finnish Rural Policy Committee, Helsinki 2008
7. New Zealand's National Statistical Office. Māori population estimates at 30 June 1991–2009 (New Zealand's National Statistical Office, 2009).

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Chapter 5: Capacity building for regional co-operation

Interactions between higher education institutions and the region in which they are located are beneficial to both parties. For this interaction to take place capacity – skills and resources – needs to be built in regional agencies as well as higher education institutions. This chapter will examine the capacity and capacity building in the regional agencies of the Bío Bío Region and its higher education institutions. This chapter will highlight the capacity in the institutions and processes in light of the decentralisation process and the efforts made by the regional government, regional development agencies and higher education institutions. It will examine where policies and practices can be improved. This chapter concludes with recommendations on how to improve regional co-operation.

5.1 The decentralisation process – building capacity in the regions

Traditionally, Chile's regional policy has been largely defined and implemented in a top-down fashion, leaving little leeway for regional initiative and capacity building. However, during the past decade, Chile has made greater decentralisation a priority in order to unleash the potential of its regions. This has resulted in policy measures and a string of reforms since 2006-2007 with the aim of providing regional governments with the tools, capacities and legitimacy to improve their autonomy and performance.

Between 2006 and 2007 the Chilean government established regional development agencies as a means of transferring responsibilities for economic development to the regions. These agencies aim to provide an integrated approach to regional development and a forum for public and private sector stakeholders to design the regional development agenda which serves as the basis for the development of programmes for improvement of competitiveness (PMCs)¹ and for defining a strategy and actions to increase the competitiveness of the regional clusters.

Since 2007, as a result of Chile's structural reform of regional administration, the Under-Secretary for Regional Development (SUBDERE) has invested more than USD 10 million in the creation and development of planning divisions in regional governments. In the Bío Bío Region, the Planning and Regional Development Division (DIRPLAN) was created to coordinate the regional agenda to promote social, cultural and economical development. DIRPLAN will gradually assume the responsibilities that were previously administered by the regional offices of the Ministry of Planning and Cooperation (MIDEPLAN) in terms of regional agenda and investment portfolio. In addition SUBDERE implemented new processes of accreditation and provided incentives and continuous learning for public officials at the regional level in order to strengthen their management capacity.

The National Innovation Strategy, also launched in 2007, has provided a framework for the prioritisation of innovation and competitiveness at the nationwide level. This strategy draws up guidelines to 2020 that include the increase of R&D spending, the improvement of levels of educational attainment and entrepreneurial innovation. A main challenge will be to reach a balance between these national guidelines and the region specific conditions, strengths and challenges.

Despite the positive changes, the regional economic agenda is still largely decided in Santiago. Moving towards place-based policies will

require changes in the governance system in order to strengthen the regional institutional framework. This will involve increasing the capacities of and the support to regional governments to help them become active players in the discussion, planning and co-ordination of regional development policies.

Consequently, in October 2009, the regional governance and administration act was reformed. According to the act, regional councils will be elected in direct elections. In addition, the regional council will elect its president, who at the beginning will be an honorary figure (in the present system, the regional council is presided by the intendant). The competencies of the president's position have not yet been defined. In addition new competencies could be devolved to one or more of the regions. Furthermore, as of January 2010, the regional development agencies are no longer dependant on the central government but are instead private not-for profit organisations in which the regional government is a part owner. The members of the board of directors of the agencies are nominated by the regional council.

However, while it is too early to evaluate these reforms –some of them will come into force after the forthcoming regional elections in 2011 or 2011– they demonstrate the Chilean government's commitment to decentralisation and are as such commendable. Governments may fear that the capacities are low at the regional level and reluctantly allocate new responsibilities to the regional actors. This is clearly not the case in Chile as the recent developments show. These new reforms also involve challenges and opportunities for regions like the Bío Bío Region.

In this context, this chapter examines the capacity at the regional level that can be broadly divided into skills and resources:

- Do the government agencies, higher education institutions and other stakeholders have adequate skills and competencies to carry out their work?
- Are the financial resources and other assets of sufficient levels and adequately allocated to make action possible at the local, regional and institutional level?

5.2 Regional development strategy in the Bío Bío Region

The Bío Bío Region has been in the forefront of regional capacity building. As early as 2001, “*Innova Bío Bío*” was launched on the basis of an agreement between CORFO (a national public agency linked to the Ministry of Economy) and the regional government, to jointly support

actions fostering competitiveness. This initiative served as model for what would be later known as “*Innova Chile*”. Likewise, in 2004, CORECYT (Regional Council for Science and Technology) was created in the Bío Bío Region, the first such council in the country, based on a public-private partnership between regional government, business and universities, aiming to design regional strategies and policies that promote research and create knowledge networks.

Within the Regional Development Strategy of the Bío Bío Region for 2008-2015 education, science, technology and innovation are amongst the regionally defined strategic priorities. Strategic Line number three relates to “*Education of quality at the service of individuals, social mobility, economic competitiveness and democratic participation*” and Strategic Line number four refers to “*Science, technology and innovation for a dynamic and competitive regional economy and social development*”.

Higher education institutions in the Bío Bío Region have been involved in the development and the implementation of the strategic goals to a varying degree. They have, for example provided intellectual capacity for the preparation of the regional strategies, as the facilitating role of the Centre of Urban and Regional Studies of the University of Bío Bío shows (see Box 5.1).

The main responsibility for the implementation of the strategic goals defined in the Agenda for Innovation and Regional Competitiveness is carried out by the Regional Development Agency.² Its board comprises representatives of regional government, national agencies such as CORFO and the business community. In future and in line with the recent reform, the members of the board will be elected by the regional council and the representation of national government will become weaker. The definition and application of the agency’s agenda are carried out in association with public and private sectors, including higher education institutions and civil society.

The three strategic sectors within the Regional Development Agency’s agenda in 2008-12 are food and agriculture, tourism, and higher education as well as science and technology. These areas are funded on the basis of PMCs (Programmes for Improvement of Competitiveness), now representing at least 10% of the resources of national public agencies involved in productive development, according to the budgetary law and to which national agencies such as CORFO and funds such as FNDR (National Fund for Regional Development) or FIC (Innovation Fund for Competitiveness) contribute alongside regional funds.

Box 5.1. UBB mobilising knowledge for regional development strategy

The Centre for Urban and Regional Studies (CEUR) of the University of Bío Bío is an interdisciplinary research centre that creates and disseminates knowledge on territorial issues. Founded in 1996 to demonstrate the university's commitment to regional development, while drawing from the experience from the Latin American and Caribbean Institute for Economic and Social Planning (ILPES/ECLAC), the centre has contributed to improving the knowledge base in the regional issues in the Bío Bío Region and also the quality of the regional decision-making process.

In 2008, the centre supported the Regional Government (GORE) in the creation of the Regional Development Strategy for 2008-15 (Estrategia Regional de Desarrollo, ERD). The centre provided active participation and support in collaboration with the German Organisation for International Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit, GTZ). The strategy process included more than 1 800 people who participated in workshops and interviews throughout the region. The strategy also drew from the initiatives by the Regional Agency for Innovation and Productive Development (ARIDP) and the Regional Council for Science and Technology (CORECYT).

The Centre for Urban and Regional Studies has also participated in a nationwide study at the Bío Bío Region which aimed to strengthen regional identities in 15 regions in Chile. The *identidad regional* study was funded by the Under-Secretary for Regional Development of the Government of Chile (SUBDERE) and the Bío Bío Regional Government. The study identified key elements of the Bío Bío identity that need to be promoted to enhance the socio-cultural diversity in the region.

The PMC for Education, Science and Technology (Bío Bío Educates and Innovates) aims to reinforce the higher education cluster in the Bío Bío Region by a series of diverse actions including the creation of a Centre for the Improvement of Firm Competitiveness, support to aquaculture, the development of a pole for the health sector and support to improve social skills among first year university students. The OECD Review of Higher Education in Regional and City Development in the Bío Bío Region is one of the components of the PMC.

