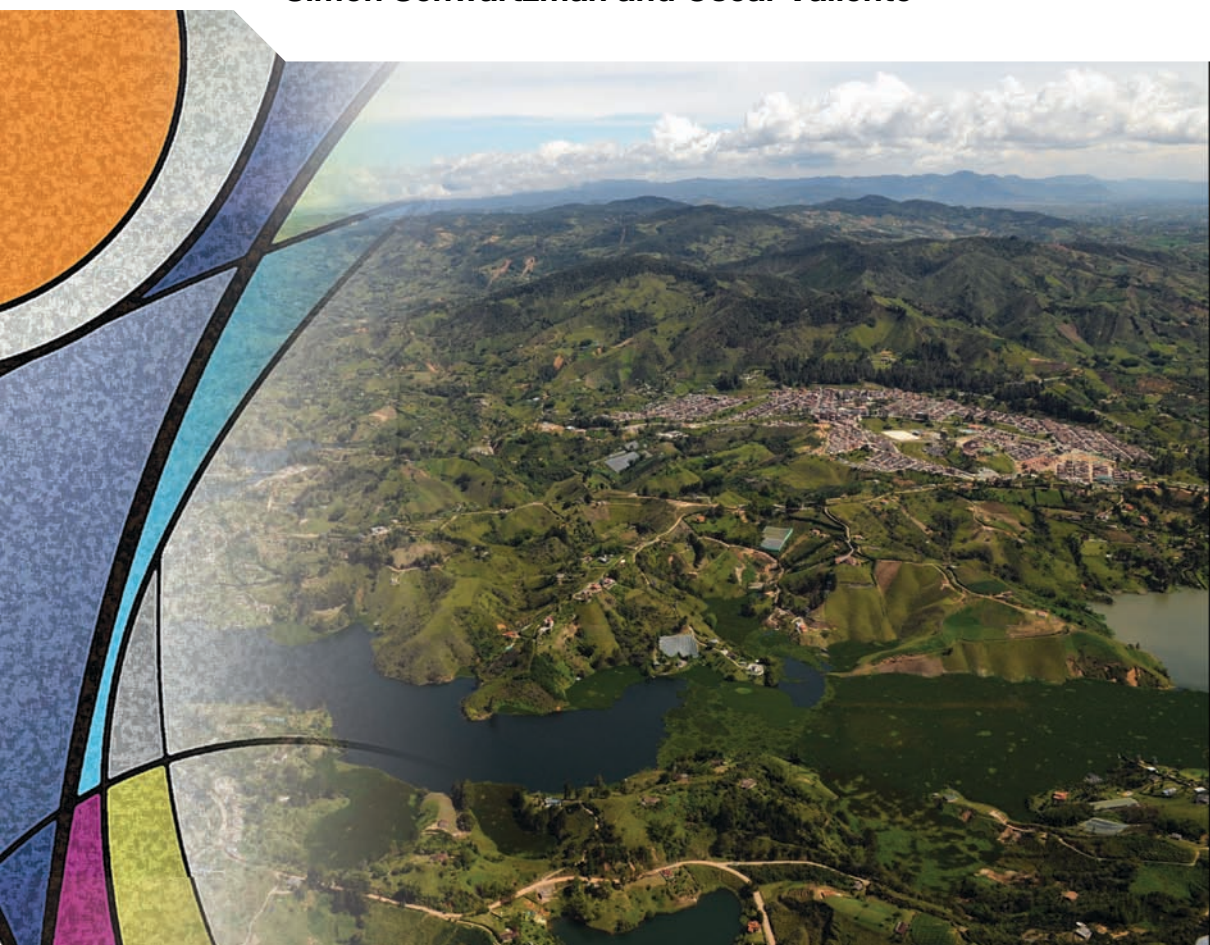


Higher Education in Regional and City Development

Antioquia, Colombia

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in Regional and City
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Antioquia, Colombia
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Foreword

Universities and other tertiary education institutions can play a key role in human capital development and innovation systems in their cities and regions. Since 2005 the Reviews of Higher Education in Regional and City Development has been a tool to mobilise tertiary education for economic, social and cultural development of cities and regions. Universities and other tertiary education institutions in more than 30 cities and regions in over 20 countries have participated in these reviews.

The reviews analyse how the tertiary education system impacts local and regional development and help improve this impact. They examine tertiary education institution's contribution to human capital and skills development; technology transfer and business innovation; social, cultural and environmental development; and regional capacity building. Finally, they facilitate partnership building at local and regional levels by drawing together tertiary education institutions and public and private agencies to identify strategic goals and work together towards them. The reviews have been carried out as a horizontal work in the OECD, in collaboration with international organisations and associations, and they support the OECD Innovation Strategy, Skills Strategy and Green Growth Strategy.

The wide multi-annum work on tertiary education in cities and regions began in 2004-07 when the OECD Programme on Institutional Management of Higher Education (IMHE) conducted an extensive study with 14 regional reviews across 12 countries. This resulted in the OECD publication *Higher Education and Regions: Globally Competitive, Locally Engaged* (OECD, 2007) with recommendations to benefit both tertiary education institutions and national and regional governments. In 2008, a second series of Reviews of Higher Education in Regional and City Development was launched to address the demand by national, regional and local governments for more responsive and active tertiary education institutions. As a result, 14 regions in 11 countries participated in the review process in 2008-11. The third round of reviews was launched in 2011-13 to respond to the OECD's global strategy and continuing demand.

This OECD review of Antioquia coincided with the OECD/World Bank review of tertiary education in Colombia and so paved the way for closer collaboration between the OECD and the Government of Colombia that aspires to join the organisation.

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Numerous national and regional stakeholders and representatives of tertiary education institutions provided valuable insights during the review visit and in the form of comments. The OECD would like to thank the Government of the Department of Antioquia, the Rectors of the universities in Antioquia, other representatives of tertiary education institutions, as well as numerous regional stakeholders who provided valuable insights during the review visit. Finally, the OECD would like to thank the World Bank for its support. Details about the Regional Steering Committee and the review visit agenda are available in annexes to this report.

This publication draws on interviews carried out during a weeklong review visit in 17-22 July 2011, during which the review team were received openly by a wide range of stakeholders. It also draws on the findings of the OECD World Bank Review of Tertiary Education in Colombia (*forthcoming*), the Antioquia's Self-evaluation Report and other additional information provided to the review team and the OECD.

The expert visit to Antioquia was led by Oscar Valiente who co-ordinated the experts' contributions to the report. Jaana Puukka, the project leader of the OECD Reviews of Higher Education in Regional and City Development, finalised and edited the report with support from Bonifacio Agapin. Peer reviewers were Jose Joaquin Brunner (Diego Portales University, Chile), Jocelyne Gacel-Avilà (University of Guadalajara, Mexico), Martha Laverde (World Bank), Julio Rubio (former Deputy Minister of Tertiary Education, Mexico) and Simon Schwartzman (Institute for Studies on Labour and Society, Brazil). Further details about the review team can be found in Annex A to this report. Louise Binns supervised the publication process.

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Acronyms

ACIET	Colombian Association of Technological Tertiary Education Institutions
ACOPI	National Association of Micro, Small and Medium-sized Companies
AMDEL	<i>Asociación de Municipalidades para el Desarrollo Económico Local</i> Municipal Association for the Local Economic Development
ANDI	National Association of Colombian Entrepreneurs
ASCUN	Colombian Association of Universities
CAN	<i>Consejo Nacional de Acreditación</i> National Council of Accreditation
CCMA	<i>Cámara de Comercio de Medellín para Antioquia</i> Medellin Chamber of Commerce for Antioquia
CERES	<i>Centros Regionales de Educación Superior</i> Regional Centres of Higher Education
CES	<i>Instituto de Ciencias de la Salud</i> Institute of Health Sciences
CESU	<i>Consejo Nacional de Educación Superior</i> National Council for Higher Education
CEUR	<i>Centros para Estudios Urbanos y Rurales</i> Centre for Urban and Regional Studies
CICE	Centre for Innovation, Consulting and Entrepreneurship
CIDE	<i>Corporación Internacional para el Desarrollo Educativo</i> International Corporation for Educational Development
CIDEA	Technical Inter-institutional Committees for Environmental Education
CIIE	Centres for excellence in research and innovation
CINDA	<i>Centro Interuniversitario de Desarrollo</i> Centre for Inter-university Development
CIVICA	International Association for the Evaluation of Educational Achievement
CNA	National Accreditation Council

CODECTI	Regional Council for Science, Technology and Innovation
CODI	Committee for the Development of Research
CONACES	<i>Comisión Nacional de Aseguramiento de la Calidad de la Educación Superior</i> National Intersectorial Committee for Higher Education Quality Assurance
CONPES	<i>Consejo Nacional de Política Económica y Social</i> National Council for Economic and Social Policy
COP	Colombian peso
COPADES	Specialised Committee for Disaster Prevention and Attention
CREAME	<i>Centro Integral de Servicios Empresariales</i> Integral Centre for Business Services
CTA	<i>Centro de Ciencia y Tecnología de Antioquia</i> Centre for Science and Technology of Antioquia
CUEE	<i>Comité Universidad – Empresa – Estado</i> University-Firm-State Committee
DANE	<i>Departamento Administrativo Nacional de Estadística</i> National Bureau of Statistics
DNP	<i>Departamento Nacional de Planeación</i> National Planning Department
EAFIT	Universidad de EAFIT EAFIT University
ECAES	<i>Examen de Estado de Calidad de la Educación Superior</i> State Examination on Higher Education Quality
ECLAC	Economic Commission for Latin America
EIA	<i>Escuela de Ingeniería de Antioquia</i> Antioquia School of Engineering
EMP	<i>Empresas Públicas de Medellín</i> Medellin Public Enterprises
ENLACE	<i>Evaluación Nacional del Logro Académico en Centros Escolares</i> National Evaluation of Academic Success in Schools
EUR	Euro
GDP	Gross domestic product
GNP	Gross national product
GPB	Pounds sterling
GRAMIT	<i>EL Grupo Regional de Apoyo a la Medicina Indígena Tradicional</i> Regional group to support traditional indigenous medicine
HDI	Human Development Index

HEI	Higher Education Institution
HEIF	Higher Education Innovation Fund (England)
IADB	Inter-American Development Bank
IBC	<i>Ingreso base de cotización</i> Basic salary deductions for social and health costs
ICC	Clavijero Consortium Institute
ICETEX	<i>Instituto Colombiano de Crédito y Estudios Técnicos en el Exterior</i> Colombian Institute for Student Loans and Technical Studies Abroad
ICFES	<i>Instituto Colombiano para la Evaluación de la Educación</i> Colombian Institute for the Evaluation of the Education System
ICT	Information and Communication Technology
IDEA	Institute for the Development of Antioquia
IEBTA	Node IEBTA for technology-based companies
IMHE	OECD Programme on Institutional Management in Higher Education
INSEAD	<i>Institut Européen d'Administration des Affaires</i> European Institute of Business Administration
ISCED	International Standard Classification of Education
JIRA	Integrated Management of the Lower Basin of the Ayuquila River
LAC	Latin American and the Caribbean
LANIA	National Laboratory for Advanced Computing
LLECE	<i>Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación</i> Latin American Laboratory for the Assessment of the Quality of Education
MEN	National Ministry of Education
OECD	Organisation for Economic Cooperation and Development
PEA	Priority Employment Area
PGT	Programme of Technological Management, University of Antioquia
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
PLANEA	Strategic Development Plan of Antioquia
RDI	Research development and innovation

RENATA	<i>Red Nacional Académica de Tecnología Avanzada</i> National Network of Higher Education and Research Institutions in Colombia
SABER 5	Final test of primary education
SABER 9	Final test of lower secondary education
SABER 11	Final test of compulsory education
SABER Pro	Examination of higher education quality
SACES	<i>Sistema de Aseguramiento de la Calidad de la Educación Superior</i> Higher Education Quality Assurance Information System
SECA	<i>Secretaría de Educación para la Cultura de Antioquia</i> Secretariat of Education for the Culture of Antioquia
SENA	<i>Servicio Nacional de Aprendizaje</i> National Learning Service
SEROTEC	Technical Cooperation Service, Ministry of Economy
SESA	Antioquia Higher Education Subsystem
SIMPAD	Municipal System for Disaster Prevention and Attention
SME	Small and medium-sized enterprise
SNA	<i>Sistema Nacional de Acreditación</i> National Accreditation System
SNIES	<i>Sistema Nacional de Información de la Educación Superior</i> National System of Higher Education Information
SPADIES	<i>Sistema de Prevención y Análisis de la Deserción en las Instituciones de Educación Superior</i> Higher Education Institutions Dropout Analysis and Prevention System
SUE	State University System
TEI	Tertiary Education Institution
TIMSS	Trends in International Mathematics and Science Study
TOP	Territorial Ordering Plans
TOS	Territorial Ordering Schemes
TTE	Technological and Technical Institution
UBN	Unsatisfied basic needs
UIS	Universidad Industrial de Santander
UK	United Kingdom
UNDP	United Nations Development Programme
UNODC	United Nations Office on Drugs and Crime
USD	US dollar

Assessment and recommendations

Antioquia: from uneven growth towards inclusive and sustainable development

Despite its “economic miracle” and robust growth for more than a decade, Colombia continues to struggle to overcome social and economic disparities. Third largest country in Latin America in terms of population and fifth largest in terms of area, Colombia is rich in natural resources, but has not created enough jobs for its 46 million strong population. It lags behind Mexico, Chile and Brazil in terms of human capital development, economic diversification, innovation and productivity. In 2010, depending on the definition, up to half of the population (49.5%) lived in poverty. Sustained growth and development are necessary for improving the quality of life of the population, particularly those from lower socio-economic and rural backgrounds. The central government is committed to long term reform to modernise the economy and to expand participation in education at all levels through the “Education Revolution”.

Antioquia, the second biggest of Colombia’s departments, is one of the economic engines of the country. With a population of over 6 million (13.3% of Colombia’s population), Antioquia’s GDP per capita and growth rates are above national averages. Antioquia’s economy is based on natural resources, manufacturing industry and a growing service sector. Industrial activity, tertiary education, R&D investments, population and income are all concentrated in the Medellín metropolitan area, which along with the cities of Bogotá and Cali forms “The Golden Triangle”.

Historically based on mining, energy and textiles, the regional economy is in the process of transformation. The textile industry is in decline because of international competition and has not yet been replaced with other labour intensive economic activities. Three sectors – commerce, manufacturing and personal services – employ 72% of the workers, but absorb just 6.7% of the region’s net investments. At the other extreme, utilities, transportation and financial services absorb 85% of the investments, but only employ 10% of the labour force.

At the same time, almost half of the population is below the poverty line. Antioquia's unemployment rate is high and about half of the workforce is outside the formal labour market. While poverty is concentrated in the rural, sparsely populated areas, more than 50% of the population in the Medellín metropolitan area is poor and nearly 60% work in the informal labour market or is under-employed.

While Antioquia has made great strides in education and performs better than Colombia in general in key education indicators, it still has a long way to go to reach the OECD averages. The tertiary education participation rate has reached 35.5%, but overall educational attainment level remains low with significant disparities between rural and urban areas. At the same time, the average years in formal education in Antioquia are 8.74 years, but 6.33 years in the rural areas. Similarly, illiteracy rate in Antioquia is 5.1%, but in rural areas 10.6%.

After decades of armed conflict, social instability and violence, Antioquia finds itself in a constructive period, oriented towards economic and social development. Efforts are being made to move up in the value chain, diversify the economy and use human capital more intensively. In this context, the key challenges for the Department of Antioquia and its tertiary education institutions are:

- How to develop a more inclusive labour market and education system to address long-term challenges of poverty and inequity?
- How to create an economy that can absorb both highly-skilled and low-skilled segments of the population?
- How to improve the equity, quality and relevance of education and turn the potential of the tertiary education sector into an active asset for regional development?

To address these challenges, the Department of Antioquia needs a skills development and innovation strategy with a vision, measurable goals, milestones, co-ordination measures and a robust evidence base seeking complementarities with the national, local and institutional actions. Long-term collaborative efforts and investments in improving quality of education are necessary to lift population out of poverty. Tertiary education provision needs to be better aligned with the needs of Antioquia through stronger university-industry links that can boost new enterprises and jobs, and efforts that can facilitate transition from an informal to formal economy. Finally, at the national level, tertiary education reform should be reintroduced after a period of review and consultation with stakeholder groups. In order to

improve regional development outcomes, evidence-based decision making at all levels and institutions need to be adopted. The existing good practices in widening access and supporting students from low income households, in university-industry collaboration and in rural and social development, and should be scaled up into a system within and between institutions.

Human capital and skills development

Antioquia's large, diversified and rapidly expanding tertiary education sector represents an important concentration of human capital and skills development in Colombia. It is absorbing a growing proportion of students who have completed secondary education. As a result of national, departmental and local initiatives, coverage, participation and equity are improving.

Antioquia provides an ample supply of tertiary education which is differentiated among autonomous public and private institutions, and between universities and non-university institutions which have different missions and responsibilities. There are 41 tertiary education institutions, 36 of them in the Medellín metropolitan area, as well as the fee free training provided by the National Learning Service (SENA). In addition, there are 11 branches of tertiary education institutions and 5 Regional Centres for Higher Education (CERES), promoted by the National Ministry of Education.

Over the last decade, tertiary education participation has expanded in Colombia as a result of national government's commitment to the "Education Revolution," policies that support broadening access to tertiary education and a strong push to support technical and technological education. The national plans have aimed to improve the supply of human capital in terms of participation, quality and relevance. This has resulted in a broad range of programmes and initiatives to increase and widen access to tertiary education and to follow-up the progress, such as scholarships and student loans through ICETEX, propaedeutic cycles, bridging programmes between secondary and tertiary education etc. Many of the initiatives are nationally-driven, but there are also bottom up joint efforts by the Department of Antioquia and large municipalities, particularly Medellín. Innovative programmes include "Access with Equity" (*Cobertura con Equidad*), a public-private partnership that brings together the government, a group of private universities and private sector employers to offer the opportunity to study in Antioquia's private universities to academically qualified low income students who could not find a place in a public

university. The students get a scholarship equivalent to 75% of the tuition costs and receive a loan from ICETEX (Institute for Student Loans and Technical Studies Abroad) for the remaining 25%.

These efforts have improved access to tertiary education at the national and regional levels. In Colombia, the tertiary education expanded from 1 000 148 students in 2002 to 1 674 420 in 2010, resulting in an increase in the undergraduate coverage rate from 24.4% in 2002 to 37.1% in 2010. In Antioquia, the tertiary education student population increased from 128 441 in 2002 to 206 782 in 2010, almost reaching the goal set out in the National Development Plan. Gross tertiary education enrolment in Antioquia was 40.9%, below the leading regions of Bogota (73.7%), Quindio (50.4%), Santander (48.0%) and Norte de Santander (42.8%), but above the national average of 37.1%. The absorption rate – which measures the students enrolled in undergraduate programmes over the number of students who take the final test of compulsory education (Saber 11^o) – showed progress from 54.1% in 2002 to 82.4% in 2008, and compares favourably with the national level (53.6% to 73.8%, respectively).

Even if access to tertiary education is far from equal, tertiary education institutions enroll a growing number of first generation students from low income families. Half of the families of students who enter tertiary education have an income of between one and two minimum salaries (USD 300- USD 600 in 2011). In Antioquia, the percentage of students from households with incomes below two minimum wages rose from 32.9% in 2002 to 52% in 2009, surpassing the national level. At the national level, the percentage of students with “low” marks (SABER 11) accepted by tertiary education institutions increased from 39% to 46% between 2006 and 2010.

While much of the progress is due to the growth in the provision of technical and technological education (T&T), more efforts are necessary to be better integrate it in the tertiary education system. Between 2006 and 2009, the participation in T&T education in Antioquia increased by 74.6% from 51 838 to 90 495 students, resulting in an increase from 31.1% to 41.3% in the share of the T&T students out of the tertiary education student population. At the same time, however, SENA, which delivers an important part of T&T programmes and does not charge fees to students, remains nationally oversubscribed so that only one out of seven applicants is awarded a place and actually enrolls. Attached to the Ministry of Labour, SENA’s programmes and students are often not included in national data on tertiary education. Pathways to facilitate student progression from T&T education to universities need strengthening at the national and departmental level. This could be facilitated by the implementation of the National Qualifications Framework and enhanced collaboration within the tertiary

education sector for data collection, joint programmes and quality assurance as recommended by the OECD/World Bank review.

But access to and success in tertiary education remains a challenge to many students who are disadvantaged due to their socio-economic background and inadequate preparation at schools. More work is needed to continue and consolidate the gains achieved.

As tertiary education participation has grown, internationally high dropout rates undermine the efficiency and equity of the system. In 2011, Colombia's tertiary education dropout rate (the proportion of students who enter the first year of education but then leave) was 45.3%. SPADIES (the national information system specifically designed to track dropout and help identify its causes) shows that the biggest dropout occurs in the lowest level tertiary programmes, during the first semester, for students from low income families and with low SABER 11 test scores.

The quality of primary and secondary education systems determines how well students are prepared to take admission tests and how they progress in tertiary education. In Colombia, most of the students who graduate in secondary education have not developed the skills that are required to enter and successfully complete technical, technological and university studies. The academic standards that Colombian students have achieved by the time they enter tertiary education are generally low in comparison with other countries. Almost half (47.1%) of the Colombian students at the 15 year old level who took part in the Programme for International Student Assessment (PISA) in 2009 performed below the baseline for functional reading or comprehension.

Widening access to and ensuring success at all levels of education remain a key policy challenge in Antioquia. National and departmental authorities need to address the challenges in primary and secondary education in a comprehensive manner, by improving the quality of the education and mobilising appropriate levels of financial resources for public schools. Universities and tertiary education institutions can strengthen these efforts by engaging in collaborative long term collaboration with vulnerable schools in order to improve the quality of teaching. In tertiary education, enhanced and better targeted academic, social and financial support for students from low income families is needed. The government is encouraged to continue its commendable work to ensure that ICETEX will be able to fund loans to eligible students and target its support more accurately.

Antioquia's tertiary education sector plays an important role by providing the local labour force with an inflow of highly qualified people. At the same time, stronger focus on quality and relevance of education is needed to ensure that students will acquire skills that will guarantee them lifelong employability.

Antioquia's tertiary education sector plays an important role in advanced human capital training by providing a labour force with an inflow of more than 21 000 highly qualified people annually, most of whom continue to work in the region. The labour market looks for and employs a high proportion of this group, recognising their value with a salary premium that shows a positive return on their investment to obtain a tertiary education degree. Among the departments of Colombia, Antioquia has the highest proportion of locally-trained graduates working (85.7%).

Antioquia's tertiary education institutions are beginning to link more systematically with stakeholders, both in the public and private sectors, understanding their requirements for qualified personnel and are taking steps to respond with education in the quantity and quality needed. Steps have been taken by the authorities and institutions to match supply and demand of skills and introduce institutional mechanisms of collaboration between tertiary education institutions and the industry. The University-Firm-State Committee (CUEE) is the most robust form of collaboration which has generated a baseline of trust on which Antioquia can build more concrete outcomes in the future.

Despite the generally good employability of tertiary education graduates and high private returns on education, there is considerable diversity among different institutions in terms of the labour market relevance of education. To strengthen the skills and competencies of students, and build stronger links with the labour market, a range of measures could help. High quality work-based and co-operative learning opportunities for students in collaboration with local industry and other employers, inclusion of labour market representation in the curriculum and course design, and the governance of tertiary education institutions, using local private sector employees as instructors, and supporting mobility of university and research staff temporarily to the private sector would be useful ways of improving labour market relevance of tertiary education.

More attention should be given to students' learning and employment outcomes. As an immediate step departmental authorities and tertiary education institutions could make better use of the results of the *SABER Pro* test that not only measures the learning outcomes of Colombian tertiary

education students, but also provides a signal to potential employers about the quality of skills. Furthermore, closer attention to data provided by the Labour Market Observatory for Education would help students and tertiary education institutions to: *i*) identify the most profitable employment sectors and tertiary education programmes; *ii*) forecast the regional demand and supply of human capital; *iii*) analyse regional relevance; *iv*) measure career success by universities (in terms of employment and salary levels); and *v*) monitor remunerations and income inequalities.

Antioquia's education system needs to become better aligned with the needs of the region, its labour market and population.

Antioquia has a dual economy, dual labour market and skill requirements. Almost half of Antioquia's population (about 47%) lives in conditions of poverty which is severest in rural areas. Unemployment and underemployment rates are high at 16% and 28%. As elsewhere in Colombia, where only 10.1% of the adult population have attended tertiary education institutions (ISCED 5 and 6), in Antioquia, poverty and poor labour market outcomes are related to the low levels of education and professional qualification of the population, and to the way in which the regional economy is organised, where the productive, capital-intensive sectors do not absorb labour. In this context, Antioquia's tertiary education sector should contribute to the efforts that enhance the global competitiveness of the modern sector, while the traditional rural sector requires research, development and innovation efforts as well as life long learning initiatives and anti-poverty programmes focused on job creation, economic empowerment and the development of skills that can support rural livelihoods. While the Regional Centres of Higher Education (CERES) have formed a major part of the strategy of the National Ministry of Education to decentralise the supply of higher education and to expand its coverage at regional level, especially in the most remote and vulnerable communities, it is important to evaluate the success of this initiative and to build on successful examples to achieve better economies of scale, critical mass and improved quality and relevance of the programmes offered.