The higher education institutions in the Bío Bío Region are beginning to play an important role in the regional development as the PMC for higher education, science and technology shows (Bío Bío Educates and Innovates). Earlier in Chapter 2 some concerns about the PMCs were identified. At the same time, however, the systematic and empirical nature of the identification of priority sectors deserves commendation. It is also evident that identifying higher education, science and technology as a priority sector

has also improved collaboration among the key higher education institutions in the region.

5.3 Partnerships and capacity building in the Bío Bío Region

The challenges in the Bío Bío Region are manifold, ranging from poverty and indigence, environmental degradation, brain drain to low absorptive capacity in the SME-based manufacturing industry and urban-rural divide. No single higher education institutions, organisation or agency has the capacity to address them alone. Broad based collaboration between regional agencies, business and industry, higher education institutions and civil society is required. By working together, these regional stakeholders can generate a greater dynamism and change in the local economy and society.

Civil leadership and collaboration have a long and strong tradition in the region. Two well established important stakeholder groups include CIDERE (Industrial Corporation for the Regional Development of the Bío Bío Region) and CORBIOBIO (Corporation for the Regionalisation of Bío Bío). CIDERE was established in the 1960s by a group of business leaders who wanted to foster the development of the Bío Bío Region's provinces and the province of Malleco in La Araucanía Region. Today, it is focused on sponsoring and funding projects to foster innovation and entrepreneurship in the region, many of which have linkages to the higher education sector. CORBIOBIO was established in 1984 by a group of businesspersons and regional leaders aimed at fostering the process of decentralisation and citizen participation in public governance. It has supported the cause of decentralisation for more than 25 years and continues to be an active opinion leader. Higher education institutions have close relations with both organisations through personal and institutional links. For example, in the case of CIDERE, the key universities, University of Concepción, University of Bío Bío and Universidad Católica de la Santísima Concepción, are members in its board. Despite the existing links, the OECD/World Bank team heard evidence also that the linkages between the business and higher education institutions had to some degree withered as most businesses now have headquarters in the Metropolitan region.

The Bío Bío Regional Agency for Innovation and Productive Development was established in 2007. It has been a national pioneer in many ways. For example, it was the first agency in Chile to include the word “innovation” in its name and to seek to integrate the promotion of innovative capacity within economic development. Despite its early focus on innovation, the regional development agency continues to have limited

capacity with 7 technical staff including an executive director. An enlarged team of professionals with the capacity to make an in-depth analysis of the regional strengths and challenges would improve the situation. With the recent reform, the need for capacity building is now becoming more pressing. Table 5.1 displays the capacity of selected regional development agencies according to the number staff and annual budget.

Table 5.1. Funding for regional development agencies, selected examples

Regional development agency	Employees	Annual budget, EUR million
One Northeast (United Kingdom)	250	400.0
SPRI – Basque Country (Spain)	92	53.0
Barcelona Activa (Spain)	80	16.0
NOM (The Netherlands)	50	13.0
ASNM Nord Milano (Milan)	30	9.0
Agência Curitiba (Brazil)	28	2.0
Midi-Pyrénées Expansion (France)	27	3.1
ARIDP Bio Bio (Chile)	7	11.8

Source: OECD (2009), OECD Territorial Reviews: Chile 2009, OECD Publishing, Paris; Agência Curitiba; ARIDP Bio Bio.

The higher education institutions in the Bio Bio Region as well as students and staff engage in wide ranging collaboration including knowledge transfer, collaborative efforts with business and industry, community outreach and volunteering. While there is an abundance of initiatives and projects and evidence of excellence, the work is often project-based and/or driven by the action on the initiative of individuals or single departments. To a large extent, the action remains organic, unstructured and undermanaged focusing on problem solving and usually with no long-term strategy and sharing good practice among the key actors. There is often limited evidence base and a lack of monitoring results which makes it difficult to evaluate the outcomes.

The situation is, however, improving with the new PMC “Bio Bio Educates and Innovates” that is bringing higher education institutions together in a more consistent manner. Currently, the Bio Bio Educates and Innovates involves representation from three universities in its steering committee, Universidad Católica de la Santísima Concepción whose rector is also the chair, University of Concepción and University of Bio Bio, while INACAP is involved as an associated institution. Care should be taken to ensure that all accredited higher education institutions have the opportunity to participate in the PMC.

The recent collaborative action within the PMC includes the self-evaluation process linked to the OECD/World Bank review. It brought

together different stakeholders from the business sector, government and higher education institutions in the regional steering committee of the Bío Bío Region. By focusing attention on higher education institutions' contribution to regional development the review process has benefited the region and higher education institutions in many ways, *e.g.* through *i*) shared diagnosis of strengths, challenges and goals in the region; *ii*) better understanding of the need for robust evidence and open sharing of knowledge and experience; and *iii*) identification of key individuals to drive the regional agenda. The general lack of robust data and the fact that information is weakly disintegrated at the regional level had an impact on the OECD self-evaluation process as a number of ad hoc surveys were necessary.

Another example of a multi-institutional initiative under the PMC “Bío Bío Educates and Innovates” is the collaboration to build a health cluster in the region. In August 2009, a memorandum of understanding was signed in clinical medicine between three universities in Concepción: University of Concepción, Universidad Católica de la Santísima Concepción and San Sebastián University with the aim to improve the quality of health-related academic programmes and to collaborate with the regional government in developing a health cluster in the Bío Bío Region. The collaboration seeks to develop teaching and research in the fields of medical imaging, emergency and intensive care. In addition, the aim is to build a medical simulation centre to provide healthcare training with the use of human patient simulators and manikins (UDEC, 2009).

At the time of the review visit this collaboration was still at early stages and there was no clear business plan, division of labour and co-ordination mechanisms as well as targets and milestones. Despite these shortcomings the initiative represents a pioneering effort not only in the region but also nationally. It holds much promise for the regional development and the region's low income population provided so that the focus will be on preventive medicine and that the region is perceived as a laboratory and a test bed for collaborative action and outreach using leading edge modern telemedicine technologies to reach out to rural and remote areas. Since the ambitious goal is also to build a health pole in the region supported by public investment, it would be useful to consider how to engage other higher education institutions delivering health related education and services. For example, the University of Bío Bío and the Universidad del Desarrollo, whose School of Medicine has gained national recognition: its first graduating class of physicians earned the second place in the National Medical Examination in 2009.

Promising progress is also made in local development. For example, the Municipality of Concepción has formed the Urban Development Task Force

with the participation of the University of Bío Bío, University of Concepción and Universidad Católica de la Santísima Concepción.

A regional competitiveness framework is often viewed as the key to regional development. The regional competitiveness approach argues that regional capacity can be nurtured and developed by identifying their competitive advantage. Furthermore, they must align public investments with economic niches (Porter, 1998; 1999). Table 5.2 shows the progress made in the Bío Bío Region in terms of the four essential elements for competitiveness in the global economy: strategy, governance, innovation and entrepreneurship. While it shows good progress in a number of points, it also identifies gaps that need to be bridged.

Table 5.2. Bío Bío Region’s competitiveness framework and HEIs’ role

Essential ingredient	Target (Ideal)	The Bio Bio Region (Actual)
Strategy	To identify the region's distinct competitive advantage. To align public and private actions necessary to seize it.	Strong progress made in achieving a shared vision and engagement among key stakeholders. Lack of alignment between public, private and non-profit investments. Short and mid-term goals. Limitations in evidence-based decision making to identify competitive advantage.
Governance	To supply a framework to unite public, private and non-profit leaders as a collective guide and owner of the strategy.	Progress made in bringing together HEIs, business and government. Some gaps in representation by key HEIs.
Innovation	To link the region with new technologies and new ways of working and living that can transform the region's social and economic assets.	Universities' science & technology activities focused on knowledge production rather than knowledge transfer. Innovation activities with limited alignment to the region's economic assets.
Entrepreneurship	To provide a fertile climate in which new ideas can be transferred successfully into the marketplace.	Fragmented efforts to support SME sector. Higher education entrepreneurship activities at early stages. Lack of robust data on "business dynamics" (new firm creation vs. firm closure).