Recommendations for the national level

- Continue the efforts to improve access and success to tertiary education, and enhance the relevance and quality of education at all levels. Pursue the goal of achieving 50% gross tertiary participation by 2014, emphasising the connections between equity, quality and relevance.

- Expand ICETEX student support and improve targeting on the least advantaged groups, by improving the accuracy of socio-economic classification for all education-related purposes. Ease the loan repayment burden by an income-contingent loan repayment system or a graduated repayment system.
- Develop and implement a National Framework of Qualifications (NQF), supplemented by a national credit transfer system to promote student mobility and create clearer and more universal pathways between tertiary levels and institutions. Integrate SENA fully into the tertiary system and into national databases.
- Commission an external evaluation of CERES to identify the strengths and weaknesses of CERES programmes relative to other T&T programmes (including those at SENA centres), with particular reference to quality of programmes, cost to students, value for money, impact on employability and long term financial sustainability and governance.
- Improve teaching quality in tertiary education institutions by attracting highly-qualified new staff and upgrading the qualifications of existing staff, encouraging peer observation of teaching, and developing indicators of teaching quality to be included in performance appraisals of tertiary institutions.
- Build strong links between institutions and industry at all tertiary education levels. Ensure that tertiary education programmes include work placements and build broad competencies, such as analysing problems, organising time, writing skills, working in teams and groups.
- Commission an external review of the supply of and demand for tertiary education graduates at all levels. The review should take into account employment rates and salary levels related to field of study as well as qualification level. Address disparities between regions in tertiary enrolment, by increasing the number of municipalities with their own provision and expanding distance learning.
- Maintain and improve the state examinations for higher education quality (ECAES) known today as *SABER Pro*, a valuable experiment in Latin America, which together with the information of the Labour Observatory (*Observatorio Laboral de la Educación*), provides valuable

instruments to guide institutional and Departmental policies in tertiary education, its relevance and quality.

- Enhance the quality of training programmes for primary and secondary teachers, design induction and professional development programmes for new school teachers and leaders. Given the unsatisfactory results obtained by Colombian students in the PISA assessment (2009), it is important to focus on teacher training issues such as recruitment for pedagogical programmes, initial teacher preparation at the tertiary education level, special accreditation of teacher training programmes, professional accreditation according to high standards in all subjects and levels and further education opportunities.

Recommendations for the departmental level

- In collaboration with tertiary and other education institutions and key public and private stakeholders of the economy and society work to develop a Regional Human Capital and Skill Development System to define region-wide goals, policies, priorities, measures and milestones for the medium term strategic development. As part of this system, establish a tertiary education co-ordinating body that develops a vision and strategy in a collaborative effort by the system participants to ensure support and legitimacy to sustain political cycles that affect the departmental, municipal and local governments. It is vital that such an organisation is autonomous, can rely on its own resources to commission studies and evaluations and is run with complete independence from the corporate interests of its participants.
- Develop a portfolio of robust data on graduate labour market related to the regional context and the situation of individual tertiary education institutions to support decision making at the regional and institutional levels. The most effective region-wide graduate labour market systems are based on the collection of comprehensive labour market intelligence, 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 increase students' chances of finding employment. Use the data strategically to identify regional priorities and respond to the data in terms of course offerings and the provision of employer/cluster-specified skills by educational institutions.
- In collaboration with tertiary education institutions continue and expand efforts to improve the access and success of students from lower socio-

economic backgrounds (strata 1 to 3), and strive for greater efficiency in education, by reducing dropout rates as well as by increasing graduation according to the minimum time for degree completion. These efforts should build upon the best international practices related to effective academic, social and financial support for students; long-term collaboration with secondary education institutions to improve students' learning outcomes; efforts to raise aspirations among students; and adoption of more student-centred learning methods. International experience shows that early warning systems, as well as individual tutorial programmes, are effective for students at risk. These systems entail attendance at remedial and compensatory classes, the identification of key subjects in the different fields that are difficult to master for at-risk students, student welfare measures that provide emotional support and counselling services, and the organisation of teams to support students in danger of dropping out.

- Improve links between secondary and tertiary education and between education and work, thereby making education programmes more attractive and relevant for young people who expect to enter the labour market quickly. Antioquia has achieved relatively high levels of absorption but, in some sub-regions it is still registering high desertion rates between secondary and tertiary education. Follow the example of the national “Programme for the Development and Strengthening of Links between Secondary, Technical and Tertiary Education” (*Programa para el Fomento y Fortalecimiento de la articulación entre la Educación Media, Técnica y la Educación Superior*), which - through agreements and alliances among secondary institutions and different tertiary and postsecondary institutions – allocates subsidies to those enrolled in both secondary and technical-professional programmes in areas with a high occurrence of dropouts.
- Focus efforts on improving the quality of education at all levels. The OECD evidence shows that economic growth is not driven by a greater number of years of schooling and wider coverage of subjects, but by the quality of that education. A tertiary education system with increased absorption and enrolment rates must develop strategies at the departmental level to address quality issues.
- In collaboration with tertiary education institutions, take steps to significantly expand tertiary education opportunities for working age adults. These steps should create clear and transparent pathways to advance 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 particular needs and interests of adults who often combine work and study. Consider establishing an agency to help recognise prior informal and non-formal learning.

- In collaboration with employers encourage entrepreneurship as an inherent feature of a society and economy. To meet the goals of the Development Plan for Antioquia (2006-2011) to stimulate academic training in entrepreneurship and to create and consolidate a culture of productivity and competition in different sub-regions, provide entrepreneurial training both at the secondary and technical levels, as well as in the technological and university levels, with particular emphasis on the less developed areas.
- Ensure sustainable and balanced sub-regional provision of tertiary education by conducting a region-wide assessment of current and planned capacity against anticipated student numbers, and identify gaps in staff and infrastructure. When developing or rationalising the network of education providers, ensure to have access to lifelong learning and industry-related services through flexible multi-provider learning and extension centres that draw on a range of providers, including both universities, T&T institutions and CERES, and are supported by adequate IT infrastructure that ensures high speed, low cost connectivity.

Recommendations for tertiary education institutions

- Develop policies, programmes and measures to improve, on a continuous basis, the quality and relevance of study programmes. Firstly, review the curriculum content and pedagogical methods of study programmes to align them with the needs of the labour market and the local and regional economies. The opinion of employers and graduates should play an important role in the systematic and continuous revision of the education programmes of tertiary education institutions. Secondly, take full advantage of the results of *Saber Pro* examination that evaluate generic skills such as critical thinking, problem solving, written output and interpersonal understanding in curriculum design and the development of teaching and learning. Thirdly, create robust methods to monitor the student progress and graduate employment outcomes. Fourthly, monitor studies that analyse the entry of graduates into the labour market, using the information generated by the Labour Observatory for Education, which facilitates the identification of the most profitable employment sectors and tertiary

education programmes, promotes awareness and monitoring of demand for different knowledge areas, assures follow-up with regard to regional demand and supply of human capital, publishes regional relevance analyses, measures career success by universities (employment and salary levels), monitors remuneration and income inequalities, undertakes follow-up studies on formal employment and stimulates awareness of the relevance, quality and supply of T&T education.

- Collaborate more actively with industry for stronger alignment of the educational provision with regional and labour market needs and in order to ensure the entrepreneurial skills of graduates and their employability. Engage employers in the curriculum development, invite professors from industry to deliver courses, and develop problem-based, interdisciplinary and work-based learning methods to develop employability, entrepreneurial and transferable skills. Place a greater emphasis on generic and soft competencies and on values that guide action, such as taking responsibility for shared goals and co-operating to achieve these.
- In order to improve the quality of all tertiary education programmes, gradually reserve academic positions only for candidates with a Masters degree or higher and fix a period for those who wish to follow an academic career to complete their doctoral studies. Provide comprehensive professional development programmes for university teachers. Provide regular short courses to improve teaching skills encourage assessment and feedback from students, and support and reward excellence in teaching. Increase the number programmes that pursue a high quality accreditation.
- Expand general education courses progressively in the first year of university programmes and reduce specialised materials to establish a curriculum structure of shorter duration at the undergraduate level with later specialisation at the Masters level following the European Bologna model. Gradually introduce, in all programmes, a greater component of English teaching, more intensive use of ICTs to facilitate autonomous learning, and the development of key competencies linked to the capacity of learning to learn.
- Look to match global levels of excellence in supporting entrepreneurship in the curriculum and build comprehensive support programmes encompassing entrepreneurship training, practical experience of creating new businesses for groups of students, and

incubation and hatchery facilities together with seed funds for new graduate ventures.

Research, development and innovation

National authorities have increased public support for science and technology, but innovation potential is constrained by many challenges.

The Colombian authorities have taken steps to strengthen the National Science and Technology System with the goal to increase human resources and investment in RDI to facilitate growth that would increase the per capita income of all Colombians. The target is to invest 2% of the national product in science and technology by 2019, with 500 PhDs graduated every year in strategic knowledge areas. At the same time, the authorities aim to stimulate innovation in the productive sector and channel funding to strategic sectors with high scientific and technological content.

Despite the progress made, Colombia continues to underperform in science, technology and innovation, ranking lower than the largest countries in Latin America. Colombia is on the 71st place in the Global Innovation Index, well behind the top performers, and also the highest performing Latin American countries. In 2007, Colombia spent 0.16% of its GNP on science and technology, compared to 1.1% for Brazil and 2.1% for the OECD average. Leading-edge research in Colombia remains underdeveloped with weak industry links, a low level of patents.

Antioquia is the leading region in Colombia after Bogotá in innovation capacity based on science and technology production. But major improvements are necessary in research and researcher training, and support for RDI.

With a diverse set of tertiary education institutions and growing student enrolments, Antioquia is one of the prime locations for science, research and innovation in Colombia, based on indicators such as human resources, funding and projects, but lags behind the national capital. Out of the 17 000 people actively engaged in research in 2009, 16% were in Antioquia. Bogotá absorbed more than half (51%) of the national investments in science and technology, compared to 13% for Antioquia. Out of the 3 000 projects approved by Colciencias in 2009, 961 were from Bogotá and 782 from Antioquia, mainly in health, industrial technology, basic sciences, and energy and mining.

Antioquia's 206 000 students represent a strong innovation potential for the future, but, as elsewhere in Colombia, post-graduate training and research are in need of strengthening. In 2009, 2 270 students out of the 206 000 were enrolled in Masters and 388 in doctoral programmes. Between 2001 and 2008, only 147 doctors graduated from Antioquia's universities, less than 20 a year. In 2009, the University of Antioquia, the leading tertiary education institution in the region had less than 300 students enrolled in its 23 doctoral programmes and graduated only 19 PhDs.

Antioquia has pioneered a large number of initiatives from different public and private bodies to boost science, technology and innovation, but lacks a coherent regional innovation system.

Antioquia is one of the leading regions in Colombia in making science, technology and innovation a pillar of its economic development and future prosperity. Its departmental government and the business sector have excelled in goal setting, prioritisation and consensus building. It has developed partnerships among the public sector, companies and universities which show a gradual growth of R&D development capabilities. Antioquia has pioneered new agencies and organisational arrangements, such as the Science, Technology and Industry Directorate that was established to stimulate co-operation and to develop a regional Science, Technology and Industry Plan; the Regional Commission of Competitiveness; and the Council for Science, Technology and Industry, CODECIT, that will co-ordinate a fund to be derived from the 10% of the income generated by the General Royalty System. At the metropolitan level, Medellin is leading cluster-based initiatives to transform itself into a centre of high technology, creative industries and tourism, but co-ordination with the Department of Antioquia and tertiary education institutions remains a challenge.

Structures have been developed to support university-industry collaboration and inter-institutional collaboration for local and regional development in Antioquia. Antioquia has pioneered in mobilising its tertiary education institutions for regional development through the nationally recognised University–Firm–State Committee, CUEE, which under the leadership of the University of Antioquia brings together 12 public and private tertiary education institutions, 21 companies, 7 regional research and development centres, the governments of Antioquia and Medellin, and the national associations of entrepreneurs and micro and small and medium-sized enterprises. Recognising the need for an integrated response to industry, the university has established five Centres of Excellence for Research and Innovation (CIIE) in collaboration with industry, social and

governmental institutions and other tertiary education institutions to respond to regional and national focus areas in health, energy, biotechnology and ICT.

Despite a wide range of initiatives, programmes and networks Antioquia has not yet developed a coherent Regional Innovation System. It is unclear what departmental institution has the main responsibility for coordinating the regional innovation strategy. It is difficult to assess the total amount of investments in innovation activities or to ascertain their source whether regional, national, public or private. Linkages between universities and technological institutions remain underdeveloped, which has a negative impact on regional and local development.

While the public role of regional innovation system is likely to grow in future, there is a need to foster a sense of responsibility to show an overall positive return to public investment. The available data on the outcomes of various RDI initiatives by the government are limited and there is a significant discrepancy between the stated objectives and the end results. 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. Innovation authorities should guard against pursuing too many goals simultaneously and dispersing energy and efforts. The incentives for tertiary education institutions should be reviewed to find ways of influencing these towards more concrete participation in innovation activities and balance knowledge production with knowledge transfer.

Science- and technology-led innovation strategy is not enough to address Antioquia's key challenges and a low absorptive capacity for innovation in the local economy that is restructuring. Antioquia needs innovation in low and middle-tech firms that dominate the local economy.

Innovation, with a significant contribution from the universities, can help address the key challenges of poverty and unemployment in Antioquia. Antioquia's dual economy has an export-oriented part, dominated by multinational corporations with few linkages to local firms, and a domestic part characterised by low skills and low RDI intensity. Poverty and poor labour market outcomes in Antioquia are not only related to the low skills of the population, but also to the way in which the regional economy is organised, with most of the resources and investments concentrated in

highly productive, capital-intensive sectors in the Medellin area that are not labour intensive.

The dynamism of the local economies depends on the ability of local firms to innovate and to adapt to changing markets and technologies by continually introducing commercially viable products, services and production processes. Large, internationally oriented companies in the areas of mining, energy and banking can source their technologies from the international market, and only in special conditions would need to develop their own local research and innovation capabilities. The kind of innovation most needed in Antioquia is not the high-tech, research-based knowledge produced in sophisticated research centres and laboratories, but incremental improvements in the way products are made and commercialised in low and middle-tech firms that are still the bulk of the economy.

Antioquia would benefit from an innovation strategy that supports not only innovation intensive sectors with high tech research, but also the wider SME base with low R&D investment and a weaker innovation culture. Tertiary education institutions could become instrumental in helping the economy to follow a more knowledge-based path of development in the sectors and areas which are currently suffering from low RDI intensity. They could play a stronger role in facilitating the cluster development in the existing productive chains in agro-industry, mining and energy, textile and fashion industry, tourism and health services and thereby help articulate the demand from SMEs for services offered by universities.

Technological institutions are often better equipped to engage with small and medium-sized enterprises in particular in managing the upgrading of technologies. To ensure that the T&T sector is well positioned to help upgrade and diversify existing industries to expand into a new line of business, their focus on skill provision should be balanced with locally focused support for SMEs across Antioquia.

In Antioquia, many institutions are involved in the development of entrepreneurship but participation and collaboration needs to expand to optimise the effectiveness of available resources.

Finding ways of increasing entrepreneurship is an effective strategy to create jobs. Spin-off companies are also locally based and likely to have a local economic benefit. This is also an area where tertiary education institutions in Antioquia could have a stronger impact on the SME sector through support for enterprise within the student/graduate community and closer collaboration with other support activities.

Antioquia, and particularly Medellín, which has a strong entrepreneurial tradition, has many interesting examples of entrepreneurial development and entrepreneurship in various tertiary education institutions. These combine curriculum at the undergraduate level, promote practical work by students, link research to the productive sector and foster the transfer of knowledge and its dissemination amongst the community (EAFIT). Other initiatives include the Entrepreneurship Park, an initiative of Medellín and the University of Antioquia that identifies business opportunities based on research outcomes and organises a competition through which the municipality provides seed money for small entrepreneurial activities, with the goal of 1 500 new entrepreneurs in 2011. In partnership with universities and local governments, the National Learning Service (SENA) has stimulated small business creation by providing seed money on a competitive basis and tutorship, but so far results remain modest with only 10% of projects having received support and a 50% failure rate in the first years.

Universities could consider mainstreaming enterprise support with degree programmes and through supporting infrastructures. Better results could also be achieved through pooling of resources and stronger collaboration across the tertiary education sector. Provision of entrepreneurship programmes should be scaled up, focusing on growth oriented entrepreneurship, but not neglecting social and cultural entrepreneurship and assistance to move towards formal economy of firms and low income people. Experience elsewhere shows that the best support for graduate entrepreneurship comes from teaching undergraduate and graduate levels programmes where students from across the sciences, engineering, business and arts disciplines work in teams to form real companies mentored by entrepreneurs.

Recommendations for the national government

- Increase investments in research, development and innovation; Stimulate research beyond the National University and Bogota, but avoid spreading resources too thinly by building critical mass and linking researchers throughout Colombia to established R&D groups. Through Colciencias support high quality and high potential centres of excellence in both academic and applied R&D. Stimulate national and international networking, collaborative projects among tertiary education institutions and university-industry collaboration.
- In collaboration with the departmental governments improve the evaluation and assessment of funded RDI initiatives to ensure accountability for the use of publicly allocated resources. These include

criteria and measures of quality and relevance to the socio-economic needs of society such as: *i)* the continued relevance of the RDI programme to its original stated objectives; *ii)* programme results and the achievement of objectives; *iii)* the impact of the programme on its stakeholders; and *iv)* the cost-effectiveness of the programme. Develop a robust system of indicators, particularly of outputs and cost-benefit analyses, to evaluate and assess RDI initiatives.

- Through Colciencias and other agencies, strengthen the incentives for tertiary education institutions to engage in systematic and institutional collaboration with local business and industry to drive socio-economic development in Colombia and its regions. These incentives should encourage tertiary education institutions to undertake collaborative activities, such as applied research, consulting and partnerships with other regional stakeholders, in areas where the regions have a real or potential comparative advantage. Government policy should allow tertiary education institutions and their researchers to obtain additional resources and funding from external sources based on the projects in which they participate. This will facilitate tertiary education institutions to balance the current focus on knowledge production (through academic papers) with knowledge exchange and transfer and to participate in university-industry partnerships and other innovation activities.
- Ensure that the expected creation of a new research and innovation fund based on royalties from the production of oil and gas is used for the commercialisation of promising research and technologies and for the creation of innovative firms. It is expected that these investments will pay back the public investment through the generation of increased private sector activity and valuable publicly-provided advancements that would not have come about without the initial government investments. It is necessary to ensure that resources are not used to subsidise current practices, leading to a situation of dependence and lack of local initiative, and that only projects with good prospects of becoming self-sustaining are supported. No benefits are gained by funding uneconomic innovations, unless the innovation has a value as a public good which can justify its subsidisation.

Recommendations for the departmental level

- Apply a systemic approach in developing a regional innovation system with a well-organised co-ordinating body. A regional innovation system can overcome the current fragmented approach and facilitate stronger

collaboration and networking, consensus-building for economic development and partnering between educational institutions and industry in order to create close collaboration across tertiary education and research and industry, particularly small and medium-sized enterprises.

- Foster entrepreneurship and the development of small and medium-sized enterprises, which are able to employ a larger number of people and make a significant contribution to the reduction of poverty and inequality. The OECD evidence of several case studies shows that governments should reorient their policies more towards individuals and individual behaviour and less towards SMEs as entities; more towards measures to develop the supply of competent entrepreneurs and less towards “picking winners” among existing firms or sectors; more in favour of measures to support the early phases of the entrepreneurial development process, including the nascent as well as the start-up phases; and more in favour of developing an entrepreneurship culture, while creating a more favourable business environment.
- In co-operation with the national government, play a stronger role in steering the resources for science, technology and innovation towards the needs of the region and in sectors in which the region holds a comparative advantage. This could include developing the existing funding models of the tertiary education institutions to improve their accountability, specialisation and efficiency. A performance-based funding system which introduces competitive funds could provide greater incentives for industry and for the regional engagement of universities.
- Co-ordinate the policies, programmes and initiatives between the regional and local authorities in Antioquia and Medellin for encouraging and funding innovation activity in order to develop a more robust regional innovation policy and to reduce duplicated efforts and wasted resources and energy.

Recommendations for tertiary education institutions

- Widen the scope of innovation activities to focus also on low-tech sectors and on organisational and social innovation, and concentrate efforts on challenge-driven innovation related to key issues in the region, such as poverty reduction and health. Use the region as a “laboratory” for research, knowledge transfer and outreach to reach global levels of excellence. Combining community outreach with

training and challenge-driven research can generate improvements in life quality and low-tech innovations.

- Improve capacity to engage in long-term collaboration with local businesses, technology transfer, innovation and new business creation. This co-operation can play an important role in improving the region's innovative capabilities, particularly in terms of technical assistance and university-industry collaboration. Encourage single entry points for industry and SMEs within a tertiary education institution or a group of institutions to help businesses identify where best to provide support for innovation in the tertiary education sector.
- Collaborate with local business to design RDI programmes and other activities that are more strongly aligned with regional needs and allow not only for high-tech development but also for incremental advances. Ensure that local firms are aware of the benefits of hiring graduates. Within tertiary education institutions, foster linkages between science and technology departments and business departments and facilities, and with other disciplines to provide support for service and industry. Promote technologies with cross-sector fertilisation potential.
- The University of Antioquia should strengthen its efforts to build world class excellence in regionally relevant activities and strengthen its role as a regional institution by providing technical assistance and extension activities which are locally relevant and undertaken in partnership with other institutions.

Social, cultural and environmental development

Antioquia's indicators for socio-economic and educational development have been improving, but challenges remain manifold calling for collaborative action with participation from the tertiary education institutions to develop complementarities.

Antioquia's tertiary education institutions have each responded, in accordance with their specific missions, to the social, cultural and environmental needs of the region, but the scope and impact of this action remains limited. Nationally all tertiary education institutions are obliged to devote 2% of their budgets to programmes to community wellbeing, often by increasing the participation of students from lower socio-economic backgrounds. Despite this significant resource allocation, the efforts remain

insufficient, resources are spread thinly, and the scope and impact of the activities constrained, partly maintaining and reproducing the disparities between urban and rural areas. There is limited evidence of collaboration across tertiary education sector, a lack of focus on the implementation and monitoring of results which could help evaluate the outcomes of the outreach activities and help scaling up good practice example into a system. There is also a lack of co-ordination among activities, programmes and plans amongst the Department of Antioquia, the municipality of Medellin and tertiary education institutions.

There is a need to empower disadvantaged communities in rural areas to address their own challenges by strengthening the social economy, cultural identity and environmental sustainability.

A more integrated approach to local economic and social development would benefit Antioquia. While widening access to tertiary education will contribute to outmigration if the best and the brightest leave rural areas to find study and work opportunities elsewhere, and universities' service delivery will address the symptoms of poverty and inequality, but not their causes, there is a need to reach out and empower communities to address their own problems by strengthening the social economy, cultural identity and environmental sustainability.

For sustainable results, tertiary education institutions, in collaboration with local, departmental and national authorities, could play a more active role in helping design and implement community development programmes that build capacity of the communities to respond to their social, economic and environmental challenges. They could play a more prominent role in improving the relevant skills in rural areas, providing lifelong learning and re-skilling opportunities, and training community development practitioners in addition to indigenous leaders. They could conduct challenge-driven research into key issues in the region, focus on preventive, multidisciplinary approaches to health promotion, and develop low tech, low cost innovation that bring concrete improvements in everyday life.

Recommendations for the national government

- Extend the obligation of tertiary education students in health and law to contribute to social development to all students to multiply interventions and to address social problems with an innovative, multi and transdisciplinary approach.

Recommendations for the departmental level

- Create a forum for the systematic exchange of information and experience amongst tertiary education institutions with regard to social, cultural and environmental matters. This forum could organise thematic events with regular information retrieval and exchange facilitated by a dedicated website. The forum would permit the tracking and monitoring of different initiatives and their outcomes, along with the identification of best practices for publication and policy fine-tuning. As a first step, all the social initiatives and projects of tertiary education institutions should be mapped and published in a shared platform. Build on existing examples of good collaboration between universities and the Department of Antioquia, most notably the “Cultural Round Table of the Institutions of Tertiary education” (*Mesa Cultural de las Instituciones de Educación Superior*), that could be used as a model for collaborative and joint intervention in other areas.
- In collaboration with a wide range of public and private stakeholders, widen access to tertiary education for the rural population. This should build on successful initiatives, such as the Regionalisation Programme of the University of Antioquia that brings educational infrastructure and services to rural areas and leads the expansion of virtual education. Facilitate connectivity and access to digital devices, virtual learning materials and well trained personnel.
- In collaboration with the tertiary 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 for the culturally 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 training, growth, productivity and employment. This strategy should address the needs of the culturally diverse populations in the region and also enhance Antioquia’s internationalisation.
- Incorporate tertiary education institutions into the governmental bodies responsible for public health and ensure that municipalities do the same in the committees of epidemiology. Encourage tertiary education institutions to address public health problems in a preventive, multi-dimensional and interdisciplinary way, and not only by generating specialised knowledge and providing services through their human and medical infrastructure. Make child mortality, high rates of adolescent pregnancy and other issues of the regional health agenda, such as

occupational security and solid waste management, priority areas for this collaboration.

- Collaborate with the public and private sector to support sustainable environmental and economic development through a comprehensive regional approach, where tertiary education institutions can contribute to the diagnosis of regional environmental conditions and sustainability, the ecological education for the community at large and research on solutions to existing environmental problems.

Recommendations for tertiary education institutions

- Improve the monitoring and follow-up of the success and results of their initiatives, projects and programmes to show the return on public investment. The lack of robust and comparable data constrains the visibility and impact of universities' activities. It also makes it difficult to measure the real success or failure of programmes.
- Align initiatives for social, cultural and environmental development with the plans designed by national and sub-national authorities in order to have a stronger impact at the local and regional level. Collaborate with other tertiary education institutions in the design and implementation of extension activities.
- Develop the international dimension of extension activities in order to maximise their potential impact and promote exchanges and networking with other parts of the world that are experiencing similar problems. Mobilise international co-operation and networks for the social, cultural and environmental development of the region.
- In addition to widening access to education and providing services to disadvantaged communities, make use of the social service obligations to engage in long term community development by seeking ways to empower communities to find their own solutions to economic, social, cultural and environmental challenges.

Capacity building for regional development

Antioquia has pioneered in building capacity for regional and local development, but co-ordination and collaboration remain challenges. There is a lack of strategic anchoring of regional engagement of tertiary education institutions and a co-ordination deficit.

Antioquia has been a national leader in building capacity in regional development, human capital and skills development, and science, technology and innovation. It has developed a number of strategies, development plans and collaborative mechanism in collaboration between tertiary education institutions, business sector and public authorities. The Antioquia 21st Century Vision has become an overarching co-ordination mechanism among regional stakeholders. The Strategic Development Plan of Antioquia-PLANEA is implemented by the governor with more than 40 public and private stakeholders, including three university leaders. The Development Plan of Antioquia 2008-11 sets goals for tertiary education institutions in terms of access to and quality of education, and applied research. The Development Plan of Medellin has focused on increasing access to education in technical and technological fields to reduce poverty. Regional Higher Education Centres (CERES) have been developed by national, regional and local governments, tertiary education institutions, the local business and industry and civil society in order to widen access and decentralise tertiary education provision. The University of Antioquia has established Centres of Excellence for Research and Innovation (CIIE) in collaboration with industry, social and governmental institutions and other tertiary education institutions to respond to regional and national strategic needs, and is also leading the award-winning University-Firm-State Committee (CUEE).

At the same time, the current extent of regionally relevant activities by tertiary education institutions in Antioquia, including industry collaboration and widening access initiatives are not fully reflected in tertiary education policy or institutional set-up, and remain limited in scope and impact. There is a lack of integration of regional and local engagement within the core teaching/learning, research and service missions of the institutions and a co-ordination deficit at the institutional and system level. Action is not reflected in the strategic development, curriculum development or budget allocation of the tertiary education institutions. Collaborative mechanisms among tertiary education institutions to build capacity and foster joint efforts for regional development remain limited. The system of information gathering

about regional environment as well as success and failure of regionally and locally relevant activities by tertiary education institutions is underdeveloped, which make it difficult to evaluate the outcomes of policies and institutional practices.

If Colombia and Antioquia want to mobilise tertiary education for external and regional development, policy and funding mechanisms should be aligned with this goal. Policy incentives should be improved with focus on the allocation of funding, governance, accountability, review and approval of new academic programmes, and staff promotion.

Tertiary education institutions can play an important role in regional and local development by joining up a wide range of policies such as science and technology, industry, education and skills, health, culture and sport, environmental sustainability and social inclusion. If Colombia wishes to mobilise its tertiary education system in support of local and regional development, the tertiary education policy which embraces teaching, research and community service could include an explicit local and regional dimension.

In Antioquia and Colombia in general, the policies and incentive structures for mobilising public tertiary education institutions for external, let alone regional and local development are limited. Public universities in Colombia, as well as in other Latin American countries, give a major role in institutional decision-making to academic staff, but little influence is given to external partners. Accountability structures are generally weakly developed. Tertiary education institutions are governed through collective bodies that represent their internal stakeholders and are subject to rigid budgetary restrictions typical of a civil service administration. Public resource allocation for tertiary education institutions in Colombia does not give adequate emphasis to performance or regional engagement. Despite the obligation to spend 2% of their budgets to community development, there is no explicit “third task” or regional development task assigned to tertiary education institutions.

A range of policy incentives could help mobilise the potential of tertiary education sector for local and regional development. One way of making the universities more focused on regional needs of the labour market and society is to bring regional stakeholders to participate in the top decision-making bodies of the institutions, and to ensure that this pattern of collaboration becomes more than a formality, leading to concrete results.

A second policy is to create funding mechanisms to provide incentives for regional engagement of tertiary education institutions. The resources received by the universities could be contingent upon their specific contributions to regional development. For this, the universities need to develop middle and long range plans and their top authorities should have the necessary autonomy to work in order to achieve these goals. The authorities could also consider a competitive way of allocating funding incentives to regional and municipal tertiary education institutions.

A third policy is to free universities from cumbersome civil service controls and regulations, to encourage them to adopt modern management practices and to ensure that regional engagement becomes a regular element of ongoing planning, development and funding allocation within the institution.

A fourth policy is to include regional perspective in the tertiary education programme review and approval process. These criteria could be re-examined to ensure that the tertiary education programme review and approval process is streamlined to allow for greater responsiveness to regional needs.

A fifth policy is to review incentives for faculty and staff by widening the criteria for recruitment, promotion and tenure to emphasise relevance and regional engagement. Currently, the criteria for staff recruitment and promotion in Antioquia's tertiary education institutions emphasise research and publication and not a broader definition including regional engagement.

Recommendations for the national government

- Reintroduce the tertiary education reform after a period of review and additional consultation with stakeholder groups. Accompany with consultation and communication strategies any funding reform proposal to rally support from potential winners and reduce the political risks. Consider making external and/or regional engagement and its wide agenda for economic, social and cultural development explicit in tertiary education legislation and policy.
- Balance the institutional autonomy of tertiary education institutions (in terms of the use of human, financial and physical resources and responsibility over curriculum) with institutional accountability for results and decisions. Work with tertiary education institutions to develop an agreed accountability framework, which makes clear how each institution will play its part in the achievement of the national goals, and what mechanisms and performance indicators the institutions will use to report their progress. Review the composition of institutional

governing boards to ensure adequate representation of the public interest, including the private sector and employers.

- Link financing more closely to performance (quality, outcomes, efficiency and relevance to national and regional economic needs). Introduce performance-based funding mechanisms for allocating a much larger part of public subsidies to redistribute resources to achieve a more equitable sharing of public subsidies across public tertiary education institutions, and to offer incentives to encourage institutions to be more efficient and responsive to development, labour market needs and needs of their regions. Mechanisms could include: i) long term core funding to support regional engagement, ii) strategic incentive-based funding schemes on a competitive basis, iii) formulae for block grant funding against outcomes, with higher weights for enrolment of students from within the region, from under-represented population groups or for enrolments in academic programmes related to regional labour market needs; iv) policies governing tuition fees that provide for lower fees for in-region students and policies for students' financial aid that provide higher amounts for in-region students and special populations; v) special or "categorical" funding contingent on evidence of regional engagement and focus; vi) requirements that institutions collaborate in order to obtain funding. This could provide incentives for tertiary education institutions to facilitate mobility of students (credit transfer within the region) and share programmes and other resources in efforts to serve the region; vii) special funds that provide matching of funding obtained by tertiary education institutions from contracts with regional employers for education and training services; and viii) investment in the fundraising infrastructure to support regional engagement.
- Explore ways of simplifying administrative arrangements and financial management rules in public universities in order to bring about modern management practices and facilitate effective partnerships between universities and industry. Review tertiary education financial control systems, at both the national and institutional level. In collaboration with the Ministry of Finance put in place adequate regulations and monitoring capacity to ensure that private tertiary education institutions manage their resources according to transparent accounting practices and prepare annual financial reports that are independently audited.
- Improve the robustness and reach of the quality assurance system. Re-examine the criteria for the inclusion to the Register of Qualified programmes to allow for quicker and greater responsiveness to regional

needs. Criteria emphasising regional engagement and responsiveness should be included in the review and approval process, for example: *i*) data documenting the specific gaps in access and opportunity for the population and important sub-groups; *ii*) data documenting relevant regional labour market needs and potential future needs arising from regional economic development plans; *iii*) evidence of engagement by regional stakeholders (employers, community representatives and representatives of under-served sub-populations) in programme planning and design; and *iv*) emphasis on regional engagement (internships, community service, student research on regional issues) within the curricula and student experience. The Commission should seek the advice of regional leaders (employers, community leaders, regional economic development officials) in the programme accreditation process.

Recommendations for the departmental government

- Update Antioquia’s Vision and the Strategic Development Plan of Antioquia-PLANEA to consider the contribution that tertiary education institutions can make to regional development and to achieve the visions of the respective sub-regions.
- In collaboration with public and private sector stakeholders including tertiary education institutions, establish a co-ordination mechanism or body to plan and implement strategic development plans for the region. The co-ordinating body should design a strategic development plan which, in a collaborative way, outlines policies, priorities and goals for tertiary education institutions that are linked to their teaching and research objectives and strengthen their capacities in regional and local development. This should also promote engagement and co-operation between regional and local institutions in achieving regional development objectives.
- Include in the regional development plans, policies for monitoring and assessing their strategic implementation and for developing a robust portfolio of socio-economic data about the region. This should entail an evaluation of tertiary education capacities for local and regional development and current practices in inter-institutional collaboration, outreach and community development.

Recommendations for tertiary education institutions

- Develop a clear and collaborative platform with other tertiary education institutions that focuses on the economic, social, cultural and

environmental wellbeing of the region to address the needs of the region, promotes shared learning and assist in the implementation of the strategic development plans of the region. This platform could facilitate the development of inter-institutional learning programmes and research projects that address the major challenges for the region. Promote institutional co-operation by enhancing pathways between universities and technological tertiary education institutions and by developing mobility programmes among the tertiary education institutions.

- Improve contribution to regional and local development through aligning institutional planning, development and resource allocation with regional and local needs. Consider establishing a Regional Development Office to create links between tertiary education and other stakeholders from the government and from social and economic sectors in the development of joint projects that address regional needs. Review career incentives to faculty and staff members to include research and activities in collaborative projects for regional and local development. Remove any institutional barriers for multi-disciplinary and institutional collaboration, technology transfer and other forms of engagement in regional and local development. Ensure that the University-Firm-State Committee of Antioquia incorporates in its performance criteria measures related to promoting regional impact, inter-institutional collaboration and capacity building for regional and local development.
- Establish an evaluation mechanism to assess institution's impact on regional and local development and publish the outcomes from this evaluation to ensure accountability and encourage the sharing of good practices examples both within an institution and with other tertiary education institutions.

Chapter 1:

Antioquia's tertiary education in context

This chapter presents the socio-economic profile of Antioquia and the key features of the tertiary education systems in Colombia and Antioquia.

Antioquia is one of the economic engines of Colombia. With a population of over 6 million, it represents over 13% of Colombia's population and has GDP per capita and growth rates above national averages. Historically based on mining, energy and textiles, the regional economy is in the process of transformation. At the same time, the region continues to struggle with poverty and poor labour market outcomes.

The national government and the Department of Antioquia perceive education as the most effective tool to fight poverty and reduce inequality.

In recent years, Colombia and Antioquia have made great strides in improving access to education, but challenges remain to sustain the gains and to improve the quality, equity and relevance of tertiary education.

1.1. The national context

Colombia is the fifth largest country in Latin America, covering an area of over 1.14 km² (440 831 square miles). It is rich in natural resources with substantial oil and gas reserves and a major producer of gold, silver, emeralds, platinum and coal, and it hosts the highest number of species and plants by area unit than any other country.

Colombia has a diverse population of 46 million, third largest in Latin America after Brazil and Mexico. Its ethnic mix includes descendants of the original native inhabitants, Spanish colonists, Africans brought as slaves, and immigrants from Europe and the Middle East. For administrative purposes, the country composed of the capital district of Bogota and 32 departments, which in turn are grouped into 6 regions.

Colombia is an upper middle income country, with Latin America's fourth largest economy and faster than average growth. According to World Economic Forum Global Competiveness Report 2011-2012, Colombia has a GDP of over USD 285.5 billion. Its economy expanded faster than the rest of Latin America, 5.0% vs. 4.1% between 2002 and 2008, thanks to austere government budgets, efforts to reduce public debt, export-oriented growth, improved security and government policies to generate business confidence.

Colombia's economy has not been severely affected by the global economic crisis, and it remained one of the few countries in the world with positive growth between 2008 and 2009. By 2010, the economy had recovered from the slowdown, and in the first quarter of 2011 it grew by 5.1% (Colombian Central Bank data). Economic success culminated in 2011 in the Free Trade Agreement with the United States. According to the World Bank publication *Doing Business 2011*, Colombia enjoys the third best business environment in Latin America after Mexico and Peru.

Economic growth in Colombia has been accompanied with poverty reduction which is laudable but modest in relation to economic growth. Between 2002 and 2010 poverty fell from 49.4% to 37.2%. However, According to Colombia's new poverty methodology, in 2010, 37.2% and 12.3% of the population, respectively, lived in moderate and extreme poverty. In 2008/09 (a period of zero per capita growth), poverty fell by 1.8%. As growth resumed in 2009/10 (2.86% per capita growth) the poverty rate dropped by 3 percentage points. Poverty is significant particularly in rural areas.

Despite the progress made, in terms of income inequality, Colombia remains at the forefront of the most unequal region of the world. Inequality

is linked to a large informal economy with over 60% of workers in the informal sector, and wide regional and intradepartmental differences.

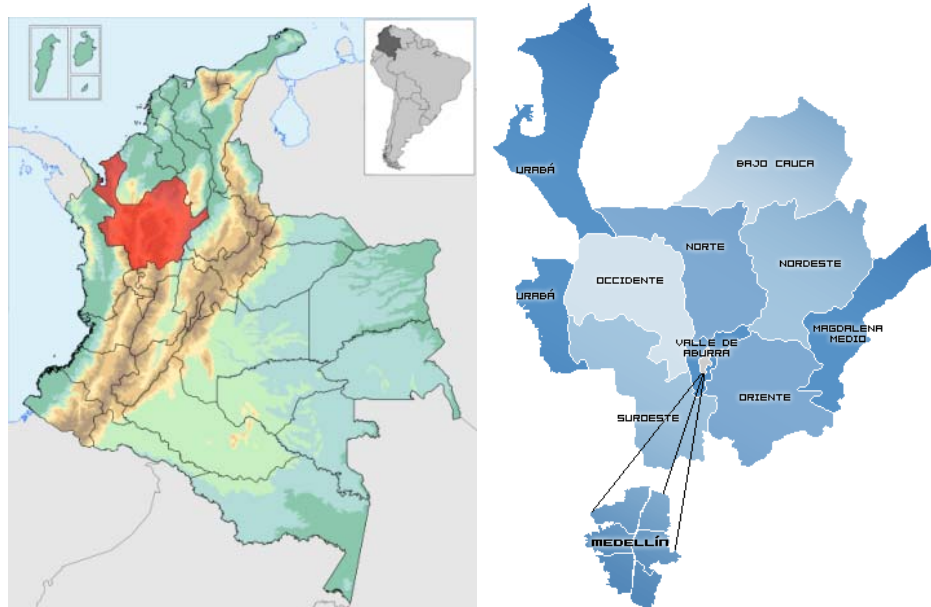
The 2010-2014 National Development Plan aims to reduce the gap between urban and rural populations and sees education as the most effective tool to fight poverty, reduce inequality and ensure equal conditions for income generation. Special attention is devoted to tertiary education and increasing coverage and participation in technical and technological programmes, as well as graduate programmes in scientific areas. This, according to the Plan, will contribute to the development and growth of the country in parallel with five sectors that will drive the economy: the mining sector; major infrastructure projects; the housing and transport sectors; the development of innovation-based sectors; and the agro-industrial sector, which needs to further develop its capacity and generate equality.

1.2. Antioquia

Geography

The Department of Antioquia (area 63 612 km²) and is located in north-western Colombia; its coastline stretches out to both the Atlantic and Pacific Oceans. Two-thirds of the department is occupied by plains and one-third is mountainous, reaching altitudes of up to 4 000 metres. Antioquia is rich in fluvial resources, particularly the Cauca, Atrato and Magdalena rivers. The Uraba Gulf has been identified as having great potential for the construction of a seaport.

Antioquia is divided into 125 municipalities, which in turn are grouped into 9 sub regions, as shown in Figure 1.1. Valle de Aburra consists of ten municipalities, which include most of the major urban centres in the department, including its capital – Medellín. Medellín, the second-largest city in Colombia, is a highly industrialised, modern city, and an economic development hub for Colombia as a whole.

Figure 1.1. Department of Antioquia

Demography and society

By 2010, according to DANE projections, Antioquia had a population of over 6 million, over one-sixth of Colombia's total population on an area of about one-twentieth of the national territory. Table 1.1 describes the main demographic characteristics of the Department of Antioquia compared to the rest of the country. Antioquia has an urban-rural mix similar to that of Colombia in general and an annual forecast population growth rate of 1.3% between 1999 and 2015, almost half a percentage point below the projected growth for Colombia as a whole.

Table 1.1. Demographic indicators, 2010

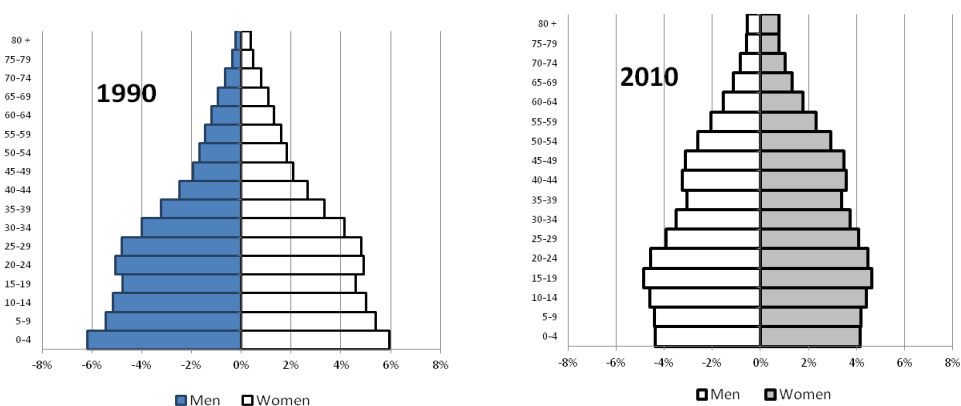
Variables and indicators	Antioquia	Colombia
Territorial area (km ²)	63 612	1 141 748
Territorial share in the nation's total	5.57%	100.00%
Number of municipalities	125	1 120
Population	6 065 846	45 508 205
Population share in nation's total	13.32%	100.00%
Population growth rate (estimated 1999-2015)	1.31%	1.79%
Percentage of urban population	77.29%	75.61%
Percentage of rural population	22.71%	24.39%

Source: DANE, Population forecasts.

The evolution of the Colombian population between 1990 and 2010 reveals changes in the age structure, reflecting the ageing of Antioquia's population, but also increasing demand for higher education (see Figure 1.2). This is expressed not only in the shrinking share of the population under 34 years old but also in its decline in absolute terms, with the ensuing increase in the population segment over 40. Between 2006 and 2011, the 6-17 year-old group diminished by 93 000 inhabitants, resulting in a reduced demand for basic and upper secondary education, which could imply increased coverage rates and school attendance.

Changes in the population pyramid of Antioquia between 1990 and 2010 also mean increased demand for higher education, accelerated by increased access to primary, lower-secondary and upper-secondary education.

Figure 1.2. Population Pyramid, 1990 and 2010



Source: DANE, Population forecasts.

There is significant diversity among Antioquia's sub regions in terms of the population structure, with concentration in Medellín and the Valle de Aburrá. In 2010, the Valle de Aburrá concentrated three-fifths of the department's population, followed by the eastern and Urabá sub regions with 10% each. The sub regions with the lowest population share are the west, north-east and Magdalena Medio sub regions with nearly 3% each. This population structure shows few changes compared to 2000.

Antioquia has similar social challenges as the rest of Colombia (see Table 1.2). While the percentage of population below the poverty line is high both in Antioquia and Colombia in general, the percentage of Antioquia's population (14.2%) with unsatisfied basic needs is below the

national average (17.7%). However, poverty rates in Antioquia are well above those in other countries in the region such as Brazil and Chile. The illiteracy rate in Antioquia among over 15-year-olds is lower than in the country as well as compared to other neighbours such as Mexico and Brazil.

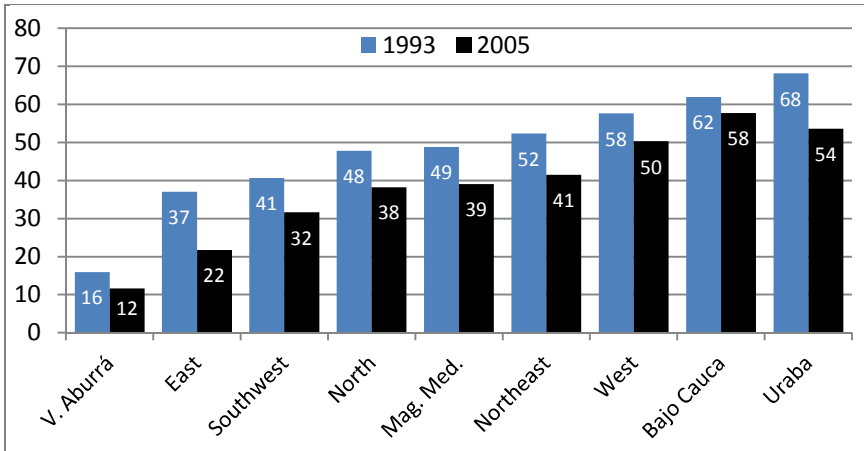
Table 1.2. Social indicators, 2009

Variables and indicators	Antioquia	Colombia	Brazil	Chile	Mexico
Rate of poverty incidence, on the basis of national poverty line (% of population)	46.70%	45.50%	21.4%	15.1%	47.4% (2008)
Population with unsatisfied basic needs	14.20%	17.70%	n.a.	n.a.	n.a.
Human Development Index (2010)		0.689	0.699	0.783	0.750
Literacy rate (ages above 15)	95%	93%	90% (2008)	99% (2008)	93%

Source: World Bank and UNDP *Human Development Report 2010*.

There is a considerable intraregional diversity within Antioquia in terms of the share of population with unsatisfied basic needs (Figure 1.3). While in the Valle de Aburra only 11% of households cannot meet their basic needs, in the Bajo Cauca sub region the share is 60%.

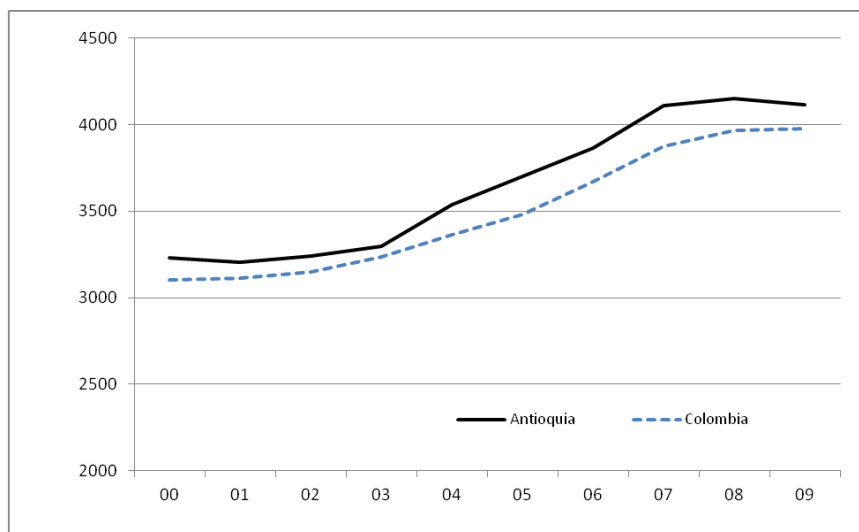
Antioquia faces severe problems in terms of violence such as armed conflict, crime and domestic violence, drug trafficking and, increasingly, micro-trafficking in the region. The homicide rate is alarming and has doubled over three years: in 2007 there were 2 075 cases of murder (a rate of 36 per 100 000 population) while in 2010 this number increased to 4 277. The homicide rate is 70.51 per 100 000 inhabitants in Antioquia and 255.66 in the municipality of Valdivia; both exceed the national average rate of 38.36 per 100 000 by far. Of these cases, in 2010, 92.4% were male homicides (Medicina Legal, 2010). These rates are among the highest worldwide, since in the 2010 country ranking, Honduras showed the highest rate with 60.9 homicides per 100 000 (2008) (UNODC). Additionally, armed conflict has engendered phenomena such as forced displacement which, nationwide, shows a cumulative figure of 3 700 000 persons as of 2011, while in Antioquia the number of “displaced” people reached 670 057 as of 31 March 2011.¹

Figure 1.3. Unsatisfied basic needs in Antioquia, 1993 and 2005

Source: DANE, Population census.