Source: Adapted from Drabenstott, M. (2008), “Universities, Innovation and Regional Development: A View from the United States”, *Higher Education Management and Policy*, Vol. 20, No. 2, OECD Publishing, pp. 43-55

5.4 Institutional capacity in higher education institutions

In Chile, the incentives structures for mobilising higher education institutions for regional and city development are limited. There is no explicit third task or regional development task assigned to higher education institutions and regional engagement is left to the initiative of the individual institutions. However, some aspects of national policies and programmes support regional orientation. For example, the national accreditation system involves a strand for outreach (*vinculación con el medio*) that assesses the institutional policies and mechanisms that link the higher education institutions with the local businesses and community and also aim at enhancing the academic and professional development of the staff and fulfilling institutional goals. In addition, some competitive national programmes include requirements, which in practice guarantee that part of the funding will benefit higher education institutions outside the Metropolitan region and indirectly also their regional economies.

Higher education institution's culture, capacity for change, leadership and the appropriate co-ordination mechanisms and oversight regionally play an important role in their capacity to engage with partnership building and collaborative action. The OECD/World Bank review of tertiary education in Chile (OECD 2009) identified several challenges including inflexible curricula and outdated classroom practices, overly long degree programmes, backward-looking institutional financing practices, a research system lacking focus and funding and persistent deficiencies in information and accountability for results. With respect to institutional management, it was concluded that Chile's public universities give a major role in institutional decision-making to academic staff, but very little influence to external partners. The review recommended reforms that would permit public universities to recruit rectors from outside the university, encourage them to adopt modern management practices and free them from cumbersome civil service controls and regulations.

The Government of Chile has taken steps to address these shortcomings through providing public incentives to transform higher education. One of the most effective measures is MECESUP, Programme for the Quality and Equity Improvement of Higher Education launched by the Chilean Ministry of Education in collaboration with the World Bank. The programme supports modernisation of the Chilean higher education through competitive funds.

MECESUP (1999-2005) was established in 1998 with a funding of USD 245 million for 5 years. It supported 400 projects with an average grant of USD 550 000 in the areas of academic staff development and training, library modernisation and student learning spaces, information access and

management, integration of information and communication technologies (ICTs) into teaching-learning, new laboratory equipment and technologies, modern lecture rooms and use of multimedia, new spaces, new science instrumentation and PhD scholarships. Regional universities (those outside the metropolitan area of Santiago) account for the 70% of the total allocation for undergraduate support. From the total budget, 20% was invested in the improvement and development of new doctoral programs and 10% was allocated to CFTs to improve teaching and learning in technological areas.

The second phase of the MECESUP Programme (MECESUP2 in 2009-11) was designed to address more complex institutional issues, identified also in the OECD/World Bank review of tertiary education in Chile (2009), including strategic planning, managerial practices in higher education institutions, accountability and the impact of learning and employability. It aims at improving the efficiency in funding higher education, alongside with improving coherence, responsiveness, equity and quality through performance-based accountability. Total budget of the first phase of the MECESUP2 is USD 91.2 million, supported with a loan of the World Bank of USD 25.1 million (MINEDUC, 2009).

The MECESUP2 Programme has two components: the Academic Innovation Fund (FIAC) and the Performance Agreements (CA) which were piloted in 2008. FIAC is available to CRUCH universities, national doctoral programmes, accredited private universities in the field of pedagogy and CFTs which have more than 100 students and are accredited or in the process of accreditation. Performance Agreements are available to state universities only.

Four state universities in Chile, including the University of Bío Bío, have received funding for the Performance Agreements. Participation has brought measurable improvements in the university's key activities and improved transparency and public accountability (see Box 5.2).

The MECESUP Programme is a good example of a national top-down initiative involving the central government's thrust to improve the quality of higher education. The 18% cap of funding for a single institution has guaranteed that 70% of the funds have been directed to higher education institutions outside of Santiago and that higher education institutions outside the national capital also benefit from the programme. It has promoted curriculum reform and individual institutions have shortened the path to advanced degrees in some cases. The recent efforts to involve also institutions outside of the traditional CRUCH universities in some MECESUP activities are commendable. Of particular interest are the performance agreements which require institutional improvement plans and enhance accountability and transparency. Ensuring that the critical reform

initiatives are scaled up throughout the system is part of the challenge facing the Government of Chile. To improve management capacity, transparency and accountability across higher education sector, it is recommended that performance based agreements are made available to all accredited higher education institutions.

Box 5.2. MECESUP2 performance agreement with UBB

In April 2008, the University of Bío Bío (UBB) launched a set of initiatives to support “Social integration and academic success of UBB students” under the Performance Agreements with the Ministry of Education. To support the activities, the university received a financial incentive of USD 6 million for 3 years with an option for a more longer term collaboration. 70% of funds come from the Ministry of Education through the MECESUP2 programme, and the rest from the university.

The university’s performance agreement has a special emphasis on students from lower socio-economic backgrounds and identifies four key objectives with measurable targets for each year: *i*) reduction of student dropout rates; *ii*) significant reduction of the length of the study; *iii*) improvement in graduate employability; and *iv*) improvement of the quality of undergraduate academic programmes by increasing the number of accredited programmes. The university is required to report annually in detail about the progress in terms of the four areas. The results are published on the public domain which increases transparency and public accountability.

By 2011 the goal is to reduce the length of study from 6.56 to 6.25 years in the 4-year programmes, 7.11 to 6.75 years in the 5-year programmes and 8.5 to 8.25 years in the 6-year programmes. In addition, the university aims to increase the number of accredited programmes by almost 30%.

The performance agreement has resulted in significant improvement in retention: between April 2008 and August 2009 the dropout rate reduced from 17% to 5.8%, exceeding considerably the original target of 14.5%. The university has also made progress in improving the information and monitoring tools on levels of student employability and this data is used to set the future goals.

According to the assessment of the MECESUP2’s international committee, the UBB performance agreement has improved the university management capacity by creating a central, strategic activity that commits UBB’s leadership team and faculty members. The report states that the agreement has fostered a new innovation dynamic which would otherwise be not present in the university.

Source: UBB (University of Bío Bío) (2009) MECESUP project website, <http://meceubb.ubiobio.cl>; UBB (2009) Performance Agreement website, <http://convenio.ubiobio.cl/not.php?Opcion=Detalle&ID=120>, accessed 16 December 2009; MINEDUC (Ministry of Education) (2009), MECESUP website, www.mece2.com, accessed 16 December 2009.

Leadership skills among the rectors and vice-rectors and their support teams play an important role in making higher education sector more engaged and entrepreneurial. Their willingness to embrace change, ability to create consensus and agreement on course of action, short- and medium-term strategies and ability to raise external funding for infrastructure, operations and services that can collectively help to build a progressive culture within the higher education institutions. Some of the leading private institutions in the Bío Bío Region are introducing professional management and quality education without government support.