Regional economy

Despite many challenges, Antioquia features robust economic growth. In 2009, Antioquia's GDP was estimated at COP 69 billion, the equivalent of 13.7% of national GDP. With regard to the dynamics of Antioquia's manufacturing sector, average growth rates for the department and the country are similar. In 2009, GDP per capita was 9% above the national average. Antioquia registered a slightly higher growth during the last decade, which resulted in an income per capita of COP 10.7 million in 2007 (equivalent to approximately USD 5 950), *i.e.* 2.1% above the national average (Figure 1.4 shows Antioquia's GDP per capita development compared to the national situation). From 2001 to 2009, the relative advantage in per-capita GDP in Antioquia compared to the national value dropped from 5.3% to 2.5%.

Figure 1.4. Department Accounts - Colombia and Antioquia GDP per capita in USD, 2000-2009p

Note: GDP in 2005 USD = GDP in COP millions based on the 2005 average nominal exchange rate, fourth quarter (2.279); p = provisional

Source: DANE, National Accounts.

Table 1.3. Economic indicators

Variables and indicators	Antioquia	Colombia	LAC	Brazil	Chile	Mexico
Total GDP (in billion current COP), 2009p	69 041	508 532				
Participation of departmental GDP in the national total (2009p)	13.65%	100%				
Average GDP growth (2001 – 2009p)	3.73%	3.65%				
GDP growth, 2010		4.30%		7.50%	5.20%	5.50%
GDP per capita (current COP), 2007	10 679 583	9 831 050				
GDP per capita (at current USD prices) 2010		6 224	8 866	10 710	11 873	9 580
Unemployment rate, 2009	12.70%	12.00%		8.30%	9.70%	5.20%

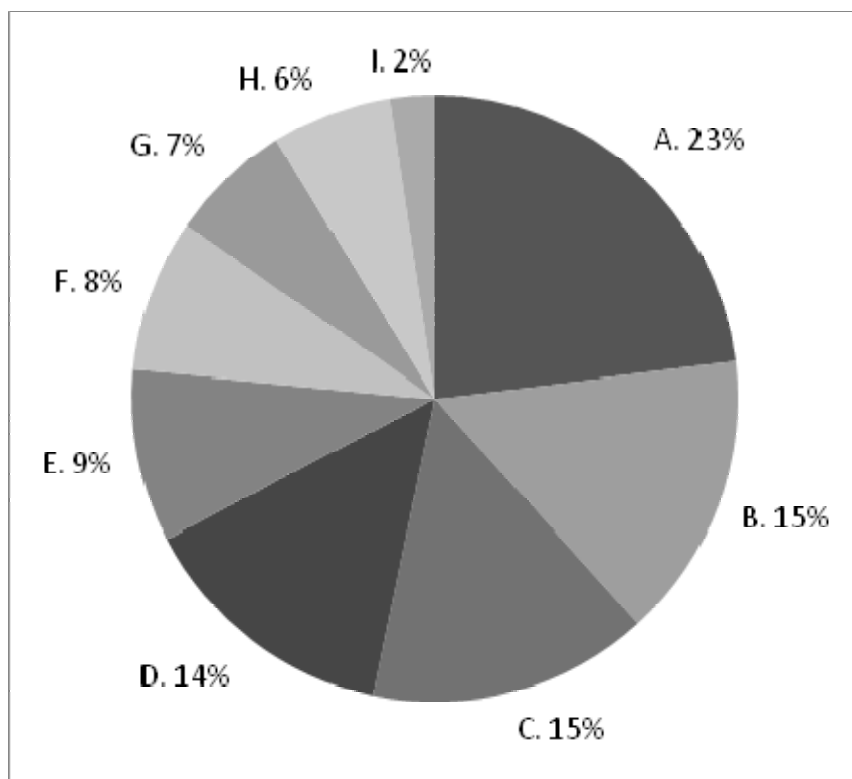
Note: p=provisional

Source: World Bank.

Antioquia's GDP structure provides indication of the fields in need of labour force training, not only among the different branches of production

but also within each branch (Figure 1.5). Almost one-quarter (23%) corresponds to the financial, insurance and real estate sector. Next, by importance, are industrial production and the social, community and personal activities sector, both with 15%.

Figure 1.5. Sector contribution to the GDP of Antioquia, 2009



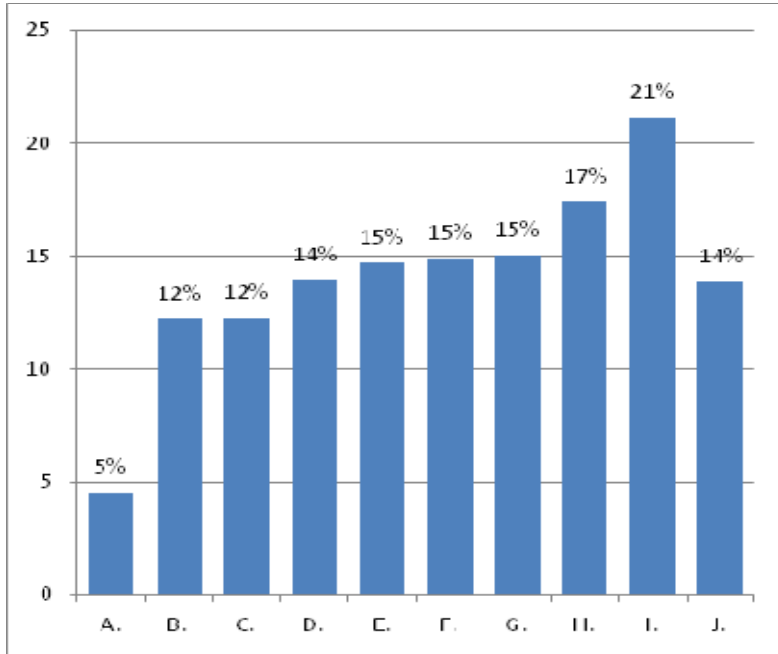
Notes: A. Financial, insurance and real estate, B. Industry, C. Social, community and personal activities, D. Commerce, restaurants and hotels, E. Construction, F. Transport, warehousing and communications, G. Agriculture, silviculture and fishing, H. Energy, gas and water, I. Mining.

Source: DANE, national accounts

Figure 1.6 shows Antioquia's share in national GDP. The energy, gas and water sectors are where Antioquia has the highest share among the different branches of production. Although its share is low (6%), one-fifth (14%) of the national production of energy, gas and water is produced in

Antioquia. Construction is another branch with a low share of the department's GDP (9%) but a high share in national production (15%).

Figure 1.6. Participation in national GDP (%), 2009



Notes: **A.** Agriculture, silviculture and fishing, **B.** Mining, **C.** Industry, **D.** Energy, gas and water, **E.** Construction, **F.** Commerce, restaurants and hotels, **G.** Transport, warehousing and communications, **H.** Financial, insurance, real estate, **I.** Social, community and personal activities, **J.** Total

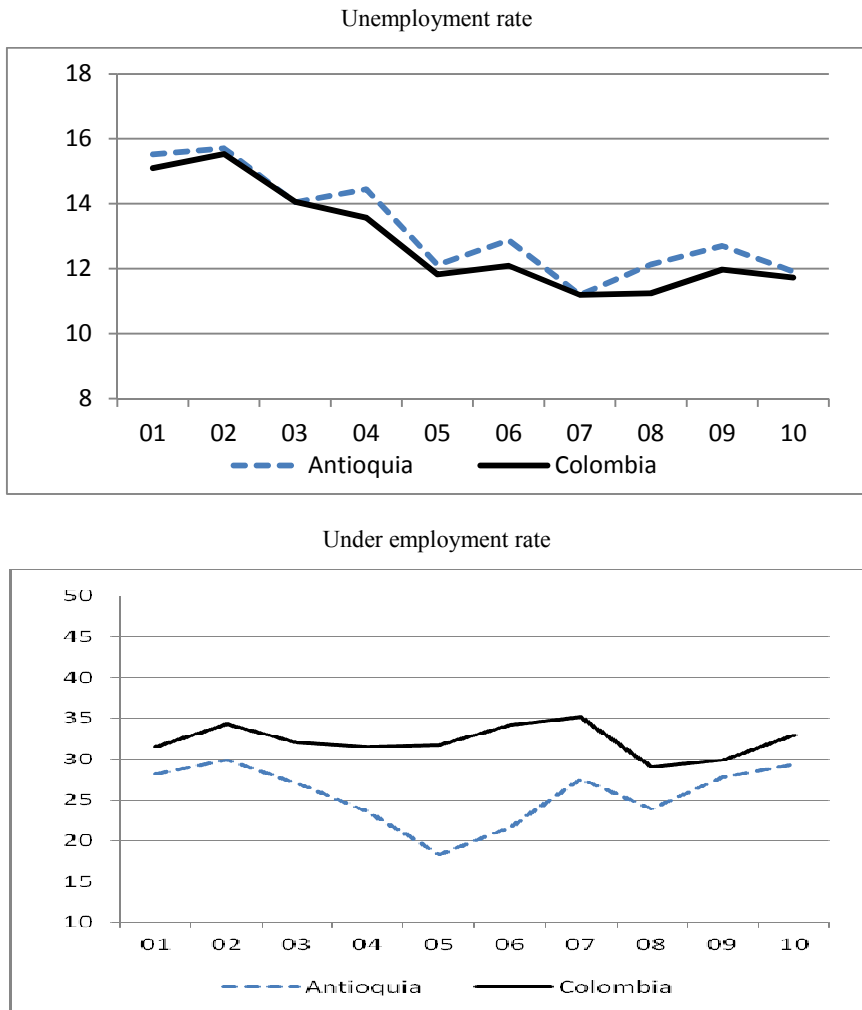
Source: DANE, national accounts

In Antioquia, the contribution of each sub region in department GDP varies quite significantly, with high concentration of production (72%) in the Valle de Aburra. Besides the Uraba and western sub regions, which account for 7% of Antioquia's GDP, the other sub regions have a marginal share. In fact, the remaining six sub regions only contribute 10% to Antioquia's GDP.

Antioquia's features consistently somewhat higher unemployment rates than Colombia in average, whereas its underemployment has remained below the national average. Antioquia's unemployment rate in 2009 was slightly above the national rate and higher than in other countries in the region. For the 2001 – 2010 period, the unemployment in Antioquia

remained slightly above the national average, following the national trend, but with sharper changes between one year and the next, involving major changes in the department–nation differential year after year. Antioquia's underemployment rates remain below the national average, but while at the start and end of the period the differences are at similar levels, in the middle years the underemployment rate drops considerably for Antioquia, while the national rate tends to rise (Figure 1.7).

Figure 1.7. Unemployment and under employment evolution, 2001-2010

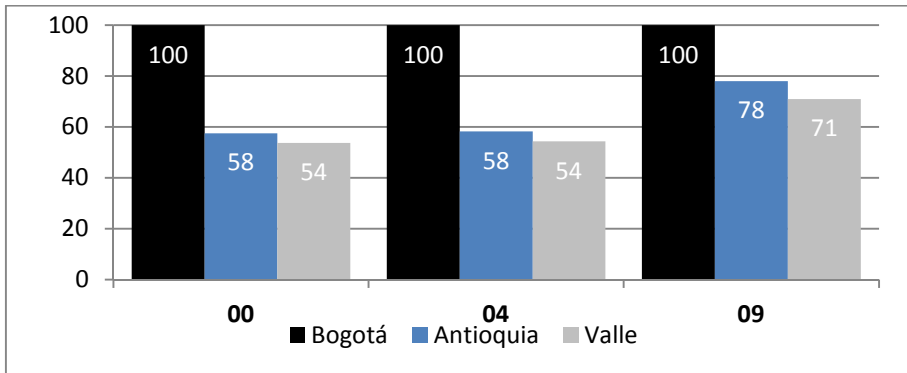


Source: DANE, Great Integrated Household Survey -GEIH-

Antioquia's exports have developed favourably in recent years. Between 1997 and 2009, Antioquia's exports increased by 120%, twice as fast as imports that grew by only 60%. Trade with the outside world represents only 13% of the department's GDP.

Antioquia's economic situation in terms of its competitiveness, understood as the comprehensive capacity of an economy to increase its production with high, sustained growth rates, providing better welfare levels to its people, is favourable in comparison to the rest of the country although gaps remain in relation to Bogota, based on the comparative studies conducted by the Economic Commission for Latin America (ECLAC) for Colombia's departments. Figure 1.8 shows the overall score of the three leading departments with the highest competitiveness indices: Bogota – Cundinamarca is first with a score of 100, and provides the reference used in this study. Next is Antioquia, which shows high levels of competitiveness, particularly between 2006 and 2009. Out of the six factors of the competitiveness index, Antioquia has the highest scores in terms of robust public finance, economic strength,² infrastructure and human capital, but they lag behind Bogota. The areas where Antioquia has the lowest results are science and technology, and environment. (Table 1.4)

Figure 1.8. Competitiveness index for Bogota, Antioquia and Valle, 2000-09



Source: ECLAC, 'Escalaón de la competitividad de los departamentos en Colombia'

Table 1.4. Competitiveness factors, 2000-2009

	Year	Bogota	Antioquia	Valle
Solid economy	2000	100	61	64
	2004	100	66	63
	2009	100	73	68
Infrastructure	2000	100	82	81
	2004	100	81	85
	2009	100	74	75
Human Capital	2000	100	47	46
	2004	100	51	44
	2009	100	71	77
Science and technology	2000	100	59	46
	2004	100	43	41
	2009	100	53	35
Public finance	2000	100	60	6
	2004	100	97	17
	2009	100	88	71
Environment	2000	0	51	37
	2004	0	58	40
	2009	44	49	51

Source: ECLAC, 'Escalañon de la competitividad de los departamentos en Colombia'

The major sectors and productive clusters in the region are: electric power (generation, materials and items), textiles and dressmaking, construction (the activity as well as materials), business tourism, health services, industrialised agriculture, mining and livestock. There are great differences between the Valle de Aburra and the other eight sub regions. The Valle de Aburra has five prominent economic sectors (Table 1.5.).

Table 1.5. Five main economic sectors in Valle de Aburra, 2007

Sectors	Natl. GDP sector %	Enterprises	Assets USD million	Size % small	Dept GDP %	Exports USD million
Electric power	23	1 387	16 006	78.9	4.5	87
Textiles	50	11 960	2 765	97.6	25.0	433
Construction	20	9 270	7 592	94.7	7.2	54
Tourism	12	6 963	1 130	99.2	1.6	
Health	20	3 277	2 064		6.0	

Note: *National GDP sector* = percentage of sector production in the department, in the sector aggregate nationally; *Size* = percentage of micro, small and medium enterprises; *Enterprises* = number of enterprises; *Dept GDP* = sector share of department GDP.

Sources: CCMA (2008), Competitiveness plan for Medellín, Valle de Aburra and Antioquia; CPC Evaluation of competitiveness in the main regions, 2008-2009.

Table 1.6 shows the main economic activities in each of the other eight sub regions of Antioquia.

Table 1.6. Main economic activity of eight sub regions in Antioquia*

Sub regions	Gold mining	Banana/plantain	Flowers	Coffee	Forestry	Dairy chain	Meat chain	Water resources
South-west		X	X	X	X			
East			X		X	X		X
North-east	X				X			
Bajo Cauca	X				X			
North					X	X	X	X
Uraba		X			X			
West				X		X		
Magdalena Medio	X					X	X	
Exports ** (%)	20	27						

Note: * Valle de Aburra is mentioned in the table above, ** Exports as a percentage of non-traditional exports.

Source: Competitiveness plan for Medellín, Valle de Aburra and Antioquia.

In 2010, 95% of Antioquia's exports were derived from mining (gold in particular), agriculture and low added-value manufacturing, traditionally produced by large enterprises mainly. In recent years, however, micro-firms and SMEs have increased their share of total exports from 10% to 24% (Scheel, 2010).

Antioquia is oriented towards those products for export that have declined instead of increased: the export opening indicator (exports/GDP) decreased from 15% in 2000 to 12% in 2010, which is lower than the country's overall figure of 14% and even lower than the indicators of other countries in Latin America, such as Chile, which reached 42%. The only exports that have shown any growth are gold mining and agriculture (banana, coffee, flowers). The manufacturing sector (excluding gold) has been losing ground in international markets; exports are also contracting in dressmaking, plastics, paper and food products although they remain important activities in Antioquia. More specifically, the textile "cluster", dressmaking and fashion, despite its growth in terms of the number of new corporations created and capital invested, reduced its exports by 30% (Chamber of Commerce of Medellin, 2010).

The regional industry is advancing towards a labour-intensive manufacturing model with the transformation of farming and livestock and industrial inputs, not towards those that have higher productivity levels. Cost rationalisation rather than technical changes or innovations have become the main source of competitiveness (Moreno and Lotero, 2005). Despite the prominent business tradition and one of the broadest and most qualified scientific communities in the country, innovation has had limited impact on Antioquia's development: "judging from the limited technological content of the goods and services produced and exported by Antioquia, one could say that the knowledge generated by Antioquia's universities has not yet managed to impact economic growth in the department with sufficient force, and the same can be said of most enterprises and the State." (Jaramillo, 2010)

Competitiveness: strategy and agenda

In 2007, Antioquia established an economic development agenda defining sectors, productive clusters and production plans on which the region will base its competitiveness strategy (DNP, 2007). In general terms, these production plans correspond to the most prominent sectors that contribute to Antioquia's GDP today:

- Agro-industry and farming: forestry, natural rubber, cocoa, coffee, banana, avocado, asparagus, flowers, meat and dairy products.
- Mining and energy: coal, gold, limestone; generation and distribution of electric power.
- Industry: dressmaking and construction goods and services.

- Services: biodiversity, business and event tourism; specialised health services.
- Other: water resources management as an environmental service and production of bottled water.

While Antioquia is focusing on economic sectors that are already being developed, these priorities should also include a commitment to strengthen emerging sectors based on research, development and innovation. The key emerging sectors include information and communications technologies (eHealth, intelligent network applications, technological platforms for animation and content, among others), included in the competitiveness plan formulated by Ruta N (Medellin's Center of Business and Innovation) and in the activities of other department sectors.

1.3. Education in Colombia

Compulsory education

Colombia's Constitution provides for free compulsory education between the ages of 5 and 15 and as of 2012 it has been free through to grade 11 (the last year in secondary education), removing a major barrier to education.

Since 2002, thanks to Colombia's commitment to "Education Revolution" major improvements have been made in education coverage at all levels of education, particularly in secondary education. Indicators show that enrolment in basic and upper secondary education has improved between 2002 and 2009. Internal efficiency improved in primary and secondary education as the dropout rate decreased from 8% to 5.4% during the same period (MEN, 2011).

While improvements have been made, substantial numbers of students are not finalising their upper secondary schooling. Standardised state tests such as SABER 11 that is administered in grade 11 show improving learning results. An increasing proportion of schools have scored progressively higher results: these rose from 17.7% in 2002/03 to 26.6% in 2009. At the same time, however, in 2010, 15.2% of the 8 442 000 young people aged 15-24 in Colombia had not completed secondary education and were no longer studying: 27.1% were still in secondary education; 23.8% had left secondary education but never entered tertiary education. 17.9% had entered tertiary education and were still there; 14% had entered tertiary education but dropped out before graduating; and 2% had both entered tertiary education and graduated from it. Among the 37.8% who had either not

entered tertiary education or had entered but then dropped out, 18.1% gave economic/financial reasons, 19.7% gave other reasons. Among the 17.9% who had entered tertiary education and were still there, 3.8% were in SENA centres, 7.5% in private tertiary institutions and 6.6% in (other) public tertiary institutions (see OECD/World Bank, 2012 forthcoming).

The Government of Colombia aims to raise the national education participation to levels typical of OECD countries and is committed to learn from international experience. Colombia has participated in several international assessments of education: the Progress in International Reading Literacy Study (PIRLS), Programme for International Student Assessment (OECD-PISA), Trends in International Mathematics and Science Study (TIMSS), Latin-American Laboratory for the Evaluation of Educational Quality (*Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación* - LLECE) and the International Association for the Evaluation of Educational Achievement (CIVICA) international tests. In relation to TIMSS, outcomes improved over 1995-2007: results for mathematics rose on average from 360 to 380 (the TIMSS scale is from 0 to 1000, with 500 being the TIMSS scale average) and in science from 393 to 417, although in 2007 results were more constant.

In 2009, Colombia participated for the second time in PISA along with eight countries from Latin America and the Caribbean (LAC) (Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru and Uruguay), showing improvements in all subjects compared to 2006 results. Colombia scored slightly above the LAC average of 408 with 413 points in reading and ranked below all the OECD countries (which averaged 493), while South Korea obtained the highest score (539). In maths, Colombia achieved a low score of 381 points while the OECD average was 496 and the LAC average was 393. Finally, Colombia scored 402 in science, compared to 405 for LAC and 501 for OECD countries (OECD, 2011). In the regional text for LAC countries, the LLECE test, the 2006 results showed that Colombia was on a par with the regional average with similar results as those of Argentina and Brazil (MEN, 2010).

Tertiary education

In Colombia, higher or tertiary education is considered to be a cultural public service, inherent to the social ends of the state, regulated by Law 30 (1992) and the amendments that have modified, added to and substituted parts.

There are four types of tertiary institution in Colombia:

- Universities – these offer academic undergraduate programmes and graduate programmes leading to Masters and doctoral degrees, and engage in scientific and technological research.
- University institutions – these offer undergraduate programmes up to professional degree level and a type of graduate programme known as “specialisation” (the highest level of career-related qualification).
- Technological institutions – these offer programmes up to technologist level (distinguishable from professional technical level by their scientific basis), and may go beyond this to professional degree level provided the programmes in question are taught as “propaedeutic cycles”. This means that students proceed to their professional degree via first a technical, then a technological qualification conferring progressively wider and higher-level knowledge and skills in the same subject area.
- Professional technical institutions – these offer professional/technical level training for a particular job or career.

Those institutions that are not universities are organised as national, departmental, district or municipal institutions as follows: National institutions are ascribed to the National Ministry of Education. Departmental institutions are the responsibility of their respective governments. District or municipal institutions to their respective local authorities (*alcaldía*).

Tertiary education institutions can create branch campuses (*seccionales*) with the authorisation of the National Ministry of Education. Branch campuses must comply with the requirements set out for each particular case.

Table 1.7 shows the number of Colombian tertiary institutions, public and private, in each category in 2010. Figures in brackets show how the numbers in 2010 differ from those of 2007. In both public and private sectors the numbers of higher-level tertiary institutions have risen while the numbers of technological and technical (T&T) institutions focusing on preparation for the labour market have fallen.

Table 1.7. Tertiary institutions, 2011

	Public (change from 2007)	Private (change from 2007)	Total (change from 2007)
Universities	32 (no change)	48 (+ 4)	80 (+ 4)
University institutions	27 (+ 4)	88 (+ 16)	115 (+ 20)
Technological institutions	12 (- 4)	42 (- 1)	54 (- 5)
Professional technical Institutions	9 (-2)	30 (- 8)	39 (- 10)
TOTAL	80 (-2)	208 (+ 11)	288 (+ 9)

Source: MEN. In OECD/World Bank, 2012, forthcoming

Figures in Table 1.7 exclude the training centres run by the following:

- SENA, the *Servicio Nacional de Aprendizaje* (National Learning Service). SENA's main objective is to promote industrial activities that contribute to the social, technological and economic development of the country. It is financed by a levy on employers of 2% of their payroll and has a number of functions, including running the public employment service. Contrary to other providers, SENA provides a wide range of training programmes fee-free to learners, and enrolls millions of people every year (nearly 9 million in 2011 in 166 training centres, though only a small proportion of those enrolled were tertiary students).
- The CERES, Regional Centres of Higher Education (*Centros Regionales de Educación Superior*). These centres were launched in 2003 with the aim of expanding educational opportunities for under-served regions. CERES programmes rely on regional resource-sharing partnerships between education institutions, government (national and local), industry and, on occasion, SENA. Each CERES is run by one of the tertiary education institutions in the partnership. By 2010, 164 CERES centres had been created in 31 departments; the 155 in operation had enrolled a total of 34 799 students, or just over 2% of the total enrolled undergraduate students.