Box 5.3. Entrepreneurial private university: Universidad del Desarrollo

Universidad del Desarrollo (UDD) is a growing private university with a learner centred orientation. Its 10 000 students – 6 000 in Santiago and 4 000 in Concepción – study undergraduate and graduate programmes and professional development programmes in education, business and economics, medicine and dentistry, law and government, engineering, art, design and architecture. UDD has clear goals, professional management and close ties to enterprises and evidence of excellence.³

Some of the degree programmes in the university, *e.g.* dentistry, require large amounts of both human capital and specialised physical capital. It would be easy to assume that such a field would require government support or need necessarily to be a public institution. Yet, the university has built successful education business models that are both commercially viable and of high quality. Apart from initial loans to the university itself, and the access of its students to national student loan programmes, the university does not require subsidies to function. Assuming that the loans are public, they provide an example of the need to match the instruments to the specific needs and what combination of publicly-provided instruments the government should offer.

Regional engagement is not only the task for the top leaders and management of higher education institutions. Institutions wishing to mobilise their staff in support of this agenda need to ensure that regional agenda is taken into consideration in the recruitment, hiring and reward systems as well as human resources development. Tangible rewards and incentives make it possible to change behaviour and ultimately attitudes and values. Employment and human resources management practices need to allow greater segregation of roles among higher education staff, with different kinds of workloads and reward systems.

In addition, regional engagement needs to be taken into consideration in the institutional planning, development and resource allocation. International experiences have shown that modern management tools and

approaches, such as Balanced Scorecard, can be useful in reorienting the institutional approaches (see Box 5.4).

Box 5.4. HE management at the Jyväskylä University of Applied Sciences

Jyväskylä University of Applied Sciences (formerly Jyväskylä Polytechnic) in central Finland has a set of engagement activities which help the institution to respond to local needs as well as to integrate local stakeholders into the institution to help with the delivery of education. One of the institution's past challenges involved the integration of seven constituent vocational colleges into one higher education institution which meets the needs of the regional businesses and working life in general. This merger process has strengthened the institution's capacity to develop new cross- and multi-disciplinary courses and educational trajectories in existing and emerging disciplinary areas to meet the needs of firms.

Jyväskylä University of Applied Sciences is particularly well equipped to work with the SMEs which form the backbone of the regional economy in central Finland. It has defined nine multi-disciplinary Centres of Expertise which respond to regional needs. Each school has an external board as well as a regional/business development office. Most significantly, it also maintains a sophisticated management information system which tracks the performance of each individual school. Of 29 Balanced Scorecard indicators, eight are specifically linked to regional engagement. The school-based indicators are regularly monitored by the central management team. Strategic planning is implemented as part of the elaboration and annual revision of the three-year Agreement on Objectives set with the Ministry of Education. The planning process translates these objectives into school-, team- and personal-level goals and actions. Strategies are brought into practice through the Balanced Scorecard.

Source: OECD (2007), Higher Education and Regions: Globally Competitive, Locally Engaged, OECD Publishing, Paris, p. 183

If higher education institutions wish to mainstream the regional agenda, they will require a number of staff with knowledge of regional development environment: *i)* structure of the organisations involved in regional development; *ii)* central, regional and local government powers and responsibilities; *iii)* different time scales and drivers influencing these organisations; and *iv)* overlaps between organisations and how these can be used to mutual advantage. A tailored human resources development programme would be helpful for the facilitators.

Influencing and managing the external environment of the higher education institution includes creating and sustaining strategic regional partnerships and assuming real and shared responsibility for the prosperity

and development of the region. For managing its regional interface, the higher education institution may need to establish a dedicated office. This has happened, for example, in the University of Newcastle upon Tyne (UK). For the experience in the Purdue University (Indiana, US) see Box 5.5. Dedicated offices are helpful when scaling up the institutional capacity from individual good practice cases to a well developed system. A systematic approach will require focus on the following tasks: co-ordination and management of regional links; provision of input to strategic planning; contribution to the marketing of the higher education institution; development of frameworks for engagement and regional understanding within the institution; and maintaining pressure for mainstreaming of regional engagement through the normal channels of the institution (OECD, 2007).

Box 5.5. Purdue University: supporting Indiana’s development

The Purdue University is a land grant university which has played a central role in agricultural and industrial extension in Indiana. In recent years, the university has focused on generating technology start-ups and new licences to advance technology firms. The university has an Office of Technology Commercialisation and a research park with more than 100 companies and 2 500 employees. Purdue Research Park, which is one of the most successful in the United States, is located in a remote area where the university is the primary economic activity. The university has also developed a Virtual Discovery Park that is home to interdisciplinary research centres. These structures identify technologies with potential for commercialisation in the state. Purdue also runs a Technical Assistance Programme which provides technology extension services to Indiana companies and Gateways Program for entrepreneurs in incubation phase. The office of Engagement and the Centre for Regional Development complement the university’s regional strategy.

Source: OECD (2007), Higher Education and Regions: Globally Competitive, Locally Engaged, OECD Publishing, Paris, p. 126

Conclusions and recommendations

Traditions of partnerships within the region between higher education institutions, businesses, regional agencies and government bodies, acting in concert with each other, is a critical factor in attracting foreign direct investment and partnering with other regions and higher education institutions globally. The Bío Bío Region has been a national leader in building capacity in regional development and innovation. *Innova Bío Bío*

and CORECYT have contributed to regional growth within the regional development strategy and the regional agenda of ARIDP (leeway alongside with national priorities) interpreted territorial strategies with participation of higher education institutions. There is evidence of innovative programmes and projects, strong civic leadership and increasing collaboration of higher education institutions in the regional development.

However, limited resources are spread thinly and there is a lack of critical mass to develop projects which will have real impact at the local and regional level and also generate multiplier effects. Collaborative mechanisms among higher education institutions to build capacity and foster joint efforts for regional development remain limited in scope and representation. There is a lack of information and robust data particularly in the field of skills gaps, business formation and productivity which undermine opportunities for evidence based decision making and make it difficult to evaluate the outcomes of local policies. The ability to design concise and targeted strategies is not yet well developed which limit the scope for the development of strategies to reflect unique and pressing issues affecting the region and provide a coherent plan how to address these.

The decentralisation process has also opened a window of opportunity for more collaborative action in the Bío Bío Region. Universities and other higher education institutions are becoming more outward looking and are increasing collaboration. To continue to deepen the collaboration between higher education institutions and their regional stakeholders the OECD/World Bank Team recommends that:

- Chile should continue and deepen the decentralisation process and enhance capacity building in regions. Experience in OECD countries shows that increased decision-making power at sub-national levels of government combined with co-ordination mechanisms can unleash the potential in the regions. As regional capacities are built through “learning by doing”, increased responsibilities at the regional level are necessary to build skills and develop problem solving approach.
- Regional and local engagement and more specifically its wide agenda for economic, social and cultural development should be made explicit in higher education legislation. Regional engagement should be encouraged through strengthening the National Commission of Accreditation Process. In addition, performance agreements should be made available to all accredited higher education institutions.
- Incentives for higher education institutions should be created to engage in local and regional development through long term core

funding and additional strategic incentive-based funding schemes. In addition, local and regional engagement of higher education staff should be acknowledged and rewarded by higher education institutions in their recruitment, hiring and reward systems.

- Evidence-based decision making should be strengthened in the region by focusing on a dashboard of key indicators that the key regional stakeholders can monitor over time. This can result in a shared local knowledge base which will galvanise the development of a strong local strategy for change.
- The capacity for regional engagement should be improved in the region among key agencies and higher education institutions through forums for communication where good practices can be fostered and through targeted training programmes with focus on practical problem solving.
- The joint resources of the higher education institutions should be mobilised for the preparation and implementation of regional strategies.
- A regional strategy platform should be developed to complement the current project-based approaches with a more system-based approach.
- Higher education institutions should establish modern administration with human resources and financial resources management systems. In addition, they should review recruitment, hiring and reward systems to include regional development agenda.