There are also some “virtual” tertiary programmes, offering 80% or more of content online, available at undergraduate (including T&T) and graduate level. The Colombian government is encouraging more institutions to offer online options as a means of increasing participation by students in

remote areas. By 2009, 36 institutions offered such programmes, with over 4 000 students enrolled.

Tertiary education students

In recent years, the tertiary education enrolment and participation rates have increased considerably, particularly at the undergraduate level. Between 2002 and 2010, the total enrolment in tertiary education grew from 1 000 148 to 1 674 420 students. Undergraduate numbers have improved every year throughout the period, from 937 889 to 1 587 928. With this, the undergraduate coverage rate improved from 24.4% to 37%, Doctoral enrolment increased from 350 to 2 326 (representing only 2.7% of graduate programmes in 2010). The number of masters increased from 6 776 to 23 808 and specialisations from 55 133 to 60 358 (See Table 1.8).

Table 1.8. Tertiary students enrolled, 2002-2010

	2002	2003	2004	2005	2006	2007	2008	2009	2010
T&T (% of under-graduate total)	183 319 (19.55)	215 285 (21.60)	263 375 (24.77)	295 290 (25.95)	347 052 (28.45)	394 819 (30.22)	462 646 (32.47)	482 505 (32.31)	542 358 (34.16)
Bachelor's	745 570	781 403	799 808	842 482	872 902	911 701	961 985	1 011 021	1 045 570
Total Under-graduate (Coverage as % of pop.17-21)	937 889 (24.43)	996 688 (25.65)	1 063 183 (26.96)	1 137 772 (28.44)	1 219 954 (30.01)	1 306 520 (31.68)	1 424 631 (34.07)	1 493 525 (35.26)	1 587 928 (37.05)
Specialisation	55 133	43 783	39 893	45 970	47 506	40 866	44 706	54 904	60 358
Master's	6 776	8 978	9 975	11 980	13 099	14 369	16 317	20 386	23 808
Doctoral	350	583	675	968	1 122	1 430	1 532	1 631	2 326

Source: MEN, in OECD/World Bank, 2012, forthcoming.

Of the growth in total enrolment from 2002 to 2010, 75.7% was in public institutions, including SENA centres, and 24.3% in private institutions. Whereas 41.7% of students were enrolled in public institutions in 2002, by 2010 the figure was 55.4%. Between them, the tertiary institutions of Colombia were offering nearly 11 000 programmes in August 2011.

Between 2002-2010, the share of the enrolments in the private sector tertiary education have declined, Colombia being the only country that has witnessed a decrease in recent years in Latin America. The participation of the private sector in total tertiary education enrolment has declined over the past decade from 58.33% in 2002 to 45.01% in 2010 (MEN, 2011). Among Latin American countries, Colombia, Chile and Brazil have higher private

sector participation rates, with 74% and 72% in the case of the latter two, while in Uruguay this rate is 10% (2006 figures – OECD, World Bank, 2009), considerably above the OECD average (15% in type A tertiary education and 16.6% type B in 2007 – OECD, 2010).

The distribution between disciplines of students who graduated from tertiary institutions excluding SENA in the period 2001-2010 was:

- Economics, management and accounting – 30.5%
- Engineering, architecture, urban planning and related degrees - 23.4%
- Social and human sciences – 19.3%
- Education – 11.4%
- Health – 9.0%
- Arts – 3.4%
- Mathematics and natural sciences – 1.6%
- Agronomy, veterinary and related degrees – 1.4%.

Dropouts and long duration of studies

Colombian tertiary education is characterised by low efficiency which is reflected in high dropout rates throughout Colombian tertiary education system – 45.3% on average in 2009 – and long duration of studies. These result in a waste of resources for both the State and households and a significant social cost for Colombia. (OECD/World Bank, 2012, forthcoming)

Despite improvements over the last decade, there is considerable diversity among institutions, regions and academic programmes in terms of dropout rates. The proportion of students who failed to complete their programmes came down from 48.4% in 2004 to 45.5% in 2010. In 2009, the dropout rate in public institutions (45.3%) was slightly lower than in private institutions (52.1%). It is even higher in professional technical (60.6%) and technological (52.6) programmes than in Bachelor's degree programmes (44.2%). During the first semester, 37% of all students drop out. Dropout by cohort was 45% in 2008 and the inter-annual rate was 12.1% that same year. Likewise, programmes in engineering, architecture, urban development and other related areas show the highest dropout rates, while these are lower in

health sciences. Studies on dropout rates show a correlation between factors such as the scores obtained by students in the SABER 11 test and family income. (OECD/World Bank 2012, forthcoming)

Tertiary education in Colombia is also characterised by long duration of studies, and students take much longer to graduate than theoretically expected. Only 10% of the students graduate on time. About 30% of the students graduate with two years of delay, meaning that they take 7 years on average to graduate instead of 5. Only 55% of students entering tertiary education actually graduate, and of those who finish their studies, less than 10% do it on a timely basis. In fact, only 6.2% graduate from university at the end of the tenth semester; in professional technical institutions 8.5% graduate at the end of the sixth semester and in technological institutions only 4.01% finish at the end of the sixth semester (CINDA, Universia, World Bank, 2011).

The National Ministry of Education has addressed the financial and non-financial issues linked to high levels of dropout. It has supported bottom-up regional projects developed by tertiary education institutions to assist students with academic problems by providing remedial courses, tutoring and tracking; to provide career guidance for secondary school students interested in entering tertiary education; and to improve institutional processes that help students adjust to university life. Between 2007 and 2010, the ministry contributed COP 6.3 billion, while the 36 institutions involved matched this amount with another COP 6.8 billion. As a result, nearly 40 000 students received assistance through direct support programmes and competency training began for nearly 6 500 students through collaboration processes with high schools.

ICETEX has taken the lead in providing financial support to prevent students from abandoning their studies for economic reasons. It offers loans enabling students to access both public and private institutions as well as grants for living expenses and tuition³ to enhance the retention of students.

Tertiary education agencies

The Ministry of National Education (*Ministerio de Educación Nacional*), MEN, first appeared in the government structure in 1886. It manages and oversees every stage in the formation of human capital in Colombia.

Within the MEN is the Vice-Ministry of Higher Education (*Viceministerio de Educación Superior*), established in 2003. The Vice-Ministry is in charge of applying national policies on higher education and planning for and overseeing the sector. Internally it divides into two main offices, the Directorate of Higher Education Promotion and the Directorate

of Higher Education Quality. The Directorate of Higher Education Promotion's responsibilities include: strategies for developing human capital; expanding the supply and improving the regional distribution of tertiary places; improving retention; promoting technical and technological education; and tertiary funding, efficiency and information systems. The Directorate of Higher Education Quality is concerned with quality improvement; developing the current quality assurance system; strengthening the development of undergraduate programmes, including the extent to which they are based on generic and specific competences; and monitoring and control.

The National Council of Higher Education (*Consejo Nacional de Educación Superior*), CESU, established in 1992, is an advisory body of the Ministry of Education. Its members are from the tertiary education community, not Ministry officials. It arranges bi-monthly meetings to discuss the creation of new tertiary institutions, approval of postgraduate programmes and other issues.

The National Intersectorial Commission on Quality Assurance in Higher Education (*Comisión Nacional Intersectorial de Aseguramiento de la Calidad de la Educación Superior*), CONACES, is a consultative institution of the Ministry. It advises on quality assurance issues and specifically on whether institutions and individual degree programmes should be included in the Qualified Registry (*Registro Calificado*): members are divided by subject area, and peer reviewers assist in the evaluation process. CONACES also advises on quality improvement policies, on the recognition of foreign qualifications and on the legislative framework for tertiary education.

The National Accreditation Commission (*Comisión Nacional de Acreditación*), CNA, is another consultative institution of the Ministry, advising mainly on applications institutions submit for “high quality accreditation”, for the institution or for individual programmes. The council consists solely of academic members nominated by the CESU and bases its operations on CESU guidelines.

The Department of Science, Technology and Innovation (*Departamento Administrativo de Ciencia, Tecnología e Investigación*), COLCIENCIAS, works closely with higher education institutions. COLCIENCIAS aims to promote policies that increase scientific research and the production of knowledge, and provides funding for many scientific research projects conducted in universities and university institutions.

Colombian Institute for Educational Evaluation (*Instituto Colombiano para la Evaluación de la Educación*), ICFES, is responsible for evaluation at all levels of education. It designs and manages four different tests. SABER 5 is taken at the end of primary school, SABER 9 at the end of

lower secondary school. The SABER 11 test is taken at the end of the 11th grade by all students who may wish to enter tertiary education in Colombia. SABER 11 includes evaluation in core subjects (Spanish, mathematics, biology, chemistry, physics, philosophy, social sciences and foreign languages) and a flexible component where deeper knowledge is required, either of a specific core subject or of cross-cutting problems related to Colombian society and the environment. SABER PRO (formerly ECAES) is taken at the end of Bachelors' degree programmes. This test, incorporates several different tests for different fields of knowledge, aims to evaluate the quality of higher education and has been mandatory as of 2009. Its results show not only the attainment levels of students in different institutions, but also – when compared to their SABER 11 scores at the end of upper secondary school – the distance they have travelled since joining those institutions, in other words the value those institutions have added.

The Colombian Institute of Educational Credit and Technical Studies Abroad (*Instituto Colombiano de Crédito y Estudios Técnicos en el Exterior*), ICETEX, aims to promote enrolment in tertiary education and increase coverage by providing financial support to less affluent students. It was set up initially to provide students with loans to access higher education abroad, but its mission has expanded to offer a wider range of support mechanisms addressed mainly to domestic students.

The National Learning Service, SENA, is attached to the Ministry of Labour rather than the Education Ministry, and has had great influence on the professional technical and technological education of Colombians during the last decade. By 2010, over 55% of professional technical and technological enrolment was in SENA centres.

The National System of Higher Education Information (*Sistema Nacional de Información de la Educación Superior*), SNIES, gathers and is the official source of data from tertiary education institutions on enrolment, number of applicants, number of graduates, finance structure, internationalisation, student welfare etc. The system includes data on all research and investigation done by higher education institutions: COLCIENCIAS keeps similar information, but only for the projects it funds.

The National Information System on Higher Education Quality Assurance (*Sistema para el Aseguramiento de la Calidad de la Educación Superior*), SACES, keeps track of the programmes on the Qualified Registry and the programmes and institutions granted high quality accreditation.

The Information System for Dropout Prevention and Analysis in Higher Education Institutions (*Sistema para la Prevención y Análisis de la Deserción en la Instituciones de Educación Superior*), SPADIES, tracks higher education students, their socio-economical and academic

characteristics. Through SPADIES it is possible to identify the variables that have a significant influence on the drop-out rate of every institution and thus formulate policies to improve the efficiency of the higher education sector.

The Labour Observatory for Education (*Observatorio Laboral para la Educación*), OLE, tracks graduates from the tertiary system once they enter the labour market, to establish their later employment history and earnings and so shed light on the relevance of their study programmes. Results by degree programme and by institution are published.

Territorial entities play a less prominent role in tertiary education. While in primary and secondary education, regional and local authorities are directly involved in planning, financing and managing educational services in their jurisdictions, in higher education, they have the responsibility of programming budget transfers from the National Ministry of Education. Regional and local authorities also contribute their own funds and may use a number of mechanisms to encourage competition and quality. The boards of public universities and other tertiary education institutions include one representative of the national government and one from the territorial government, who are responsible for articulating government policy within the institutions.

Funding tertiary education

Colombia's commitment to education is shown in consistently high funding levels. Over the period 2007 to 2011 (projections), Colombia's GDP increased by nearly 35% and its total education spending by over 43%. The percentage of GDP spent on education rose from 7.19% to 7.65%, and there was a corresponding rise in the percentage devoted to higher education, from 1.84% to 1.96%. Within these spending totals, public spending increased significantly – from 4.28% to 4.75% of GDP on education at all levels and from 0.86% to 0.98% of GDP on tertiary education. (OECD/World Bank, 2012, forthcoming)

In the international context, Colombia's investment in education is commendable. Its total spending on education, at more than 7% in 2008, is considerably above the OECD average of 5.9% and LAC average of 5.3%. The same is true of tertiary education expenditure, which amounted to 1.9% of GDP, compared to an OECD average of 1.5% and LAC average of 1.3%, respectively, in 2008.

Table 1.9. Expenditure on education in Colombia, 2000-2010

Year	Education (all levels)		Tertiary education			
	Public expenditure on education as % of GDP	Private expenditure on education as % of GDP	Public spending on tertiary education as a proportion of GDP	Public spending on tertiary education as % of total expenditure on tertiary education*	Total spending on tertiary education as a % of GDP.	Total expenditure on education as % of GDP
2000	4.3	3.6	1.0	46	2.1	8.0
2003	4.4	3.3	0.9	45	1.9	7.8
2005	4.4	3.1	0.9	45	1.9	7.5
2007	4.4	2.9	0.8	46	1.8	7.2
2008	4.4	3.0	0.9	45	1.9	7.4
2009	4.8	2.9	0.9	48	2.0	7.9
2010	4.7	2.9	1.0	50	2.0	7.9
2011*	4.7	2.9	1.0	50	2.0	7.6

Sources: MEN. GDP 2000-2007: DANE and GDP 2008, 2009, 2010 and 2011: DNP.* 2011 Preliminary Data, in OECD/World Bank, 2012 (forthcoming).

Over the past decade, education expenditures have increased faster than GDP. The growth in education expenditure was 48.4%, compared to an overall increase in GDP of around 40% during the same period. Public expenditure has risen slightly faster than private expenditure. From 2002 to 2010, public spending increased by 67.3%, while private spending grew by only 25%. (OECD/World Bank, 2012, forthcoming).

The level of Colombia's public commitment to tertiary education is less impressive than its overall spending. Compared to Latin American countries as well as OECD nations in general, Colombia's contribution at per student public spending is in the middle range.

The Colombian government follows a traditional, conservative resource allocation approach in tertiary education. With the exception of the resources dedicated to student loans, the budget that tertiary education institutions receive is linked only marginally (1%) to performance measures, and the direct transfer of public funds to universities and other tertiary institutions is principally based on historical trends and negotiations. Funding does not reward performance or acknowledge the regional differences and disparities in the provision of educational services. This approach has led to significant disparities across different types of tertiary

education institutions and between public universities as well as disparities between per student budget contribution.

The income generation performance of Colombian public universities is above the average of Latin American countries as well as many OECD countries. The proportion of self-generated resources in Colombian public universities, including tuition fees and research contracts, amount to 45% of their total income in 2011, compared to 18% in 1993 and 27% in 2003. Even though tuition fees in Colombian public universities are about six times less than in private ones, they are significant compared to most Latin American countries.

1.4. Education in Antioquia

Education in figures

Enrolment in Antioquia for 2010 was close to 1.6 million (13% of the national total), 1.4 million in basic and upper secondary and 191 000 in higher education. Of the total enrolment in basic and upper secondary education, enrolment in the Medellín metropolitan area was 53%, while in higher education it was a high 94% showing unequal geographical access to this educational level.

In Antioquia and in Colombia in general, undergraduate enrolment represents 94% of total enrolment in tertiary education, indicating the need to promote participation and attainment in master's and doctoral programmes in areas relevant to the national and local context (not including enrolments in SENA's vocational technical and technological programmes). (Table 1.10)

Table 1.10. Enrolments by educational level, Colombia and Antioquia, 2010

Educational level	Colombia	Antioquia		
		Metropolitan area*	Rest of Department	Total
Preschool	958 176	65 388	47 884	113 272
Primary	5 084 966	288 919	334 872	623 791
Lower secondary	3 681 469	272 000	208 973	480 973
Upper secondary	1 398 263	115 585	72 302	187 887
Subtotal	11 122 874	741 892	664 031	1 405 923
Higher undergraduate	1 291 242	168 379	10 641	179 020
Higher graduate	86 492	11 650	110	11 760
Subtotal	1 377 734	180 029	10 751	190 780
Total	12 500 608	921 921	674 782	1 596 703

Note: * The metropolitan area of Antioquia comprises 10 municipalities out of a total of 125: Barbosa, Bello, Caldas, Copacabana, Envigado, Girardota, Itagüi, La Estrella, Medellín and Sabaneta.

Source: SINEB and SNIES, MEN.

In lower and upper secondary education, indicators for coverage and internal efficiency in Antioquia show better results than those for Colombia in general. They are also generally above the Latin American and the Caribbean averages. (Table 1.11)

Table 1.11. Education indicators: coverage and efficiency, %, 2009

		Antioquia	Colombia	LAC
Gross coverage	Basic primary	121.29	121.32	116.66
	Lower secondary	108.95	102.02	102.11
	Upper-secondary	79.85	75.76	74.53
Net coverage	Basic primary	95.42	90.47	93.93
	Lower secondary	74.30	70.49	73.08
	Upper-secondary	41.57	39.83	
Intra-annual dropout in basic and upper secondary (public sector)		4.50 (2007)	5.40	
Primary completion rate (% of relevant age group)			114.80	101.00

Source: MEN, World Bank, September 2011.

In terms of quality measured by national examination, the 2008 SABER 11 exam shows that Antioquia's results are similar to the national level. In fact, the percentage of schools ranking with high, superior and excellent performance was 15% in Antioquia versus 14.9% nationally. In terms of shares, 14.2% of students in Antioquia scored at these levels, versus 15.4% nationally (ICFES, 2011).

TEIs in Antioquia

Antioquia has a diverse tertiary education sector, There are 41 tertiary education institutions (TEIs) in Antioquia: 1 professional technical institution, 10 technological institutions, 23 university institutions⁴ and 7 universities. Eight of the 41 tertiary education institutions are public and 33 private. In addition to the main campuses, additional places are available through the branch campuses (seccionales) of the 41 TEIs, or other institutions whose main campus is in other departments. In Antioquia, there

are 11 branch campuses, of which 9 belong to universities, and 3 to university institutions⁵.

Colombia's departments features considerable intraregional differences in terms of availability of tertiary education places and Antioquia makes no exception to this. In Antioquia, tertiary education institutions are concentrated in the Medellín Metropolitan area. Altogether 29 of the 41 main campuses are located in Medellín, 7 in other municipalities of its metropolitan area, specifically in Envigado (2), Caldas, Bello, Sabaneta (2) and Copacabana; the 5 remaining institutions are in the municipalities of Río Negro, Santa Rosa de Osos, Marinilla, Santa Fe de Antioquia, and Apartado. Five regional TEIs are in the metropolitan area and 4 in Medellín. The remaining 6 are in other municipalities of the department (Turbo, Carmen de Viboral, Cauca, Puerto Berrio, Andes and Santa Fe de Antioquia).

While some municipalities lack tertiary education provision, the National Education Plan plans to increase the percentage of municipalities offering at least some tertiary opportunities (from 62% in 2010 to 75% in 2014).

Antioquia's tertiary education governance

Antioquia's Higher Education Subsystem (SESA)

Antioquia's Higher Education Subsystem (SESA) integrates all tertiary education institutions in the department. SESA was created in 2002 by the departmental government, with the participation of the Universidad de Antioquia, el Politécnico Jaime Isaza Cadavid and Tecnológico de Antioquia. Other TEIs include the Universidad Pontificia Bolivariana, the Universidad Nacional Sede Medellín, the Universidad Santo Tomás, the Fundación Universitaria CEIPA and the National Learning Service (SENA).

SESA brings together Antioquia's TEIs, while respecting their autonomy. It aims to build an equitable, productive and sustainable society through the generation, research, development, dissemination and promotion of knowledge in the fields of humanities, science, fine arts, philosophy, technical and technological levels. Its remit is based on research, teaching and outreach activities and it works to solve regional, national and international community problems.

SESA's objectives are to:

- Promote harmonious inter-agency work that enables the creation, development and transmission of knowledge in all its forms and expressions, and to facilitate its application in all fields so as to address regional needs.

- Contribute to the development of activities and projects aimed at achieving academic excellence.
- Stimulate scientific, cultural, economic, political and ethical development at the regional and national levels.
- Contribute to the development of basic education to facilitate the achievement of its purposes.
- Implement strategies that facilitate education by stream and student mobility, the exchange of teachers, the creation of joint programmes, the integration of related academic programmes and the development of its own activities.
- Optimise human, physical, technical and financial resources of participating TEIs.
- Create conditions that facilitate evaluation activities aimed at institutional and academic programme accreditation.
- Promote complementarity and academic exchange among its members.

The role of the Secretariat of Education

The Department of Antioquia is the only department in Colombia whose Secretariat of Education has taken the lead in carrying out its tertiary education responsibilities. There is no legal framework to establish responsibility at this level, unlike primary and secondary education, and since 2008 the department has set up an instance responsible for co-ordination and liaison between the three departmental tertiary education institutions and the Secretariat of Education/Ministry of Education. One illustration of the sense of responsibility with which the department has taken action at this level is the agreement with the OECD to conduct an external evaluation. In this context, and as part of the restructuring of the department's Secretariat of Education, a high-profile higher education office was created in January 2012. It is directly accountable to the Secretary of Education's Office.

Institutional autonomy

Antioquia's private and public universities have different degrees of decision-making powers which has implications on public universities' governance and efficiency. As Table 1.12 shows, private universities have

greater autonomy in terms of ownership of buildings and equipment, of borrowing funds from commercial banks and setting salaries.

Table 1.12. Extent of autonomy in private and public TEIs in Antioquia

	Public TEIs	Private TEIs
Own buildings and equipment	No	Yes
Borrow funds from commercial banks	No	Yes
Freedom to set tuition fees	Yes	Yes
Set academic structure, programmes and content of courses	Yes	Yes
Employ and dismiss staff	Yes – Some employees are public servants. University directors are elected by the Higher Council and are free to recruit some staff such as co-ordinators, deans, etc.	Yes
Set salaries	Set by law	Yes
Decide size of student enrolment	Yes	Yes

Source: Consultations with SEDUCA

Some countries in Central America have greater autonomy in managing higher education institutions than Antioquia and Colombia. For example, Nicaragua and El Salvador are free to borrow funds from commercial banks and Costa Rica and El Salvador are also free to issue bonds in the financial markets.

Access, equity and attainment in tertiary education

Transition from upper secondary to tertiary education

The transition rate, which compares the number of individuals evaluated in the SABER 11 test with the number of students in the first year of undergraduate programmes, shows that in 2008, 68% of upper secondary students proceeded to higher education nationwide. Antioquia's 84% is much higher than the national average and has improved considerably in 2002 when Antioquia's indicator was close to the national value (54%).

Students who take the SABER 11 test fill a registration form, which includes questions about their personal and social contexts. This information is part of the basic input for the Higher Education Institutions Dropouts Analysis and Prevention System (SPADIES). The data provided by the system show, for example, the income of the student's family, and the parents' educational level. In relation to family income, in 2011, 45.5% of the students entering tertiary education come from families whose income was between 1 and 2 minimum monthly salaries.⁶ Only about 10% reported family incomes equivalent to 5 minimum salaries or more. In relation to parents' educational level, 9% of mothers had completed higher education;

in most cases the level of education is primary (47%), followed by lower secondary (32%). In Antioquia, 45% of mothers had their education recorded as "unclassified", and of the remainder, 17.7% have primary or less, followed by 15.6% with only lower secondary (MEN, SPADIES, 2011).

Enrolment and equity

While tertiary education places are unevenly distributed across Colombia's departments, Antioquia belongs to one of the best endowed regions in this respect. Table 1.13 shows tertiary enrolment in Colombian departments in 2002-2010 as a percentage of the population aged 17-21 in that region. Gross tertiary education enrolment in Antioquia was 40.9% below the leading regions of Bogota (73.7%), Quindio (50.4%), Santander (48.0%) and Norte de Santander (42.8%), but above the national average of 37.1%, and considerably above seven regions that have coverage of less than 15%, mainly savannah and jungle departments in the west and south of the country.

According to the Ministry of Education, in 2009, the gross enrolment rate in tertiary education in Antioquia was 32.1%, compared to 26.6% in 2002. Enrolments in 2010 totalled 186 095, an increase of 53 467 over 2002.

Universities have an average of 11 113 students enrolled at their main campus, the university institutions have 3 688 and the technological institutions 518. The average for universities is boosted by the Universidad de Antioquia (University of Antioquia) an institution which in 2010 had 33 571 students at its main campus, and 2 725 at regional centres (about 20% of the total number of students). The enrolment figures for the regional TEIs (23 367 students) include enrolments at the Universidad Nacional de Colombia (National University of Colombia); it has 11 247 students, representing 48% of total branch campuses.

When considering other institutions located in Medellin with enrolments of more than 10 000 students, seven tertiary education institutions account for 61% of total enrolments (see Table 1.14).