Notes

1. PMC: “Programa de mejoramiento de competitividad”
2. The Regional Agency for Innovation and Productive Development (ARIDP, *Agencia Regional de Innovación y Desarrollo Productivo*) is the first agency in Chile including the term “innovation” in its name.
3. In 2007, the National Accreditation Commission granted the university institutional accreditation for 5 years with a rating of 7, the higher mark that the commission has ever awarded to a private university. In 2009, the university MBA programme was ranked number 1 in Latin America in terms of the quality of its faculty and leading institution in entrepreneurship (ranking published in *América Economía*). The university’s first graduating class of physicians of the *Clinica Alemana-Universidad del Desarrollo* School of Medicine earned the second place in the National Medical Examination after 7 years of its establishment. Chilean business leaders have ranked the university as number 5 in preparing graduates for real world experience (*La Segunda and Adimark*).

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Annex 1: OECD review team

Jaana Puukka leads the OECD work on Higher Education and Regional and City Development. She joined the OECD Programme on International Management in Higher Education (IMHE) in 2005 to coordinate and manage the first round of OECD Reviews of Higher Education in Regional Development which took place in 2005-07 and embraced 14 regions in 12 countries. She is leading the second round of reviews in 2008-10 which is reaching out to 14 regions and city-regions in G8 countries and emerging economies. She is the co-author and editor of the OECD publication “Higher Education and Regions – Globally Competitive, Locally Engaged” (OECD, 2007). Before joining the OECD, Puukka had experience in higher education and regional development in Finland as a national and local government adviser, programme manager, practitioner and evaluator. She has management experience from both the university and polytechnic sector and has worked in university internationalisation, PR & communication and stakeholder management. In addition, she has experience in the corporate sector in the pharmaceutical industry.

Michael Crawford is a Senior Education Specialist with the World Bank’s Education Department in the Latin America and Caribbean Vice Presidency, where he leads work on tertiary education and science, technology, and innovation (STI). Michael Crawford currently develops and manages investment projects and analytic studies in university reform, improvement of research and innovation capacity, access to tertiary education, quality assurance and related issues in Chile, Peru, and Brazil. He recently co-led the joint World Bank/OECD review, Tertiary Education in Chile. He previously designed and implemented the World Bank’s first loan for the promotion of science, technology, and innovation capacity in Sub Saharan Africa, the 2004 Uganda Millennium Science Initiative project, and he has developed World Bank policy for STI capacity building. He holds a Master’s degree in Economics and Development from the Johns Hopkins University School of Advanced International Studies (SAIS), and a Bachelor’s degree in Philosophy and Mathematics from St. John’s College, Annapolis, Maryland.

Ernesto Flores, a Mexican national, who joined the OECD Programme on Institutional Management in Higher Education (IMHE) in Paris in 2009 for a 15-month secondment to support the OECD review programme Higher Education in Regional and City Development. He holds a Masters degree from Monterrey Institute of Technology and Advanced Studies, Mexico. He has worked as a Consultant in the Quality Centre of Monterrey Tech, developing projects in several companies. In 2002, he was invited to collaborate to the Strategic Planning and Regional Development Office of the Executive Office of the President of Mexico. There, he served as planner and consultant in strategic planning for Federal Government offices to support them applying strategic thinking and planning, developing scorecards and using technologies to strategy follow-up in order to align actions consistent with the Mexico's National Development Plan. Since 2004, he was working at the Sonora Institute of Technology (*Instituto Tecnológico de Sonora*, ITSON) as planning coordinator, participating in projects aimed at improving economic and social performance in the region, such as the creation of the Technology Park and the Digital City initiatives. In addition, he led international projects in the field of innovation-based regional development.

Dewayne Matthews is Vice President for Policy and Strategy of the Lumina Foundation for Education. Matthews has served in a variety of higher education leadership roles, including Senior Adviser to the President and Vice President of the Education Commission of the States (ECS), Director of Programs and Services for the Western Interstate Commission for Higher Education (WICHE), and Executive Director of the New Mexico Commission on Higher Education. He has been a legislative staff member, faculty member and university trustee, and has worked with higher education institutions in Mexico, Canada, and Japan. He began his career as a first-grade teacher in Taos, New Mexico. Matthews is a graduate of the University of New Mexico and earned a master's degree in bilingual education at New Mexico Highlands University in Las Vegas, New Mexico. He earned a doctorate in educational leadership and policy studies at Arizona State University and received an honorary doctor of humane letters from Marycrest International University.

Philip Wade, retired (2007) OECD Administrator, is an expert in regional and rural development, with specific knowledge in Information and Communication Technologies (ICTs). In OECD, Philip Wade was responsible for several national territorial reviews in Europe, which objective is to identify and analyse the factors of disparity between regions and the implementation of regional policy, so as to formulate recommendations aiming to improve its delivery and increase its impact. He also carried out specific regional tasks and authored several rural case

studies, and before that, the OECD report “ICTs and Rural Development”. Presently, Philip Wade is one of two experts, coordinating and supervising, under the aegis of the Government of Finland, a pilot rural development project in Mozambique. Prior experience in such countries was acquired in the field of technical assistance in Peru and Ethiopia. Philip Wade is a graduate in political science of Paris Sorbonne and ENA (economics, law and public administration). He holds a degree in Higher Latin American Studies (IHEAL). Before joining OECD, he worked in various international positions in the public and private sectors in France. Besides OECD publications, he is the author of several books on broadcasting, ICTs and tourism development.

Jorge Yutronic, a Chilean national, is a consultant for IDB, WB, UNESCO and national government agencies in management of science, technology, innovation and competitiveness especially for Chile and other Latin American countries. His activities and responsibilities in university management and higher education include: Membership of the International Consultative Council of MECESUP; implementation of performance agreements with universities; evaluation of universities; former rector of the *Universidad de las Américas*, a private Chilean university with 25 000 students, Jorge Yutronic is also an entrepreneur: he has created technology-based companies and was manager of SONDA, a Latin American ICT company. He has been active in Chilean science, technology and innovation systems. He was member of the boards of directors of *Fundación Chile* and also President of the Chilean Institute of Engineers.

Annex 2: Regional steering committee

Coordinators

- Mr. Martín ZILIC HREPIC, University of Concepción
- Mr. Andrés VIVEROS, Regional Development Agency

Higher Education Institutions

- Mr. Sergio LAVANCHY MERINO, Rector of the University of Concepción
- Mr. Héctor GAETE FERES, Rector of the University of Bío Bío
- Mr. Juan CANCINO CANCINO, Rector of the Universidad Católica de la Santísima Concepción
- Mr. Ramón SAAVEDRA ROGEL, Rector of the Federico Santa María Technical University
- Mr. Guido MELLER MAUER, Rector of the San Sebastián University
- Mr. Ernesto SILVA BAFALLUY, Rector of the Universidad del Desarrollo
- Mr. Javier VERA JÜNEMANN, Vice-Rector of the INACAP Technical University
- Mr. Pedro TRONCOSO MUÑOZ, Rector of the DUOC UC
- Ms. Evelyn BECERRA RODRÍGUEZ, Manager, CFT La Araucana
- Mr. Juan Carlos IUBINI, Rector of the CFT CRECIC

Business sector representatives

- Mr. Pedro SCHLACK HARNECKER, President of the Chamber of Production and Commerce
- Mr. Marcos CAAMAÑO RÍOS, President of the Chamber of Commerce of Concepción
- Mr. Juan Ignacio ORTIGOSA AMPUERO, President of the Chilean Chamber of Construction Industry

- Mr. Jorge SERÓN FERRÉ, President of the Chilean Wood Industry Corporation, Bío Bío Region
- Mr. Rodrigo SARQUIS SAID, President of the Fishery Industry Association
- Mr. Marcos DELUCCHI, Executive Director of CIDERE Bío Bío
- Mr. Claudio LAPÓSTOL MARUÉJOULS, President of CORBIOBIO
- Mr. Enresto HÚNE MOLLER, President of SOCABIO
- Mr. Hugo ARANCIBIA ZAMORANO, President of FEREPA
- Mr. Felix ADLERSTEIN, Manager of COINFA

Public sector representatives

- Mr. César ARRIAGADA, Regional Secretary of the Ministry of Economy
- Mr. Rodrigo MARTÍNEZ FERNÁNDEZ, Regional Government
- Mr. Marcelo CHAVÉZ VELASQUEZ, Regional Council
- Mr. Mario MORALES BURGOS, Regional Council

Annex 3: Regional self-evaluation report's research team

Coordinator

- Jorge DRESDNER CID, Ph.D., Department of Economics, University of Concepción

Principal researchers

- Andrés ACUÑA DUARTE, M.S., Department of Economics and Finance, Bío Bío University
- Bernardo CASTRO RAMÍREZ, Ph.D., Department of Sociology, University of Concepción
- Miguel QUIROGA SUAZO, Ph.D., (c), Department of Economics, University of Concepción
- Hugo SALGADO CABRERA, Ph.D., Department of Economics, University of Concepción
- Andrés ULLOA OLIVA, Ph. D. (c), Department of Economics, Universidad Católica de la Santísima Concepción
- Felipe VÁSQUEZ LAVIN, Ph.D., Department of Economics, Universidad de Concepción

Assistant researchers

- Hans ALTAMIRANO, Department of Economics, University of Concepción
- Jorge ESPINOZA, M.B.A., Department of Administration, Universidad Católica de la Santísima Concepción
- Gabriel PINO, M.S., Department of Economics, University of Concepción
- Gloria RIVAS PALMA, M.S. (c), Student Development Directorate, Bío Bío University
- Leonardo SALAZAR, M.S., Department of Economics, University of Concepción

- Grethel ZURITA ZAPATA, M.S., Department of Economics, University of Concepción

Administrative support

- Marcela ALVEAL, Department of Economics, University of Concepción

Annex 4: OECD-WB review visit programme

Bío Bío Region, 16-21 August 2009

Sunday 16 August

18:00 OECD-World Bank review team internal meeting

Monday 17 August

09:00-11:00 **Technological University of Chile (INACAP)**
 Leadership, management and faculty members
 Mr. Javier VERA JÜNEMANN, Vice-President
 Mr. Renzo CORREA, Director of Academic Affairs
 Mr. Víctor ULLOA, Director of Finances and Administration
 Mr. Blas PEREIRA, Director of Business and Administration Programme
 Mr. Ernesto PAREDES, Director of Mechanics Programme
 Mr. Francisco FUENZALIDA, Director of Automation Programme
 Mr. Flavio GONZÁLEZ, Director of Construction and Design Programme
 Mr. Luis ENDÍA, Director of Tourism and Hotel Management Programme
 Ms. Evelyn MARTÍNEZ, Director of Education Programme
 Ms. Yanet MUÑOZ, Head of Health Department
 Ms. María Paz JIMÉNEZ, Director of Communications
 Ms. Daniela VALLADARES, Student Affairs
 Ms. María Victoria HERRERA, Director of Outreach
 Ms. Faridi JURI SEPÚLVEDA, Registrar's Office
 Ms. Sady UGARTE, Professor of the Hospitality Management Programme

11:00-13:00 **Thematic meeting on Entrepreneurship and Collaboration with SMEs**
 Mr. Javier VERA JÜNEMANN, Vice-President, INACAP
 Ms. Silvia GASCÓN, INETEC (INACAP's Business incubator)
 Mr. Vicente HERNÁNDEZ, CDEUBB (University of Bío Bío's Business Development Centre)
 Mr. Marcelo VERGARA, IDEAINCUBA (University of Concepción's Business incubator)
 Mr. Renzo CORREA, Director of Academic Affairs, INACAP
 Mr. Víctor ULLOA, Director of Finances and Administration, INACAP

Thematic meeting on Entrepreneurship and Collaboration with SMEs (cont'd)

Mr. Victor DÍAZ, Business Manager, INETEC
 Ms. Victoria HERRERA, Outreach Director, INACAP
 Mr. Gonzalo OLIVARI, Director for Management, DUOC
 Mr. Angelo GARAY, Director of Industrial Design, DUOC
 Mr. Nelson AYALA, Director of Public Relations, DUOC
 Mr. Patricio CORTÉS, Executive Director, Centre for Entrepreneurship and Innovation, Universidad del Desarrollo (UDD)
 Mr. Iván VALENZUELA, Dean, Faculty of Economy, UDD
 Mr. Jorge ESPINOZA, Head, Business Management Department, Universidad Católica de la Santísima Concepción (UCSC)
 Mr. Guillermo SCHAFFELD, General Director, Research and Outreach Affairs, San Sebastián University (USS)
 Mr. Marcos DELUCCHI, Executive Director, Industrial Corporation for the Regional Development of the Bío Bío Region (CIDERE)
 Mr. Felix ALDERSTEIN, President, COINFA
 Mr. Jürgen CARRASCO, Director, Civil and Industrial Engineering School, USS
 Mr. Alejandro NAVARRO, Director of Research, Federico Santa María Technical University

15:00-16:00

University of Bío Bío (UBB) - Leadership, management and Deans

Mr. Héctor GAETE FERES, Rector
 Ms. Gloria GÓMEZ VERA, Provost
 Mr. Aldo BALLERINI ARROYO, Vice-President for Academic Affairs
 Mr. Luis AMÉSTICA RIVAS, Vice-President for Finances
 Mr. Peter BACKHOUSE ERIAZO, Dean, Faculty of Engineering
 Mr. Ivan CARTES SIADE, Dean, Faculty of Architecture
 Mr. Hector SALDIA BARAHONA, Dean, Faculty of Business Sciences
 Mr. Marco Aurelio REYES COCA, Dean, Faculty of Education
 Mrs. Nora PLAZA CEBALLOS, Dean, Faculty of Health
 Mr. Mauricio CATALDO MONSALVES, Dean, Faculty of Sciences
 Mrs. Elizabeth GRANDÓN TOLEDO, Director for Institutional Affairs
 Mr. Mario RAMOS, Director for Research, Development and Innovation

16:00-17:00

University of Bío Bío - Outreach activities

Mr. Sergio MOFFAT LÓPEZ, Director, Centre for Urban and Regional Studies (CEUR)
 Mr. Francisco GATICA, Researcher, CEUR
 Mrs. Magaly MELLA ABALOS, Researcher, CEUR
 Mr. Ariel YÉVENES, Researcher, CEUR
 Mr. Roberto LIRA, Director, Urbanism Laboratory
 Mrs. Lilián LAGOS, Researcher, Urbanism Laboratory
 Mr. Manuel ALBARRÁN ULSEN, Director, Public Policies Programme
 Mr. Nelson GARCÍA ARANEDA, Public Policies Programme
 Ms. Vivianne HASSE RIQUELME, Public Policies Programme
 Mr. Javier LEÓN, Public Policies Programme
 Ms. Pilar LASO, Public Policies Programme
 Mr. Ariel BOBADILLA, Director, Technology Transfer Office
 Mrs. Ninón JEGÓ ARAYA, Director of Outreach
 Mr. Cristhian AGUILERA, Director of Training
 Mr. Francisco NUÑEZ CERDA, Researcher
 Mr. Francisco RAMIS, Researcher