Table 1.13. Gross tertiary enrolment by department, %, 2002-2010

Department	2002	2003	2004	2005	2006	2007	2008	2009	2010
Amazonas	1.5	4.0	5.1	4.4	6.4	6.5	6.5	12.4	13.3
Antioquia	26.6	28.0	29.6	31.3	33.3	33.1	35.1	39.6	40.9
Arauca	1.6	1.7	3.0	3.2	4.5	8.6	12.5	14.0	12.7
Atlantico	34.0	32.2	32.2	34.9	35.2	36.0	36.5	33.4	37.9
Bogota	55.4	55.5	59.9	61.3	66.8	63.0	68.3	71.7	73.7
Bolivar	13.2	17.9	18.3	18.5	18.3	22.2	24.9	21.8	28.0
Boyaca	21.0	22.5	23.1	26.3	25.7	33.7	36.5	37.4	39.7
Caldas	22.4	23.2	25.0	26.5	26.2	29.3	28.3	33.7	35.0
Caqueta	7.6	7.5	8.9	12.2	14.8	20.3	22.5	26.1	19.1
Casanare	2.6	4.5	5.0	8.2	9.9	18.4	26.0	26.1	23.8
Cauca	12.8	13.5	15.1	15.8	16.4	20.1	22.1	23.2	26.6
Cesar	10.9	11.7	12.0	14.0	15.5	19.2	21.0	25.0	21.6
Choco	19.1	17.0	18.4	19.3	22.0	19.3	19.5	22.1	25.8
Cordoba	11.1	12.1	12.5	12.7	15.2	17.6	17.4	10.9	17.0
Cundinamarca	11.5	13.4	13.6	13.8	14.8	15.9	18.8	21.4	21.1
Guainia	N.D	0.0	3.3	4.2	9.7	17.0	19.4	14.0	11.5
Guaviare	N.D	0.0	1.7	3.1	7.3	11.6	13.0	14.2	12.8
Huila	11.5	13.7	14.4	16.2	17.0	21.1	23.3	26.0	25.7
La Guajira	13.0	13.2	12.8	14.3	15.3	14.6	17.7	20.8	17.5
Magdalena	6.7	7.9	9.4	11.5	13.0	21.5	23.1	24.6	20.5
Meta	13.2	14.2	14.1	17.9	20.0	24.9	26.5	25.3	24.4
Nariño	10.6	11.0	10.6	11.9	12.2	16.6	17.5	18.9	18.3
Norte de Santander	21.9	26.9	25.9	29.0	26.2	36.6	39.8	42.2	42.8
Putumayo	2.8	3.3	4.2	4.1	5.1	6.1	9.1	6.8	11.5
Quindio	22.7	25.0	25.3	24.6	29.6	40.6	47.8	49.4	50.4
Risaralda	17.6	21.0	24.2	26.6	28.7	35.3	39.4	37.1	42.2
San Andres	18.1	7.1	9.4	7.2	12.2	18.7	19.2	17.3	25.7
Santander	31.2	32.2	34.4	36.1	36.1	39.7	44.8	38.2	48.0
Sucre	9.2	10.6	9.1	10.7	11.4	14.8	17.3	17.2	17.0
Tolima	18.1	25.8	27.6	27.9	27.9	24.2	26.5	26.5	25.6
Valle del Cauca	23.8	22.9	23.2	24.3	24.7	26.5	27.8	29.7	31.7
Vaupes	N.D	0.0	0.7	2.7	4.1	12.0	7.8	9.6	4.2
Vichada	N.D	0.0	0.5	2.0	2.7	7.6	8.3	10.9	9.9
NATIONAL TOTAL	24.5	25.6	27.0	28.4	30.0	31.7	34.1	35.3	37.1

Source: MEN-SNIES, in OECD/World Bank, 2002, forthcoming.

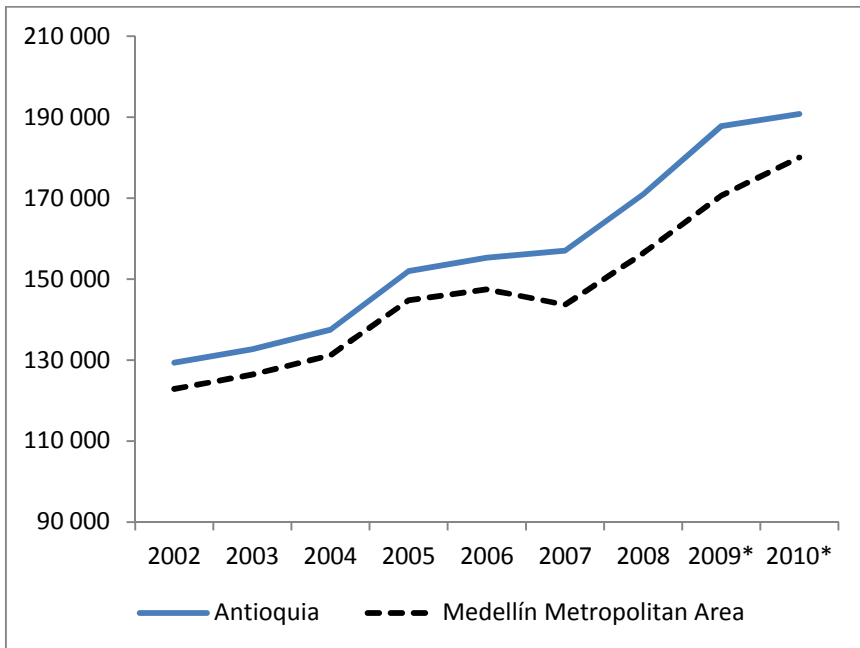
Table 1.14. Antioquia: Total TE enrolment, 2010

Institution	Enrolment*	Percentage
University of Antioquia	33 571	17.6
Metropolitan Technological Institute	23 127	12.1
Colombian Polytechnic Jaime Isaza	13 390	7.0
Bolivarian Pontifical University	12 818	6.7
Medellin University	12 217	6.4
National University of Colombia	11 247	5.9
EAFIT University	10 365	5.4
Other HEIs	74 045	38.8
Total	190 780	100.0

Note: *Excluding SENA enrolment

Source: SNIES, MEN, 2011.

As Figure 1.9 shows, the Medellín metropolitan area accounts for approximately 94% of Antioquia's total enrolments.

Figure 1.9. Development of HE enrolment in Antioquia, 2002-2010

Source: MEN, National Information System of Higher Education

In 2010, TEIs in Antioquia offered a total of 814 academic programmes of which 424 were for undergraduate studies and 394 for graduate studies.

Among undergraduate studies, the Bachelor's degree level concentrated the highest number of programmes, while in graduate studies, specialisation programmes took the lead. Table 1.15 shows the number of academic programmes and enrolments. On average, the number of students enrolled per programme was 234. The highest number of students per programme was at the Bachelor's degree level and the lowest was at the doctoral level.

Table 1.15. Programmes and enrolments by level in Antioquia, 2010

Level	Programmes	Enrolment	Enrolment /programme
Technical Professional	35	2 237	63.9
Technological	151	44 543	295.0
University - Bachelor's degree	234	132 240	565.1
Specialisation	276	7 838	28.4
Masters	86	3 311	38.5
Doctorate	32	611	19.1
Total	814	190 780	234.4

Source: MEN, National Information System of Higher Education

Post-secondary level enrolment in the vocational training service of SENA rose from 8 000 students in 2000 to 55 000 in 2010, which is higher than the enrolments for TEIs at these levels of study.

Table 1.16. Share of SENA in total technical and technological education in Colombia and in Antioquia, 2010

	Colombian HEIs	SENA - Colombia	Share of SENA - Colombia	Share of SENA - Antioquia in relation to national HEIs
Technical	93 519	26 211	28.0%	5.6%
Technological	448 250	270 475	60.3%	11.25%
Total	541 769	296 686	55.0%	10.27%

Source: Ministry of Education, 2010

At the undergraduate level, the most significant growth has been in the technological programmes. The number of doctoral students is very modest in Antioquia, growing from 108 to 611 students between 2002 and 2010 (see also Chapter 3 for more details).

Students enrolled in on-campus programmes totaled 178 000 in 2010, representing 93% of all students. Between 2002 and 2010, the number of students in distance programmes grew from 6 000 to 13 000, increasing their share of the total from 6% to 13%. By area of knowledge, three of the eight areas brought together 76% of total enrolments, namely *i*) engineering, architecture, urban development and similar (31%), *ii*) economics,

administration, accountancy and similar (20%), and *iii*) social and human sciences (17%). The five remaining areas individually accounted for less than 10% each: health sciences (7%), education sciences (7%), fine arts (5%), agronomy and veterinary sciences (10%), and mathematics and natural sciences (2%). (See also Table 1.17.)

Table 1.17. Enrolments 2002-2010 and graduates 2001-2009 by area of knowledge in Antioquia

Area of knowledge	Enrolments			Graduates 2001 – 2009
	2002	2010	Growth %	
Engineering, Architecture, Urban Development & similar	41803	59 991	43.51	49 682
Economics, Administration, Accounting & similar	31 337	53 024	69.21	56 872
Social and Human Sciences	24 039	32 640	35.78	34 143
Education Sciences	14 246	13 363	-6.20	15 708
Health Sciences	9 041	12 986	43.63	13 941
Fine Arts	4 181	10 180	143.48	6 551
Mathematics and Natural Sciences	2 894	4 344	50.10	2 731
Agronomy, Veterinary Sciences & similar	1 789	4 051	126.44	3 226
Total	129 330	190 579	4736	182 854

Source: Authors calculations based on SNIES data.

In 2001, according to a study developed in 2003 by the International Corporation for Education Development (CIDE), the number of students from Antioquia aspiring to enter higher education (high school students with ICFES test scores high enough to go on to higher education) was 50 737. Although Antioquia's tertiary education institutions offered 63 791 places, only 34 899 candidates were admitted. According to the CIDE study, 52.1% of the surplus places in higher education were concentrated in eight TEIs.⁷ Furthermore, the greater part of the 15 838 high-school students not admitted came from the lowest socio-economic category of population in the Metropolitan area of Medellín or from the outlying regions of the Department of Antioquia.

Antioquia has in recent years followed a policy to increase coverage in tertiary education has emphasised the need to attract more students from the lowest income groups. In 2002, 32.9% of new students came from families with an income of less than two monthly minimum wages; in 2009 this proportion had risen to 52% (see Table 1.18). The percentage of students in Antioquia who come from families that do not own their home increased

from 25.46% in 2002 to 31% in 2009, this being higher than the national average of 29.6% (MEN, 2010).

Table 1.18. Percentage distribution of new students by family income group, Antioquia, 2002-2009

Monthly minimum wages	2002	2003	2004	2005	2006	2007	2008	2009
1-2	32.90	32.31	41.67	44.37	47.2	51.07	51.53	52.01
2-3	25.67	24.09	26.37	26.16	26.87	26.01	27.08	24.64
3-5	23.36	21.01	17.64	17.13	15.73	14.55	13.45	14.39
5-7	11.68	10.32	7.21	6.20	5.72	4.77	5.01	5.21
7-9	2.11	4.33	2.65	2.06	1.68	1.22	1.18	1.67

Source: Ministry of Education, 2010.

Despite progress in improving access to higher education, significant inequalities remain. An increasingly high percentage of students come from low-income families but a detailed analysis of the information on household surveys does not support such a favourable analysis (Table 1.19). While 59% of households in Antioquia have an income of less than 2 monthly minimum wages, only 32% of students in TEIs come from this income bracket. This signifies significant inequality of access to higher education in Antioquia.

Table 1.19. Percentage distribution of households by income range, Antioquia, 2009

Minimum salary ranges	Percent of Households				
	Total households	Households with students			Other
		Total	Metropolitan area		
<1	27.16	9.72	6.7	20.29	
1 – 2	32.14	23.02	20.18	32.95	
2 - 3	16.58	19.85	18.95	23.01	
3 – 5	12.94	24.13	25.50	19.33	
5 – 7	4.81	9.21	11.07	2.70	
>7	6.38	14.07	17.60	1.72	

Source: GEIH-DANE, author's calculations.

Efficiency

The SPADIES statistics show that, in Antioquia, the dropout rate per cohort at university level is 48.1%, which is about three points higher than the national average (45.4%). In non-university institutions, the dropout rate in the department is below the national average, and at the technological

level it is 47%, versus 55% nationally; and at the technical/professional level, the rate was 32% versus 60% nationally.

Quality in tertiary education

The National Accreditation System (SNA) was created by Law 30/1992. According to Article 53 of the law, its mission is to guarantee that tertiary education institutions “meet the highest requirements of quality, and attain their purposes and objectives”.

In order to guarantee observance of the basic conditions of quality, any higher education programme offered in Colombia must obtain a qualified registration (*registro calificado*). According to Law 1188/2008, the qualified registration is the instrument of the Quality Assurance System for Higher Education, through which the State monitors HEIs quality conditions. The ministry, supported by the National Intersectoral Commission for Higher Education Quality (CONACES), appoints the academic peer(s), responsible for monitoring visits. Once the external reviewers have presented their report, CONACES gives its opinion, and the ministry issues the appropriate administrative act.

Law 1188 establishes 15 conditions concerning quality, 9 related to programmes (denomination, justification, curriculum content, organisation of academic activities, research, relationships with the external sector, teaching staff, pedagogical tools, and physical infrastructure), and 6 institutional conditions (mechanisms of selection and evaluation, administrative and academic structure, self-evaluation, programmes for graduates, university welfare, and financial resources). According to Regulatory Decree 1295 of 2010, the qualified registration is valid for seven years from the date of the administrative act granting it.

SNIES, the National System of Higher Education Information, reports on 1 701 programmes which have been registered in Antioquia.

In addition to having to undergo this process of checking compliance with basic conditions, the TEIs may voluntarily seek programme and/or institutional accreditation. To this end, they must follow the procedures established by the National Accreditation Council (*Consejo Nacional de Acreditación* – CNA). CNA is responsible for making external evaluations through academic peers, and then gives a final recommendation to the ministry, which is responsible for issuing the appropriate administrative act.

According to information from CNA, there are 23 accredited tertiary education institutions in Colombia (8% of the total), of which five (23%) are located in the Department of Antioquia, one is a public university (University of Antioquia) and four are private (EAFIT, Universidad

Pontificia Bolivariana (UPB), Universidad de Medellín (UdeM) and Escuela de Ingenieros de Antioquia (EIA). Annex 1.A1 presents the strengths of the accredited tertiary education institutions in Antioquia.

There are 663 programmes accredited at the national level (7% of all programmes, according to SNIES). In Antioquia, there are 145 programmes accredited (9% of the total and 22% of those accredited), of which 102 are offered by four HEIs (Figure 1.20).

Table 1.20. Accredited high quality programmes in Antioquia, 2011

HEI	Number of programmes	Participation within the department
Universidad Eafit	12	8.3%
Universidad Pontificia Bolivariana	18	12.4%
Universidad Nacional de Colombia	21	14.5%
Other (12 HEIs)	43	29.7%
Universidad de Antioquia	51	35.2%

Source: CNA, 31 March, 2011.

Likewise, it should be noted that in the results for 2009-2012 of the SABER PRO test nationwide, 5 of the top 50 results came from the Universidad de Antioquia, 1 from EAFIT and 1 from Escuela de Ingeniería de Antioquia (EIA).

One important responsibility of TEIs relates to adding value to competences already acquired by students in basic and lower-secondary education, and in some cases, filling gaps in that formation. In this context, it is a matter of concern that the number of new students entering higher education with a low score in the SABER 11 test has risen from 39% in 2006 to 46% in 2010. At the same time, the percentage of students with high scores fell from 22% in 2006 to 14% in 2010.

Graduate employability

Table 1.21. Distribution of graduates by level: Colombia, 2011-2009

Level of education	% of graduates (number)
Bachelor's degree	62
Specialisation degrees	18
Technology and technical degrees	18
Masters and PhD	2
Total	100 (1 361 348)

Source: MEN, National Information System of Higher Education

Table 1.21 shows the need to increase (post)graduate degrees as well as technical and technological degrees at the national level, since they barely represent 2% and 18% respectively. Also, by area of knowledge, economics, administration and accounting represent 31% of the degrees provided by TEIs; this is followed in importance by engineering, architecture, urban development (with 24%), and by social and human sciences (18%).

According to the most recent results of the Labour Market Observatory,⁸ at the national level 78.5% of the graduates had found a job within a year of finishing their studies in 2008. This percentage was significantly higher in Antioquia (83%). The percentage was 75% for undergraduate studies and 92% for postgraduate studies. Also, salaries ranged between COP 901 026 for a technician and COP 4 904 102 for a PhD graduate. The average salary of recent graduates was slightly higher in Antioquia (COP 1 729 086) compared to COP 1 619 825 nationally.

1.5. Regional development and tertiary education

The principal challenge in Antioquia's tertiary education is the need for effective decentralisation of provision, increased coverage and labour market relevance. These challenges have been addressed by different mechanisms that include: *i*) the establishment of Regional Centres of Higher Education (CERES) in different parts of the country, *ii*) the development of virtual and distance learning opportunities, *iii*) aligning tertiary education institutions' provision and service with regional needs; and *iv*) improving labour market relevance of tertiary education through partnerships, such as Technical & Technological Education Partnerships and the University-Firm-State Committees (CUEE).

Regional Centres of Higher Education in Antioquia

In line with the national programme, six Regional Centres for Higher Education (CERES) have been established to facilitate access in remote areas in Antioquia in the following municipalities: Apartadó (Politécnico Jaime Isaza Cadavid); Bello (Universidad Minuto de Dios); Puerto Nare (Fundación Universitaria CEIPA); Santa Fe de Antioquia (Corporación Tecnológica Católica de Occidente); and Sonsón and Yarumal (both, Universidad de Antioquia). Table 1.22 gives an overview of five of the six CERES in the Department of Antioquia (Sonsón was created in December 2010).

Table 1.22. The regional centres for higher education in Antioquia

Location of CERES	Date started	Number of education programmes	Number of students
Apartadó	August 2006	6	327
Bello	February 2004	22	3 498
Puerto Nare	February 2006	17	86
Santa Fe de Antioquia	November 2007	6	273
Yarumal	August 2008	10	293
Total		61	4 477

Source: National Ministry of Education, 2010.

The CERES located in Puerto Nare is a typical example of a regional initiative, largely supported by the Cementos Argos' Foundation. Educational programmes are offered by the Fundación Universitaria Católica del Norte, the Fundación Universitaria CEIPA, SENA and the Universidad de Pamplona through virtual and distance learning. The focus is on sustainable development, agro-industry, business management, information technologies and social sciences. The latest CERES, launched in Sonsón in December 2010, is operated by the University of Antioquia and has an agro-industrial orientation. The Santa Fe de Antioquia CERES offers a technological programme for agro-industrial business management and entrepreneurship. The coverage and profile of each of the CERES vary, because they reflect the characteristics of the specific subregion and the higher education programmes offered. Currently, there are only limited data on enrolments and graduates because of lack of monitoring and evaluation systems.

Distance learning

Another response to the need for greater decentralisation of educational provision and increased coverage has been the growth in distance learning programmes, albeit from a low base. In 2011, Antioquia had 69 programmes of distance higher education, 12 (7.1%) in technical fields, 49 (29%) in technological fields, 67 (9.6%) at undergraduate level, and 41 (24.3%) at graduate levels. Antioquia has also a 100% virtual university, the Fundación Universitaria Católica del Norte, which is based in Santa Rosa de Osos in northern Antioquia. This institution has gained international recognition and is present in 95 municipalities in Antioquia, offering virtual access to 18 programmes.

Antioquia's government is supporting distance learning through its education policy which includes a programme known as *Virtualidad para Inclusión* ("Virtuality for inclusion") whose objective is the generation of

new pedagogical approaches for learning through ICTs. It has produced the *TareaNet Siglo XXI* educational portal which has links to national and international educational sites. This provides a platform for the formation of experts for the production of educational programmes and materials that are relevant to the needs of the Antioquia Department.

Aligning TE provision and service with regional needs: the case of the University of Antioquia

The principal channel for the regionalisation of tertiary education for the government of Antioquia is the University of Antioquia. Its regionalisation policy has translated into five main campuses and six regional centres, with 5 205 students, 4 000 graduates so far and 40 academic programmes in the sub regions. In 2011, university offered higher education opportunities in all nine sub regions of Antioquia and has regional centres in Urabá (Turbo), Bajo Cauca (Caucasia), Magdalena Medio (Puerto Berrío), Suroeste (Andes) and Oriente (Carmen de Viboral). The municipal centres are in Occidente (Santa Fe de Antioquia, Nordeste (Amalfi and Segovia) and Norte (Yarumal and Santa Rosa de Osos); and in Oriente (Sonsón).

The University of Antioquia bases its policies on strategic sub regional documents that analyse the education and training needs in each zone. Its Regionalisation Division provides leadership for this strategy of inclusion of students from remote areas. Access to the regional centres involves an element of affirmative action with a lower score requirement in the SABER 11 test (from 53 to 50 points). This decision was taken after a diagnosis showing that high-school students in remote areas had greater difficulties of access to universities because of their relatively lower scores in the SABER 11 test. This measure has helped to increase access for students in remote areas without sacrificing quality, since the follow-up on these students has shown similar results to those admitted with better scores than 53 points.

The University of Antioquia receives approximately 10% of the funds transferred by the national government to the Antioquia education system. In accordance with article 87 of Law 30/1992,⁹ as a regional university, it receives funds for operating costs (national universities also receive funds for investment). In terms of per-capita funding, the university received COP 5.8 million per student in 2010, which is the largest per-capita contribution received by any public university, after the National University and the Universidad del Atlántico.

Table 1.23. National per-capita contribution to the Universidad de Antioquia, 2003-2010

	2003	2004	2006	2009	2010
Universidad de Antioquia	4.96	4.82	4.49	5.45	5.80

Source: MEN. Memorias Revolución Educativa, 2002-2010.

In addition, Law 122 of 1994 authorises the issue of special administrative stamps to benefit the University of Antioquia, for an annual value not to exceed COP 200 million (about USD 100 000). The resources generated through the sales of these special administrative stamps are dedicated to investment, infrastructure maintenance, sport and arts equipment, ICT, libraries and laboratories.

Furthermore, the Department of Antioquia allocates funding to the three public HEIs – Universidad de Antioquia, Politécnico Colombiano Jaime Isaza Cadavid² and Tecnológico de Antioquia (Table 1.24). In 2011, the departmental contribution per student is COP 739 038 for the Universidad de Antioquia, COP 1 770 884 for the Politécnico Colombiano Jaime Isaza Cadavid and COP 992 464 for Tecnológico de Antioquia. This denotes great differences in contributions to each one of the institutions.

Table 1.24. Contribution of the departmental government to TEIs in Antioquia, 2008-2011

Year	Value (COP)
2008	33 711 546 000
2009	53 019 611 023
2010	65 929 761 424
2011	66 194 528 756

Source: SEDUCA budget.

Partnerships to improve relevance of education

Technical & Technological Education Partnerships

An initiative that seeks to combine increased coverage with greater labour market relevance and graduate employability is the “Technical & Technological Education Partnerships”, which consists of strategic partnerships between businesses and educational institutions, supported by the municipal, departmental and national authorities. These partnerships are based on competitive funding within the framework of the competitiveness agenda of the Department of Antioquia. Five projects were selected in 2010:

- *Technical and Technology Partnership.* The partners are the Politécnico Jaime Isaza Cadavid, Instituto Tecnológico de Antioquia and the EAFIT University (project administrator), Corporación Intersoftware (the private sector) and 16 upper secondary education institutions. The partnership offers four educational programmes (two technical, two technological) and involved 70 students in 2010.
- *Agro-Industrial Partnership.* The emphasis is on sustainable development, technical upper-secondary education and a preparatory cycle made up of upper-secondary technical and technological education. The partners are the Fundación Católica del Norte that represents the higher education sector; Cartón de Colombia; the Fundación Smurfit Cartón de Colombia and Asocolflores for industry. This partnership offers four virtual programmes (two technical, two technological), and involved 53 students in 2010.
- *Industrial Partnership.* The emphasis is on technical and technological training relevant to industry. The participating higher education institutions are the Instituto Tecnológico Pascual Bravo and UdeA. Industry partners include Compañía de Empaques, SOIFASA, Colombiana de Comercio and Cerromatoso Fundación San Isidro. The partnership is supported by the National Learning Service SENA, Comfama (a fund that provides financial support for families) and eight upper-secondary schools.
- *Coffee Growers' Partnership.* This initiative seeks to transform the training of technicians and technology specialists in the coffee-growing region of Antioquia, as part of the national strategy promoted by the Coffee Growers' Federation. The UniMinuto University offers three technical programmes and one technological programme under this partnership.
- *Telecommunications Alliance.* It is implemented in the municipality of Envigado by the Institución Universitaria de Envigado, and supported by telecommunication firms (Aciem, Edatel), the Chamber of Commerce and seven upper-secondary schools. There are two technological programmes and two technical programmes with 35 students enrolled.

The University-Firm-State Committee (CUEE)

Antioquia's tertiary education sector contributes to a range of platforms for regional dialogue designed to promote education for competitiveness and productivity

The University-Firm-State Committees (CUEE) (Box 1.2), are organised by agreements between the universities, research groups, businesses, and departmental agencies. Their purpose is to generate and promote applied research products, with a focus on the actual technological needs of businesses in the region. In Antioquia, the sectors that have participated in this programme are energy, agro-industry, biotechnology, information and communications technologies, health, environment, infrastructure, timber, and pulp and paper. CUEE has been useful in aligning the participating universities on the offer of applied knowledge to production sectors, particularly those that have been identified as priorities in the departmental agenda.