- 17:00-17:30 **Visit to University of Bío Bío's Biodeterioration and Nanotechnology Labs**
- 17:30-19:00 **Thematic meeting on the Bío Bío's Forestry Cluster**
 Dr. Jose NAVARRETE, Researcher, University of Bío Bío (UBB)
 Dr. Cecilia POBLETE, Researcher, UBB
 Mr. Peter BACKHOUSE ERIAZO, Dean, Faculty of Engineering, UBB
 Dr. Cecilia BUSTOS, Wood Engineering Department, UBB
 Ms. María Eugenia HERMOSILLA, Wood Industry, CFT Lota Arauco
 Mr. Cristián GÓMEZ, Biotechnology Engineering Department, San Sebastián University
 Mr. Ángelo GARAY, Director of Industrial Design, DUOC-UC
 Mr. Renato SEGURA, Faculty of Economy, Universidad Católica de la Santísima Concepción
 Mr. Sergio VALDÉS, Regional Manager, Forestry Institute
 Mr. Jean Pierre LASERRE, Product Development, Forestal Mininco CMC Maderas
 Mr. Mauricio LAGOS, MASISA
 Mr. Vicente GÁMBARO, Research and Development Manager, Oxiquim, S.A.
 Mr. Sergio VARGAS, Manager, VSV Proyectos Industriales
 Mr. Bruno GORRINI, Technology Manager, Paneles Arauco – Planta Nueva Aldea
 Mr. Jorge CALDERÓN, Manager, Wood Technology Centre, University of Bío Bío
- 19:30 **Dinner with Regional Council members – Hotel Araucano**
 Mr. Eduardo ARAYA POBLETE
 Mr. Marcelo CHÁVEZ VELÁSQUEZ
 Mr. Claudio ARTEAGA REYES
 Mr. Mario MORALES BURGOS
 Mr. Oscar FERREL MARTÍNEZ

Tuesday 18 August

- 10:00-12:00 **Thematic meeting on Agriculture and Food Cluster**
 Mr. Fernando BÓRQUEZ, Director, Chillán Campus, UDEC
 Ms. Susana FISCHER, Researcher, UDEC
 Mr. Fidel Ovidio CASTRO, Researcher, UDEC
 Ms. Claudia TRAMON, Researcher, UDEC
 Ms. Gloria GÓMEZ VERA, Provost, University of Bío Bío (UBB)
 Mr. Aldo BALLERINI, Vice-President for Academic Affairs, UBB
 Ms. Nora PLAZA CEBALLOS, Dean, Faculty of Health Sciences, UBB
 Ms. Fabiola CERDA LEAL, Food Technology, UBB
 Ms. Luisa ARRIAGADA SAN MARTÍN, Engineering, UBB
 Mr. Patricio OLIVA MORESCO, Master in Nutrition, UBB
 Mr. Juan Carlos YÉVENES, Deputy-Director, Centre for Research and Development on Agribusiness, UBB
 Mr. Eduardo JERIA, Director, Centre for Agricultural Innovation and Technology Transfer (CITTA), UCSC – Professional Institute at Cañete
 Ms. María Claudia PÉREZ, Director, Tourism Programme, DUOC
 Mr. Jorge SAN MARTÍN, DOUC
 Mr. Carlos MOLINA, Vice-President, INACAP
 Ms. María Teresa MORALES, INACAP
 Mr. Marcos GERDING, Researcher, National Institute for Agriculture Research (INIA)

- 12:00-13:00 **University of Bio Bío, Chillán Campus**
Visit to the Food safety and certification laboratory (LECICA)
- 13:30-15:00 **INACAP, Chillán Campus**
Lunch meeting with Mayors of Chillán, Chillán Viejo and San Carlos, Governor of the Province of Ñuble
- 16:30-18:30 **Meeting with the Regional Steering Committee**
- 19:30-22:00 **Universidad del Desarrollo (UDD)**
Leadership and faculty
Mr. Sergio HERÁNDEZ OLLARZÚ, Vice-President for Graduate Studies and Research
Mr. Pedro RAMÍREZ, Regional Manager, Chilean Security Association
Mr. Félix ALDERSTEIN, President, COINFA
Mr. Daniel CONTESSÉ, Mininco Forest Company
Mr. Álvaro MUÑOZ, President, Providencia Professional Institute
Mr. Pedro SILVA RIQUELME, Research Director, Faculty of Engineering
Mr. Pelayo COVARRUBIAS, Director of Institutional Affairs
Ms. Alejandra AMENÁBAR FIGUEROA, Dean, Faculty of Design
Ms. Teresita SERRANO GILDEMEISTER, Dean, Faculty of Psychology
Ms. Paulina ARTIGAS MEDINA, Director of Outreach
Ms. Florencia JOFRÉ MANIEU, Vice-President for Undergraduate Studies

Wednesday 19 August

- 09:00-11:00 **University of Concepción - Leadership and top management**
Mr. Sergio LAVANCHY M., President
Mr. Ernesto FIGUEROA, Vice President
Mr. Alberto LARRAIN P., Vice President for Administrative and Economic Affairs
Mr. Jaime BAEZA H., Director for Research
Mr. José SÁNCHEZ HENRÍQUEZ, Director for Teaching
Ms. Ximena GARCÍA, Director for Postgraduate Studies
Mr. Iván ARAYA, Director for International Affairs
- 11:00-12:00 **University of Concepción - Deans and Directors**
Ms. María NIEVES ALONSO, Director, Cultural Affairs
Mr. Miguel CORNEJO AMÉSTICA, Director, Student Affairs
Mr. Jaime BAEZA H., Director for Research
Mr. José SÁNCHEZ HENRÍQUEZ, Director for Teaching
Mr. Iván ARAYA, Director, International and Institutional Affairs
Mr. Fernando BÓRQUEZ, Director, Chillán Campus
Mr. Luis HAUENSTEIN DORN, Director, Los Angeles Campus
- 14:00-15:30 **Lunch meeting with students**

- 16:00-18:00 **Thematic meeting on the pathway from research to commercialisation**
- Mr. Jaime BAEZA, Director, Research Unit, UDEC
 Mr. Galo CÁRDENAS, Researcher, UDEC
 Mr. Rolando HERNÁNDEZ, Researcher, UDEC
 Mr. Alex BERG, Director, Technology Development Unit, UDEC
 Ms. Ximena SEPÚLVEDA, Intellectual Property, UDEC
 Mr. Marcelo VERGARA, Director, IDEAINCUBA Business Incubator, UDEC
 Mr. Luis AGUAYO, Researcher, UDEC
 Ms. Verónica SALCEDO, Industrial Property, UDEC
 Ms. Pía ZEPEDA, Industrial Property, UDEC
 Ms. Mariella GUTIÉRREZ, Director, Research, Universidad Católica de la Santísima Concepción (UCSC)
 Mr. Christian SCHMITZ, Professor of Law, UCSC
 Mr. Guillermo SCHAFFELD, General Director, Research and Outreach Affairs, San Sebastián University (USS)
 Mr. Eric BARADIT, Director, Research, University of Bío Bío (UBB)
 Mr. Mario RAMOS, UBB
 Mr. Alejandro NAVARRO, Research Director, Federico Santa María Technical University (UTFSM)
 Mr. Manuel SAN MARTÍN, UTFSM
 Mr. Gonzalo OLIVARI, Director, Administration and Business, DUOC
 Mr. Cristian VAN RYSSELBERGE, Deputy-Director for Administration, DUOC
 Ms. Pamela CANOVAS, Director for Communication, DUOC
 Mr. Renzo CORREA, Research Director, INACAP
 Ms. María Teresa MORALES, Academic Advisor, INACAP
 Mr. Hugo GUZMÁN, CFT La Araucana
 Mr. Eduardo RODRÍGUEZ, Manager, Bioforest
 Mr. Víctor SAN JUAN, Manager, Aerus
 Mr. Felix ADLERSTEIN, President, COINFA
 Mr. Genaro GOTELLI, VITOAGRO
 Mr. Roberto VEGA, Manager, Pasteur Laboratory
- 20:30 **Dinner with business representatives**
- Mr. Pedro SCHLACK, President, Concepción Chamber of Production and Commerce (CPCC)
 Mr. Javier VERA JÜNEMANN, Vice-President, INACAP
 Mr. Mario SEGUEL, Concepción Chamber of Production and Commerce
 Mr. Waldo MUÑOZ, Manager, Regional Centre for Computer and Informatics (CRECIC)
 Mr. Arturo AGUAYO, Manager, Huachipato Steel Company
 Mr. Pedro RAMÍREZ, President, Chilean Construction Chamber
 Mr. Marcos DELUCCHI, Executive Director, Industrial Corporation for the Regional Development of the Bío Bío Region (CIDERE)
 Mr. Félix ALDERSTEIN, President, COINFA
 Mr. Leoncio TORO, General Manager, Concepción Chamber of Production and Commerce