The tasks of the CUEE have included the identification of priority areas of innovation linked to the regional competitiveness agenda and participation in the Strategic Plan for Antioquia (Planea). This is a working scheme designed around a strategic plan of the department, which has participatory instances such as the Governing Council (in which a number of mayors, and universities, businessmen and other civil society organisations are members), and the technical support team, in the Antioquia Development Institute IDEA, the Regional Competitiveness Commission. See also Chapter 5 for more details.

Box 1.1. The University-Firm-State Committee (CUEE) in Antioquia

The University-Firm-State Committee Antioquia (*Comité universidad – empresa – estado de Antioquia*, CUEE) was established in 2003 to bring together tertiary education institutions, and public and private stakeholders. In 2011, the National Ministry of Education supports seven committees across Colombia. The CUEE for Antioquia received national recognition for good management in 2009.

The CUEE in Antioquia is composed of 11 tertiary education institutions with regional influence, 21 private companies, 7 Technological Development Centres, the National Association of Colombia's entrepreneurs (ANDI), The National Association of Micro, Small and Medium-Sized Companies (ACOPI), the Secretariat for Productivity (Antioquia) and Secretariat for Municipal Planning.

Box 1.1. The University-Firm-State Committee (CUEE) in Antioquia (continued)

The 11 tertiary education institutions are:

- National University with headquarters in Medellín (Universidad Nacional sede Medellín)
- Medellín University (Universidad de Medellín)
- Pontifical Bolivarian University (Universidad Pontificia Bolivariana)
- Lasalle University (Universidad Lasallista)
- CES University (Universidad CES)
- University of Antioquia (Universidad de Antioquia)
- EAFIT University (Universidad de Eafit)
- Engineering School of Antioquia (Escuela de Ingeniería de Antioquia)
- Jaime Isaza Cadavid Polytechnic (Politécnico Jaime Isaza Cadavid)
- Grand College of Antioquia (Colegio Mayor de Antioquia)
- Pascual Bravo Technological Institute (Tecnológico Pascual Bravo)
- Metropolitan Institute (Instituto Metropolitano)

Over seven years, the Committee has supported numerous research projects related to the impact on industry in Antioquia such as “Research and Documentation of the experience University-Firm-State Committee of Antioquia”. This is a well documented record of the CUEE experience which has been important to universities, firms and subnational governments in and outside Antioquia. It has become a guide for other committees who seek to build bridges between government, industry and academic.

Source; Colombia Aprende see, www.colombiaprende.edu.co/html/home/1592/article-211994.html

Proposed reform of the Higher Education Law

Early 2011, the National Ministry of Education unveiled a proposal to reform Law 30 of 1992 which regulates higher education in Colombia in terms of its purpose, organisation, governance, funding and regulations. The proposal aimed to improve the quality of tertiary education by building a stronger quality assurance system on the foundations already in place; to expand the capacity and efficiency of the system so that more students could be served; and to bring more funding into the system, both by committing significant new public resources and by governance changes designed to stimulate new private sector investment.

The proposal aroused great interest and passions among stakeholder groups, including students and public universities. The main debates centred around the national government's intention to authorise universities to generate profits. The debates and protests from students and presidents of public tertiary education institutions forced the government to withdraw its proposal.

The proposal included a specific chapter on “Transparency, Efficiency and Good Governance” that established criteria on governance, eligibility and a disqualification regime, combining institutional autonomy and public responsibility. According to the proposal, all institutions were subject to the same rules of accountability and transparency in terms of the use of resources, and encouraged public universities to adopt modern management practices with comprehensive information systems. For this purpose, the proposal included the creation of a National Public Registry for Higher Education, which meant that TEIs would have to provide and update information on their statutes, contact information, academic programmes with registries and accreditations etc.

The proposal also promoted regionalisation through the allocation of additional funds to public tertiary education institutions. This reform envisaged the creation of departmental co-ordination units, in which the respective Secretaries of Education would hold a seat and would receive the support of the ministry. In Antioquia this arrangement is already in place. In addition, it envisaged that both national and territorial entities would contribute additional funds for investment in specific infrastructure projects to improve learning environments, which has already taken place in some departments such as Antioquia. It also proposed to allocate funds to TEIs “to open new places taking into account ... regionalisation programmes, presence in border areas and attention to vulnerable populations.” Furthermore, 10% of the income from the General Royalty System would be allocated to a science, technology and innovation fund, allowing an increase in funding for innovation from 0.17% to 0.60% of GDP by 2012.

The proposed reforms to Law 30 were, taken as a whole, a constructive approach to improving the Colombian education system. In future when the tertiary education reform is reintroduced, it will need to be done after a period of a careful consultation process including a wide range of stakeholder groups. See OECD/World Bank (2012, forthcoming) for a full account of the proposal and reforms needed.

Notes

1. Agencia Presidencial para la Acción Social y la Cooperación Internacional.
2. Economic strength refers to the capacity (assets and processes) and performance of the economy of the Department to face macroeconomic pressures.
3. Between 2006 and 2009, COP 132 428 were allocated in subsidies for tuition and living expenses and in 2010 COP 74 000 million were assigned to new subsidies and the renewal of those previously allocated.
4. “University institutions” or “technical schools” are those that can offer undergraduate programmes up to the professional level and graduate programmes of specialisation level.
5. The department has enrolment records in another 15 HEIs and in other programmes under agreement or extension services. The total enrolment figure for these institutions is 8 548 students, with 3 199 of them in the Universidad Nacional’s Open Distance programmes, and 1 869 in the Fundación Universitaria San Martín.
6. For 2011, the minimum monthly salary was COP 535 600 (approximately USD 300).
7. Universidad de Medellín, Politécnico Jaime Isaza-Cadavid, Corporación Universitaria Remington, Universidad San Buenaventura, Fundación Luis Amigó, Universidad Cooperativa de Colombia and Universidad Católica del Oriente.
8. The Labour Market Observatory matches information on graduates from SNIES with the databases of the Ministry of Social Protection and the Ministry of Finance to identify the percentage of graduates who make contributions the social security system, and their contribution base income. See OLE website: www.graduadoscolombia.edu.co.
9. Article 87 of Law 30/1992 states that “The government will increase its contribution to the public universities in a percentage of not less than 30% of the real increase in GDP”.

Annex 1.A1 Strengths of TEIs accredited in Antioquia

Accredited TEIs	Strengths of TEIs accredited in Antioquia
Universidad de Antioquia (UdeA) Res. 2087 2003-09-05 Accreditation valid for 9 years	UdeA has institutional evaluation, and high-quality accreditation for a number of programmes. It has expanded its coverage, favouring students from low-income families, candidates from special groups and from remote areas. It has a high average level of qualification in teaching staff, enabling more research to be done, and making the curriculum more flexible. It has good technological capacity, a well-developed system of libraries, connections to information networks, and institutional effort to manage a second language. It has a regionalisation strategy, varied extension programmes and projects (for example, encouragement of quality at the various educational levels of the department, and programmes of continuing education). It has an appropriate and efficient organisation for management and administration
Universidad EAFIT. Res. 1680 2010-03-16 Accreditation valid for 8 years	Strengthening of the teaching staff, and research activities, which have made it possible to broaden the offer of Masters programmes, and to create two doctoral programmes. Preparatory courses and programmes offered by the University, which has helped to reduce student dropouts. The use of information and communications technologies as an effort to internationalise the university. Good library facilities and information technology resources. Accreditation of 100% of programmes subject to accreditation in undergraduate level, according to the CNA guidelines. Relationship between university and the business sector in the region and elsewhere in Colombia, and strategic alliances established with technological centres and the encouragement of innovation.
Universidad Pontificia Bolivariana (UPB) Res. 10246 2010-11-22, Accreditation valid for 6 years	Increased offer of undergraduate and graduate programmes (includes two doctorates). Full-time teaching staff total 406, of whom 55 (13.1%) have doctorates, 161 (39.6%) have Masters degrees, and 97 (23.9%) have specialisation degrees. 60 research groups registered with Colciencias, of which 4 are classed A1, 4 are A, 15 are B, 14 are C and 9 are D. Significant scientific production by faculty, which is reflected in 208 articles placed in indexed international journals, 272 are indexed on the ISI database. The process of internationalisation of the university (75 international agreements being effectively applied, with exchanges of faculty and students with HEIs in other countries). Laboratory infrastructure available at the university. System of university libraries, which combines traditional libraries with virtual facilities.

Accredited TEIs	Strengths of TEIs accredited in Antioquia
<p>Universidad de Medellín (UdeM). Res. 5148 2009-08-03 Accreditation valid for 4 years</p>	<p>Teaching staff composed of 192 (27%) full-time faculty, seven (1%) half-time, and 516 (72%) part-time, for an average of 30 students per full-time professor-equivalent; 11 (6%) of the teaching staff have doctorates, 97 (50%) have Masters degrees and 52 (27%) have graduate specialist studies.</p> <p>Research effort, for which there are 4 research centres that co-ordinate 21 research groups, of which Colciencias classified 5 as A, 8 as B, 3 as C; and another 5 are registered.</p> <p>Institutional programmes for follow-up, support and interaction with graduates, in particular the Employment Mediation and Graduate Support Centre, as well as the Graduates Club.</p> <p>Appropriate physical infrastructure, and facilities for sport cultural activities, bibliographic resources, audio-visual equipment, computer teaching centre, communications channels, laboratory centre for academic activities.</p> <p>Efficient management of funds, and appropriate mechanisms of internal control.</p>
<p>Escuela de Ingeniería de Antioquia (EIA) Res. 2203 2010-03-30 Accreditation valid for 4 years</p>	<p>The quality of the 68 full-time faculty, of whom 6 (8.8%) have doctorates, 34 (50%) have Masters degrees and 14 (20.6%) have graduate specialisation degrees, the remainder having undergraduate degrees. There are some 28 students per full-time faculty member. Research. There are 15 research groups, of which Colciencias has classified 11: 1 as B, 2 as C and 8 as D.</p> <p>Production generated by the research groups is reflected in 126 articles or products of new knowledge, 213 items of dissemination, and 79 items of educational material in the period 2004-2008.</p> <p>EIA is a founding partner in the Antioquia Science and Technology Centre (CTA). It works in co-operation with a number of public and private entities.</p> <p>The quality of students in EIA – from the top 5% of the SABER 11 test (State high school examination), and the excellent results of students in the SABER PRO tests. Also, 10% of students in each semester take part in international exchange programmes.</p> <p>The development of students' entrepreneurial skills, led by the university's Innovation and Entrepreneurship Centre. Activities in social projection, through engineering projects, and advisory services and consultancy for organisations such as EPM, Hospital Manuel Uribe Angel, etc.</p> <p>Appropriate physical infrastructure and ICTs.</p> <p>Appropriate management of financial resources and internal controls.</p>

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Chapter 2:

Human capital and skills development

Human capital and skills development is the single most important factor for economic growth of countries and regions. Nurturing relevant skills to fuel growth is the best guarantee that the region will prosper in future.

This chapter examines how effectively tertiary education institutions in Antioquia 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 development and tertiary education, as well as recent trends and policies in human capital and skills development. It sheds light on the positive outcomes of increasing participation rates and widening access to tertiary education. It identifies major challenges facing Antioquia's tertiary education system including the need to reduce dropout rates and to improve the alignment of tertiary education to the needs of the region. The chapter closes with a series of recommendations on how to improve human capital development in Antioquia, emphasising the benefits of a region-wide strategy for the sustainable development of tertiary education and human capital development.

Introduction

The National Development Plan 2010-2014 outlines the challenges that must be addressed over the long term in Colombia. The Plan seeks to promote *i)* innovation in production, social processes, the design and development of institutions, adaptation to climate change and the management of sustainable development; *ii)* good government as the backbone of public policy, social programmes and the relationship between the citizen and public administration; *iii)* greater international exposure of Colombia to world markets, international relations and multilateral agendas; *iv)* sustainable environment as an essential element of welfare (DNP, 2011).

To achieve these objectives, the Plan calls for human capital development to be the key policy. It stresses that every educational level should contribute to the continuous development of basic skills for employment and citizenship; and that there should be a closer association between the education and productive sectors, so that the population is both more skilled and competitive to reduce the social gaps and promote national development (DNP, 2011).

Antioquia proposes similar general policies and measures. For example the document “Antioquia 2020: Competitive Strategy” (*Antioquia 2020: Estrategia de Competitividad* published in 2006 in the context of the agreement among the Government of Antioquia, the Metropolitan area of the Valley of Aburrá and the Municipality of Medellín with the assistance of the Chamber of Commerce of Medellín for Antioquia) states that “One of the principal challenges that Colombian society should confront is related to consistently lifting the educational levels of the population, guaranteeing its quality and relevance, so that it achieves higher economic growth rates, greater improvement to welfare and greater social mobility”. It points out that “in Medellín and Antioquia the challenges are not less and should be dealt with by improving the quality of primary education and by the greater coverage of tertiary education. Given the skills demanded by the globalisation process, efforts should be made to structure activities toward the training and education of the labour force in those areas which have been defined as strategic” (Comisión Tripartita, 2006).

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

- Widening access: do the existing tertiary education providers offer adequate learning and training opportunities to the local population?

- Demand for skills: are existing tertiary education institutions and programmes adequately aligned with the skill needs of the local economy, do they support entrepreneurship in the region and provide relevant education and training?

2.1. Human capital development in Colombia

The current educational level of the Colombian adult population (25 years and above) reflects the relatively low tertiary education participation over the last decades. Only 10.1% have attended tertiary education institutions (ISCED 5 and 6) compared to 24.5% in Spain, Peru (18.2%), Chile (15.1%), Ecuador (14.8%), Venezuela (14.6 %) Mexico (14.5%) and Argentina (13.7%) (UIS, 2010).

Overall Colombia's tertiary education has been expanding consistently in recent years, from 1 137 657 students in 2005 to 1 587 928 in 2010, with an average growth rate of 7% per annum during this period (Orozco, Castillo y Roa, 2011) resulting in an increase in the gross participation rate in tertiary education from 24.4% in 2002 to 35.5% in 2009 (MEN, 2010). The increase in coverage and participation is the outcome of the "Education Revolution," government policy which, during the first decade of the 21st century, supported broadening access to tertiary education, together with a strong push to promote technological and technical education (TTE) with the promulgation of Law 749 in 2002¹ and the inclusion of relevant data of the National Learning Service (*Servicio Nacional de Aprendizaje*, SENA) within tertiary educational statistics.

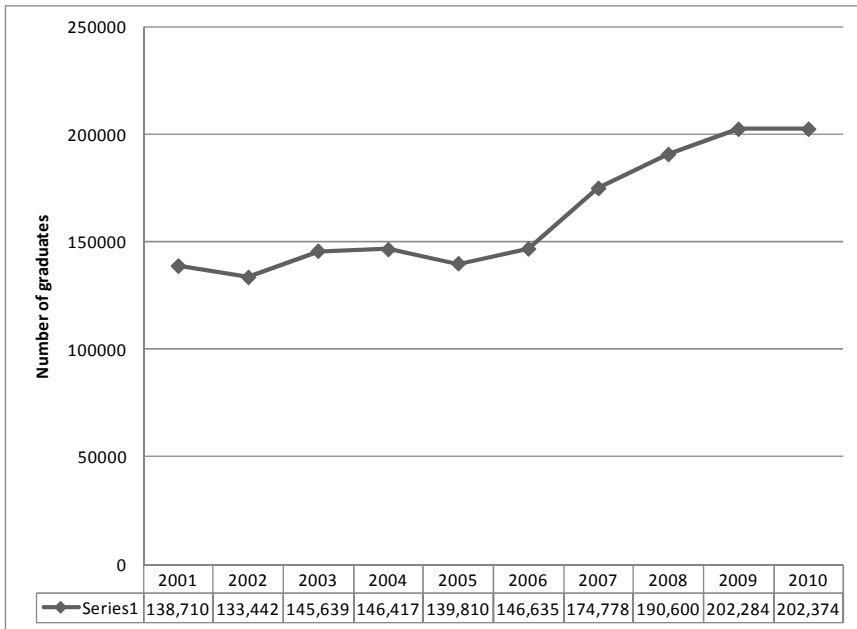
Government policy has also encouraged the participation of students from low-income households with scholarships and loans; the reduction of student dropout rates; an accreditation regime based on peer-reviewed, external evaluation of institutions and programmes; and the modernisation of tertiary education management. The National Ministry of Education (MEN) has developed a National System of Information for Higher Education (*Sistema Nacional de Información de la Educación Superior*, SNIES) for the tertiary sector.

In terms of increasing greater access to tertiary education nationally, between 2002 and 2007 while the strong differences by income quintile continued, there was a slight improvement; quintiles 1 and 2 (the poorest) increased their participation over the five years from 4.4 and 8.5% (2002) to 8.5% and 10.4% (2007) respectively. However student dropouts – mainly for economic and academic reasons – continued to be high, compromising the objective of consistently increasing participation as well as access to tertiary education. As has been recently noted, "Dropout constitutes, for the

country, the greatest weakness of the system in terms of efficiency and quality” (Orozco, Castillo and Roa, 2011).

The tertiary education system is the main provider of technical, professional and scientific human capital. Over the last decade (2001-2010), over 1 621 000 students have graduated, an average of 162 000 yearly, of whom 61.5% are from private institutions (Figure 2.1). Half received their qualifications in three areas: economics, administration and accounting, social sciences, and education.

Figure 2.1 Colombia: tertiary education graduates, 2001-10



Source: Observatorio Laboral, Colombia: Tertiary Education Graduates, 2001-10, www.graduadoscolombia.edu.co:8080/o3portal/viewdesktop.jsp?cmd=open&source=Perfil+Graduados%2FGraduados+por+Departamento%23_public.

2.2. Regional demographics and the labour market

Population

The Department of Antioquia contains 13.3% (6 065 846 inhabitants in 2010) of Colombia’s population of which 77.3% live in urban and 27.2% in rural areas. The Department’s population annual growth rate is 1.3%, below the national average of 1.8%.

Antioquia has an ageing population and a slight decline in those of school age. Between 2006 and 2011, the population between 6 and 17 years of age fell by 93 000, at the same time as tertiary education continued its vigorous expansion with a growing proportion of students over the age of 24.

The labour market

The main characteristics of Antioquia's labour market are set out in Table 2.1, thus allowing a comparison of variables for 2010 and 2001. As can be seen, there has been an increase of the labour force and the employed, with a fall in unemployment; however, there is a slight upturn in underemployment for reasons of perceived inadequacies in income and use of skills.

In Colombia, data for 13 urban and metropolitan areas report an increase in the number of jobs. The greatest increase is for qualified workers, with those having attended tertiary education increasing by 7.9% and those with only primary education falling by 3.1%. According to some analysts, this is because firms are using the economic recovery to emphasise technical change, replacing less educated staff with better educated personnel. Thus those in employment with tertiary education – most pronounced in the formal labour market – increased by 8.7%, greater by 4.1% when compared to those with only secondary education. In comparison, those employed with primary education fell by 4.6%. These data confirm the increasing participation of employees with tertiary education in the formal sector, as shown in Figure 2.2. In the period November 2010 to January 2011, 49% of those in formal employment had attended tertiary education, 42.2% had attained secondary education and 8.5 % had primary education only.

Table 2.1. Antioquia: Working age population, 2001 and 2010

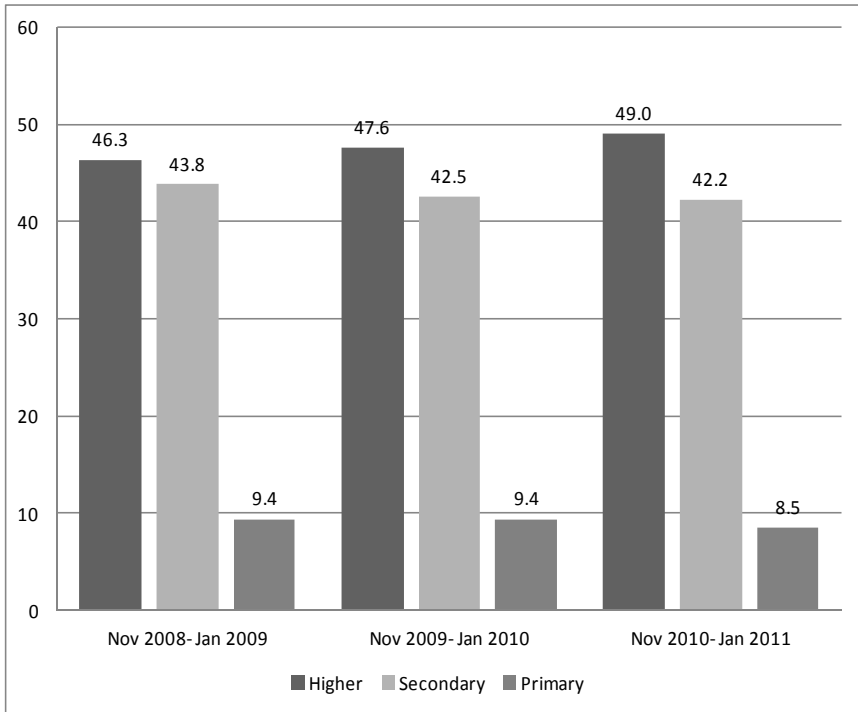
Participation rates, employment and unemployment (open and disguised), inactive and under-employed (thousands)

Antioquia	2010	2001
Working age population (%)	80.2	76.4
Gross participation rate	61.2	59.9
Employment rate	53.9	50.6
Unemployment rate	11.9	15.5
Open unemployment	11.1	14.1
Hidden unemployment	00.8	01.5
Underemployment rate	29.4	28,2
Insufficient hours of work available	11.3	13.7
Mismatch between employment and skills	12.1	03.3
Inadequate employment by income	24.4	21.5
Total population (thousands)	6 066	5 369
Working age population	4 868	4 101
Economically active population	2 977	2 457
Employed	2 622	2 076
Unemployed	355	381
Open unemployment	329	345
Hidden unemployment	25	36
Inactive	1 891	1 643
Underemployed	874	693
Insufficient hours of work	336	338
Mismatch between employment and skills	361	80
Inadequate employment by income	727	527

Source: Based on DANE, Gran Encuesta Integrada de Hogares, 2011

Antioquia's 15-24 age group increased their years of education from an average of 9.39 (2007) to 11.90 (2009)². Nearly half of the population (46.5%) is below the poverty line, slightly better than the national level, and 14.2% had unsatisfied basic needs (a figure which ranges from 11% in Valle de Aburrá to 60% in Bajo Cauca).

Figure 2.2. Colombia (13 cities and metropolitan areas): formal labour market participation by level of education. 2008-2011



Source: Based on DANE, Gran Encuesta Integrada de Hogares, 2011. Taken from Observatorio de Políticas Públicas de la Alcaldía de Medellín, Boletín Informativo, Edición 18, marzo de 2011 (March 2011).

2.3. The supply of tertiary education in Antioquia

Antioquia's tertiary education system consists of 41 tertiary education institutions: 7 universities, 23 university institutions (*instituciones universitarias*), 10 technological institutions and one professional technical institution (SECA, 2011) as well as the services offered by SENA. 29 of these institutions are located in Medellín, 7 in municipalities that form part of the metropolitan area and the remaining 5 in municipalities outside the metropolitan area. In addition, there are 11 branches (*seccionales*) of tertiary education institutions. The average size for universities is around 11 000 students at their principal location, 3 700 for university type institutions and 500 students in the technological institutes.

In addition, Antioqui has five Regional Centres of Higher Education (Centros Regionales de Educación Superior, CERES) promoted by the National Ministry of Education, which seek to decentralise the provision of tertiary education. They are in the municipalities of Apartadó, Bello, Puerto Nare, Santa Fe de Antioquia and Yarumal with a total of 3 507 students. 77% of students study in the largest of these centres, operated by the University Corporation Minuto de Dios.

In total, and including SENA, tertiary educational institutions in Antioquia enrolled 206 782 students in 2010, a considerable increase from the 128 441 students in 2002 (MEN, 2010). The large majority of tertiary education students (94%) are concentrated in the metropolitan area. Students are divided among 1 439 programmes (around 15.6% of the national total in 2010), of which 95% are undergraduate. Of the undergraduate programmes, 9.7% are in the professional technical field, 29.2% in technological education and 56.8% at universities.

The seven largest institutions make up 61% of the total enrolments in Antioquia (see Chapter 1, Table 1.14). The University of Antioquia has 33 571 students located at its principal campus and is the second most important public university in Colombia (see Box 2.1). Among the branches (seccionales), the National University of Colombia represents 48% of enrolments in this category.

Box 2.1 University of Antioquia

Decree 610 (2002) established that decentralised and territorial agencies (which includes the University of Antioquia) have to be approved for credit in order to manage funds or undertake internal or external operations with public debt for periods longer than one year. This is an innovation in the financial management of public universities in Latin America. The rating agency reports also provide an overview of the University of Antioquia which is nationally recognised as the second most prestigious public university in Colombia.