Thursday 20 August

- 08:30-09:45 **Meeting with central government representatives**
- 10:00-11:00 **San Sebastián University(USS)**
Leadership and top management
Mr. Ricardo RIESCO JARAMILLO, President
Mr. Alfonso RIVAS OTÁROLA, Vice-President
Ms. Sandra GUZMÁN MARTÍNEZ, Secretary-General
Mr. Guillermo SCHAFFELD, General Director, Research and Outreach Affairs
Mr. Ricardo HEPP KUSCHEL, Institutional Affairs Director
- 11:00-12:00 **San Sebastián University (USS)**
Faculty members and staff
- 12:00-13:45 **Thematic meeting on Poverty, inequity and social issues**
Mr. Guillermo SCHAFFELD, General Director, Research and Outreach Affairs, San Sebastián University (USS)
Mr. Alfonso RIVAS OTÁROLA, Vice-President, USS
Mr. Ricardo HEPP KUSCHEL, Institutional Affairs Director, USS
Mr. Osvaldo RODRÍGUEZ, Director, School of Social Work, USS
Mr. Armando CARTES, Director, School of Law, USS
Mr. Sergio CASTRO ALFARO, Dean, Faculty of Dentistry, USS
Mr. Jorge JIMÉNEZ ESPINOZA, Dean, Faculty of Education, USS
Mr. Jürgen CARRASCO KRUMM, Director, Civil and Industrial Engineering Department, USS
Mr. Andrés ULLOA, Academic Projects Director, UCSC
Mr. Rafael GALDAMES FUENTES, Regional Education Director, University of Bio Bio (UBB)
Mr. Manuel ALBARRÁN ULSEN, UBB
Mr. Jorge URRUTIA, Federico Santa María Technical University (USM)
Ms. Rita NAVARRO, Social Responsibility Programme, University of Concepción (UDEC)
Mr. Jorge ROJAS, Dean, Faculty of Social Sciences, UDEC
Mr. Juan SAAVEDRA, Dean, Faculty of Economy, UDEC
Ms. Evelyn MARTÍNEZ, Director for Education, INACAP
Ms. María Antonieta QUIJADA, Director for Social Work, INACAP
Mr. Pedro SILVA RIQUELME, Research Director, Universidad del Desarrollo (UDD)
Ms. Florencia JOFRÉ, Vice-President for Undergraduate Studies (UDD)
Mr. Rodrigo CASTRO, Deputy-Dean, Graduate Studies (UDD)
Ms. Katia WEISSER, Director for Student Affairs, DUOC
Ms. Ximena BUSTOS, CFT La Araucana
Mr. Claudio LAPOSTOL, President, CORBIOBIO
Mr. Marcos DELUCCHI, Executive Director, CIDERE
Mr. Jorge TAGLE, *Trabajo para un Hermano* Foundation
Mr. Andrés SANHUEZA, Association for the Development of the Arauco Province (CORPARAUCO), Social Programme
Mr. Tomás VARELA, La Araucana Financial Indemnity Fund

- 14:00-15:30 **Universidad Católica de la Santísima Concepción (UCSC)**
 Dr. Juan Miguel CANCINO CANCINO, President
 Mr. Jorge PLAZA DE LOS REYES ZAPATA, Vice-President
 Mr. Alberto LOOSLI WEASON, Vice-President for Social Affairs
 Mr. Jorge GALLEGUILLOS PIZARRO, Vice-President for Administration
 Pbr. Luis RIFO FELIÚ, Vice Grand Chancellor
 Ms. Teresa LOBOS DEL FIERRO, Provost
- 16:00-17:00 **UCSC - Deans and Directors**
 Mr. Hubert MENNICKENT, Dean, Faculty of Engineering
 Mr. Marcelo LAGOS, Dean, Faculty of Medicine
 Mr. Hernán VARELA, Dean, Faculty of Law
 Ms. Carolina AGUIRRE, Dean, Faculty of Sciences
 Mr. Jaime CONSTENLA, Dean, Faculty of Education
 Mr. Iván VALENZUELA, Dean, Faculty of Economics
 Mr. Mario URZÚA, Dean, Faculty of Social Sc. and Communication
 Mr. Juan Carlos INOSTROZA, Director of the Theology Institute
 Mr. Marcelo BASSALETTI, Director of the Technological Institute
 Mr. Osman ANDRADE, Director for Student Affairs
- 17:00-19:00 **Thematic meeting on Fishery Cluster**
 Mr. Christian DÍAZ, Researcher, UCSC
 Mr. Pablo VENEGAS, Researcher, UCSC
 Mr. Javier CHONG, Researcher, UCSC
 Mr. Dagoberto ARCOS, Director, Regional Centre for Environmental Education (CREA)
 UCSC
 Mr. Álvaro JORQUERA, Fishery Coordinator, DUOC
 Mr. Marcos CHÁVEZ, Environment Coordinator, DUOC
 Mr. Jorge FRÍAS, Research Director, San Sebastián University
 Ms. Irene LEPEZ, Researcher, UDEC
 Mr. Alfredo KLEMPAU, Researcher, UDEC
 Ms. Mariela GUTIÉRREZ, Researcher, UDEC
 Mr. Ariel VALENZUELA, Researcher, UDEC
 Mr. Hugo ARANCIBIA, Researcher, UDEC
 Mr. Renato QUIÑONES, Researcher, UDEC
 Mr. Franklin CARRASCO, Dean, Faculty of Oceanographic Sciences
 Mr. Rafael SOLAR, Federico Santa María Technical University
 Mr. Jorge TORO, Regional Coordinator of Fisheries
 Mr. Sigifredo SHEUERMANN, Regional Coordinator of Fisheries
 Mr. Hugo ARANCIBIA, President, Local self-employed fisherman federation
 Mr. Néstor LLOYD, National Shellfish Exporters Association
 Mr. Rodrigo SARQUIZ, Fish Industry Association
 Mr. Sergio MORA, Fishing Development Institute

Friday 21 August

- 09:00-13:00 **OECD-World Bank Review Team internal meeting**
- 15:00-17:00 **Feedback session to the Regional Steering Committee**
- 17:10-17:30 **Interviews with local media**

Higher Education in Regional and City Development

Bío Bío Region, Chile

The Bío Bío Region has pioneered regional development in Chile. It has a high concentration of higher education and research activity. Its universities and other higher education institutions have made significant progress in widening access to education. But challenges remain: the Bío Bío Region continues to suffer from brain drain as well as higher than average unemployment and poverty rates.

How can the Bío Bío Region promote new business formation and the development of the existing small and medium-sized companies? What incentives are needed to improve higher education institutions' regional and local orientation? How can higher education institutions move from knowledge generation towards knowledge transfer?

This joint OECD and World Bank review explores a range of helpful policy measures and institutional reforms to mobilise higher education for the development of the Bío Bío Region. It is part of the series of the OECD reviews of Higher Education in Regional and City Development. These reviews help mobilise higher education institutions for economic, social and cultural development of cities and regions. They analyse how the higher education system impacts upon regional and local development and bring together universities, other higher education institutions and public and private agencies to identify strategic goals and to work towards them.

The full text of this book is available on line via these links:

www.sourceoecd.org/education/9789264088931

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