Strengths:

National level leadership in tertiary education and research. High quality of teachers and administrators with an institutional accreditation for nine years. A two centuries' old institution. Large number of accredited programmes and international agreements. Strategic Plan and identified actions for 2006-2016. A high average level of the teaching faculty (Masters and PhD level). A large number of research groups of excellence and internationally recognised publications. Strong participation and high quality in the tertiary education academic services market. Diversification of income.

Box 2.1 University of Antioquia (continued)

Opportunities

Stable synergy among the university, the state and firms. Leveraging partnerships to strengthen contracts and consulting projects, technical assistance and research. Modernisation and expansion of infrastructure and services. High level of public contracts. Regional expansion. Increase in the strategic partnership base to strengthen research projects. Consolidation and strengthening of international co-operation agreements. Capacity to generate own resources. Opportunity to gain international accreditation. Consolidation of the university's financial development.

Weaknesses:

Dependency on state funding. Stamp income and consulting are dependent on economic cycles. The partnerships depend on current public and private administrations. Concentration on income sources that limit the University's financial independence. Lack of autonomy in the capacity to expand coverage of the services.

Challenges (Threats):

Increasing debt level. General economic environment of slow growth. Failure to pay pensions by Department and the State. Strong competition due to the strengthening of other public universities in Antioquia. Dependence on administrative and regulatory norms (state transfers, state contracts etc.). Institutional stagnation. Decline or deterioration of the collection of the sales taxes (*estampilla*) by the University of Antioquia which affect the expansion plans of the University. Income from research is vulnerable to Colombia's changing economic conditions.

Source: BRC Investor Services, *Revisión Periódica*, 23 February 2010; *Revisión Extraordinaria*, 22 August 2007; 2nd Annual Revision 28 February 2007.

The study programmes included in the National Qualifications' Register (*registro calificado*)³ are 905 undergraduate and 611 postgraduate programmes distributed across fields in a way that is not very different from the national pattern (Table 2.2).

Table 2.2 Colombia and Antioquia: Programmes accredited by field, 2010

Fields	Colombia				Antioquia			
	Undergraduate		Postgraduate		Undergraduate		Postgraduate	
Agronomy, veterinary sciences and associated disciplines	216	4.0%	90	2.4%	42	4.6%	15	2.5%
Fine Arts	293	5.5%	28	0.8%	58	6.4%	11	1.8%
Education	688	12.8%	443	11.9%	127	14.0%	60	9.8%
Health	319	6.0%	656	17.6%	48	5.3%	142	23.2%
Social sciences, politics, law	511	9.5%	720	19.4%	112	12.4%	104	17.0%
Economics, administration, accounting	1 571	29.3%	1 075	28.9%	227	25.1%	164	26.8%
Humanities and Religious sciences	77	1.4%	76	2.0%	16	1.8%	21	3.4%
Engineering, Town Planning and associated disciplines	1 556	29.1%	534	14.4%	247	27.3%	83	13.6%
Mathematics and natural sciences	124	2.3%	97	2.6%	28	3.1%	11	1.8%
Total	5 355	100.0%	3 719	100.0%	905	100.0%	611	100.0%

Source: MEN (2010) using SACES data.

2.4. The transition from secondary to tertiary education

Tertiary education in Antioquia fulfils an increasingly strategic role for the preparation of advanced human capital for the economy and society of the region. In Antioquia, the absorption rate – which measures the students enrolled in undergraduate programmes over the number of students that take the final test of compulsory education (Saber 11^o) – shows an important progress from 54.1% (2002) to 82.4% (2008) and compares favourably with the national level that recorded change from 53.6% to 73.8% in the same period (MEN, 2010).

This progress represents a challenge for tertiary education institutions as each year a greater number of first generation students from low socio-economic background are entering tertiary education. In Colombia, of the 20% population with least income, only 3.8% attend tertiary education, while for those from households with the highest 20% of income, the figure is 44.8%. Half the families of students entering tertiary education have an

income of between 1 and 2 minimum salaries (the minimum salary in 2011 was around USD 300) while only 10% of the families have an income that is above 5 times the minimum salary. Only 9% of students' mothers have finished tertiary education; the majority have completed only primary (47%) or lower secondary education (32%) (SECA, 2011).

Quality and equity gaps in primary and secondary education lead to poor learning outcomes at schools. The distribution of Colombian students by performance levels in the Programme for International Student Assessment (PISA) shows that almost a half (47.1%) are below level 2, the baseline for functional reading or comprehension. Students below this line do not have the minimum skills that allow them to participate effectively and productively in society. In comparison, in Latin American countries, Chile, Mexico and Uruguay have relatively better results with 30.6, 40.1 and 41.9% of students below level 2. That of Brazil is similar to Colombia (49.6%) while for Argentina, Peru and Panama, the proportions are 51.6, 64.8 and 65.3% respectively (Banco Mundial, 2009).

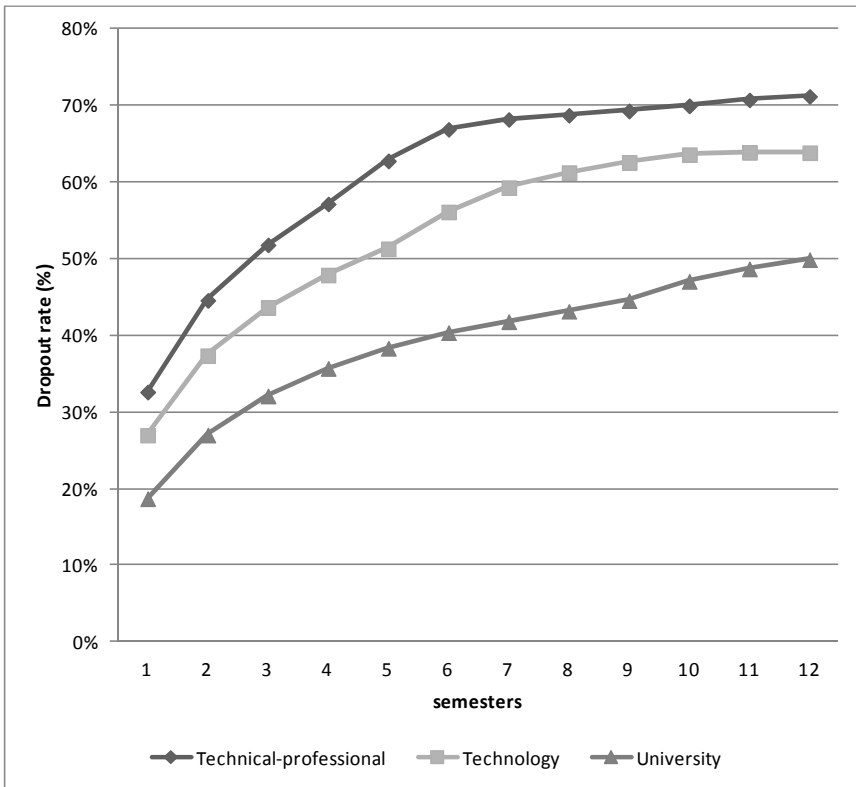
Furthermore, a Colombian study on the performance of its students in the 2009 PISA test summarises the situation as follows: “The results for Colombia in reading show a worrying reality in spite of the advances since 2006. Almost half of the students fail to reach level 2, which implies that they do not have basic reading skills that would allow them to participate productively in modern society. In consequence, these young people would not be able to enter tertiary education and face difficulties in learning throughout their life, which substantially reduces their possibilities for individual, social and economic progress” (Banco Mundial, 2010).

In Colombia, the massification of tertiary education has brought with it a relative deterioration in the marks of young people who enter the sector. For example, between 2006 and 2010, the percentage of students with “low” marks accepted by tertiary education institutions nationally, using the final obligatory examination, (Saber 11°), increased from 39 to 46%. In contrast, those with “high” marks fell by 8 points, from 22% to 14% (SECA, 2011). In Antioquia, these figures also turned negative between 2002 and 2009 reducing the percentage age of students with “high” marks from 23.5 to 13.0% (MEN, 2010a).

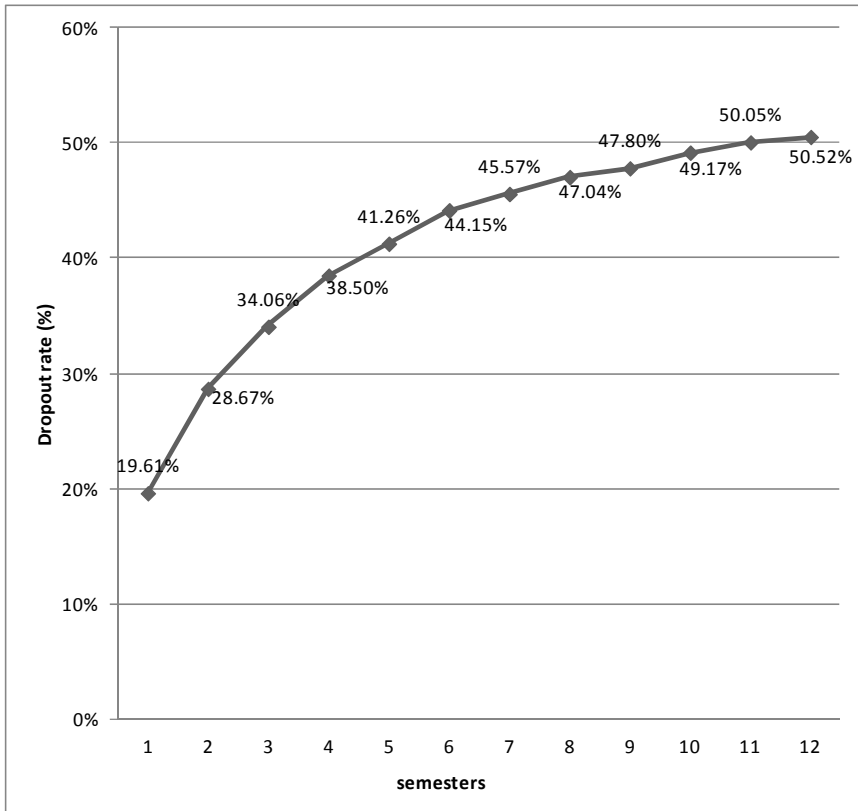
While access to tertiary education had improved, low retention rates reveal the underlying issues of under preparedness and quality. Information on the website of SPADIES, the national information system specifically designed to track dropout and help identify its causes, rates of dropout vary considerably by student characteristics, study level and institution type. In 2010 nationally, by age cohort, the mean dropout rate during the first semester was 33% for professional technical education, 27% for

technological education and 19% for universities. This reached 67%, 56% and 40% respectively in the sixth semester, stretching to 50% in semester 12 in the case of universities (Figure 2.3). The mean cohort dropout rate in Antioquia for the first, sixth and twelfth semesters was 20%, 44% and 51% respectively (Figure 2.4). In 2011 national level dropout rate by cohort was 45.3%. The biggest dropout occurs in the lowest level tertiary programmes, during the first semester, for students from low income families and with low SABER 11 test scores. (OECD/World Bank, 2012, based on SPADIES data).).

Figure 2.3. Colombia: dropout rate by cohort and type of institution



Source: Based on SPADIES, 2011.

Figure 2.4. Antioquia: dropout rate by cohort in tertiary education

Source: Based on SPADIES, 2011.

2.5. Improving access and retention in tertiary education

National initiatives

Colombia and Antioquia are promoting a series of programmes and measures to improve the quality and equity of tertiary education and to reduce academic desertion. All these initiatives seek to strengthen the region's human capital and skills.

The policies found in the National Development Plan (*Plan Nacional de Desarrollo*) 2006-2010 are centred on the improvement of supply in terms of coverage, quality and relevance (see Box 2.2).

Box 2.2. Goals for higher education in the National Development Plan, 2006-2010

The improved access to primary and secondary education in Colombia has led to a greater demand for tertiary education. There is a need to improve equity in access for the poorest section of the population and to have a qualified human capital for scientific and technological development.

It has been a priority to improve the supply of tertiary education in terms of coverage, quality and relevance. The first great challenge has been to increase the gross enrolment rate to 34.7% by 2010, which implied in absolute terms places for 320 000 new students, simultaneously achieving a 34% participation rate in technology and technical education.

To increase tertiary education participation, tertiary education institutions have been required to: i) improve their management capacity; ii) develop new programmes with stronger alignment with the needs of different geographical and economic zones; iii) develop science and technology activities; and iv) improve their collaboration with the private sector.

The plan has promoted access and success for diverse population groups (indigenous communities, Afro-Columbians, the physically incapacitated, and displaced and reincorporated migrants), provision of flexible academic programmes supported by the use and incorporation of information and communication technologies, decentralising the supply of education and reaching out to the geographically remote areas with relevant and high quality higher education programmes

Source : DNP, Plan Nacional de Desarrollo, Estado Comunitario: desarrollo para todos, 2006-2010.

In order to improve tertiary education participation, the National Development Plan proposed six key measures:

- The promotion and strengthening of technical and technological (T&T) education with a greater scientific content and a social value similar to university education. This will give greater opportunities for student mobility within the system by strengthening education by cycles and promoting postgraduate studies.
- The decentralisation of tertiary education provision. In order to expand coverage in remote areas and inner cities, the Regional Higher Education Centres (CERES) have been established. The plan has supported the strengthening of the centres and ensuring the quality and

alignment of the study programmes with the labour market and local and regional needs in order to facilitate graduate retention.

- The provision of financial support to facilitate access of students from lower socio-economic backgrounds in the form of: *i*) subsidies or educational loans to all students to cover tuition fees, with special conditions for students from low income households; *ii*) maintenance support grants; or *iii*) a combination of both types of student aid.
- The revision of the funding of the public tertiary education sector.
- The development of alliances among tertiary education institutions and secondary schools including non-formal educational institutions, with the private sector and regional and local governments and institutions, to raise aspirations for tertiary education. These alliances are expected to redesign technical and technological programmes to encourage the development of skills, adapt infrastructure, plan for the improvement of teaching staff, follow up graduates, modernise the bibliography and review institutional management models.
- The strengthening of SENA's relations with tertiary education institutions to improve the learning experience of SENA students.

To achieve the goal of wider participation the government acknowledges that the dropout rates need to be reduced at all educational levels. The National Development Plan has proposed financial and academic support mechanisms ranging from individual assistance for those with learning difficulties to early detection systems of potential risk cases.

The National Development Plan also calls for the strengthening and modernisation of the Secretaries of Education at the sub national level as these are tasked with liaising with tertiary education institutions and industry to strengthen the organisation and delivery of tertiary education services.

Initiatives in Antioquia

These national programmes, together with the measures adopted at the Departmental level, have resulted in a broad range of initiatives in Antioquia, such as:

- The programme “Access with Equity” (*Cobertura con Equidad*). A public-private partnership bringing together the departmental government, a group of private universities and a number of private sector employers offers the opportunity to study in eight private

universities in Antioquia to academically qualified low income students who could not find a place in a public university (university of Antioquia or National University – Medellín Campus). The students get a scholarship equivalent to 75% of the tuition costs and receive an ICETEX (Institute for Student Loans and Technical Studies Abroad) loan for the remaining 25%.

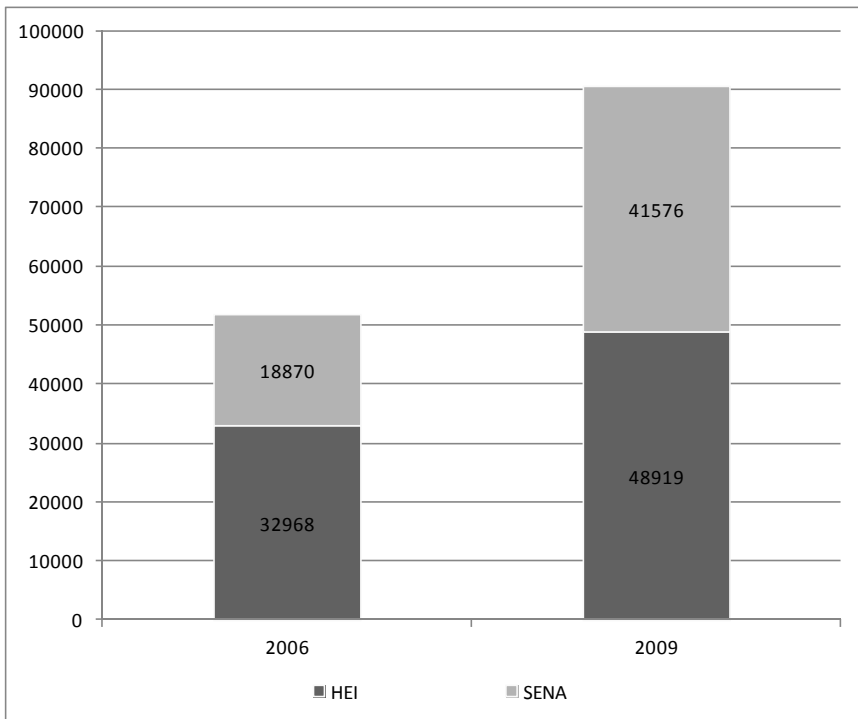
- The programme “Expansion of Participation in Technical-Professional and Technological Education in the Department of Antioquia” (*Ampliación de Cobertura de Educación Técnica Profesional y Tecnológica para el departamento de Antioquia*). This programme is funded by municipalities, the departmental government and participating institutions to support – in co-ordination with industry – the provision of programmes aligned with the needs of the regional labour market.
- The programme “Study Antioquia” (*Estudia Antioquia*) to fund students in municipalities with poor educational coverage and from low income households who wish take part in a technical or technological education programme.
- Six Regional Centres of Higher Education (CERES) in the least developed municipalities, each under the tutelage of a tertiary education institution.
- The EPM Fund provides 17 182 students from low income families in Antioquia with loans, from which 2 720 students are from municipalities other than Medellín; 71% of recipients are pursuing bachelors’ degrees. In cases when students’ academic outcomes are positive and if they perform “social services” for the community, the loans initially provided are converted into grants. The Gilberto Echeverri Mejia Fund has provided close to 6 000 scholarships in technical and technological education in Antioquia’s subregions other than Valle de Aburrá.
- “Propaedeutic cycles” (*i.e.* preparatory instruction cycles) to improve pathways between programme levels. Law 749 of 2002 and Law 30 of 1992 established that tertiary education institutions can organise their undergraduate courses in propaedeutic cycles, where students proceed to their professional degree via first a technical, then a technological qualification conferring progressively wider and higher-level knowledge and skills in the same subject area. For example, a mechanical engineering programme can be organised by cycles so that, after completing the first cycle, a student receives a Professional Technical Title in Diesel Mechanics and, at the same time, is prepared for the

second cycle. When completed, this confers the title of Automotive Mechanic Technologist. Then, if the person wishes can proceed to the third cycle, he/she receives the title of Mechanical Engineer (MEN, 2007).

These initiatives that aim to widen participation have given positive results in aggregate. The absorption rate of students from secondary education increased significantly, while tertiary education participation was expanded to almost reach the goal set out in the Development Plan 2006-2010.

At the same time, the share of T&T education increased its participation in Antioquia's total enrolment (Figure 2.5). Indeed, between 2006 and 2009 T&T enrolment increased by 74.6% from 51 838 to 90 495 students, and from 31.1% to 41.3% of Antioquia's tertiary education enrolment (MEN, 2010a).

Figure 2.5 Antioquia: T&T enrolment by type of supplier, 2006 and 2009



Source: based on MEN (2010a).

The participation of students from lower income households has increased (Table 2.3). The data shows that the percentage of students from households with incomes below two minimum wages has risen from 32.9% in 2002 to 52% in 2009. Another indicator for Antioquia (*i.e.* households without homeownership) shows that the percentage of students entering tertiary education increased from 25.5% in 2002 to 31.0% in 2009 thereby surpassing the national level (29.6 % in 2009) (SECA, 2011).

Table 2.3. Antioquia: Tertiary education enrolment, 2002-2009

New students by income group (multiples of minimum salary)

Multiples of Minimum Salary	2002	2003	2004	2005	2006	2007	2008	2009
1-2	32.90	32.31	41.67	44.37	47.2	51.07	51.53	52.01
2-3	25.67	24.09	26.37	26.16	26.87	26.01	27.08	24.64
3-5	23.36	21.01	17.64	17.13	15.73	14.55	13.45	14.39
5-7	11.68	10.32	7.21	6.20	5.72	4.77	5.01	5.21
7-9	2.11	4.33	2.65	2.06	1.68	1.22	1.18	1.67

Source: SECA (2011) using MEN official data

In general, none of the described initiatives appear to have been externally evaluated by specialised independent organisations. Hence it is difficult to form an idea about their effectiveness, quality, relevance, and value added. The available information is either anecdotal or based on the personal experience of the interviewees who often are unequally familiarised with these initiatives.

2.6. Aligning tertiary education to regional labour markets

Composition of graduates

The educational composition of the Antioquian labour force – a total of 2 759 228 persons in 2010 – consists of 32.5% with primary education, 43.6% with secondary education and 23.9% with tertiary education (SECA, 2011). The most important contribution of tertiary education to Antioquia's and Colombia's economy and society involves expanding the population with tertiary education qualifications and continuously renewing it by incorporating graduates from diverse disciplines and areas of knowledge.

Between 2001 and 2010, more than 213 000 graduates joined the labour force, an annual average of 21 000. Of this number, 89% graduated from institutions in metropolitan Medellín. In 2010, tertiary education institutions

in Antioquia granted 28 007 degrees in the fields listed in the following Table 2.4.

Table 2.4. Tertiary education graduates in Antioquia, 2010

Characteristic	
Graduates (number)	28 007
Public tertiary education institution	45.5%
Undergraduate	77.5%
Technical professional training	1.6%
Technological training	20.3%
University training	55.6%
Female participation	55.7%
Classroom-based	93.2%

Source: Observatorio Laboral de la Educación (2011).

The majority of Antioquia’s tertiary education graduates are from Economics, Administration, Accounting and associated disciplines (30.4%), Engineering, Architecture, Town Planning and associated disciplines (27.1%), the Social Sciences, Humanities and Education (26.6%), representing the majority (84.1%) of all graduates in the Department over the last decade. When comparing graduates from Antioquia and all Colombia (see Table 2.5) there are only minor differences between the national and departmental distribution pattern by field of knowledge. The most noticeable differences are that Antioquia has a smaller proportion of graduates in the field of education than Colombia in average and somewhat higher proportion of graduates in the field of engineering. At the national level, the distribution and concentration of graduates has been criticised by public authorities: “The observed concentration in specific areas of knowledge is problematic for it shows that students’ decisions when selecting a career do not always take into account the potential of new production areas and the weak co-ordination between the academy and the needs of the productive sector when designing new and adapting current programmes” (CONPES, 2010).

Table 2.5. Tertiary education graduates by discipline, 2001-09

	Antioquia		Colombia	
	Nº	%	Nº	%
Agronomy, Veterinary Sciences and others	3 070	1.7	17 977	1.3
Fine Arts	6 147	3.4	43 227	3.2
Education	15 053	8.3	145 934	10.9
Health	13 783	7.6	115 820	8.6
Social Sciences and Humanities	33 103	18.3	240 953	17.9
Economics, Administration, Accounting etc.	54 867	30.4	410 596	30.6
Engineering, Architecture, Town Planning etc.	48 867	27.1	312 694	23.3
Mathematics and Natural Sciences	2 702	1.5	21 027	1.6
Unclassified	2 993	1.7	35 388	2.6
Total	180 585	100.0	1 343 616	100.0

Source: MEN (2010:11)

Graduate employability

The graduate employability rate, computed as the percentage of those making contributions to social security one year after graduating is around 80 % nationally (2010); 76% at the undergraduates level and 91% at the postgraduate level (Table 2.6). The monthly revenue contributed by these recent graduates (*ingreso base de cotización*, IBC) was COP 1 783 049 (Colombian pesos) and oscillated between an average of COP 909 017 for a professional technical and 5 249 673 for a PhD degree holder. In Antioquia, the graduate employability rate was slightly higher at 83% overall (81% for undergraduates and 93% for postgraduates). The IBC was slightly lower than the national figure at COP 1 756 674 ranging from COP 1 376 126 at the professional technical level to COP 4 928 864 for a PhD degree holder. When examining the period from 2001-2008, 81% of tertiary education graduates in Antioquia made contributions to the social security system which was 6.2% above the national average (MEN, 2010)

Table 2.6. Graduates in 2009, labour market entrants and employability rate (contributions), 2010

	Entrants	Contribution rate	Graduates	Graduates that contribute
COLOMBIA				
Level	1 783 049	0.80	181 239	144 904
Undergraduate	1 347 442	0.76	135 229	102 842
Technical-professional training	909 017	0.59	7 960	4 696
Technology	1 057 062	0.76	21 096	16 005
University	1 441 180	0.77	106 173	82 141
Postgraduate	2 785 415	0.91	46 010	42 062
Specialisation	2 701 503	0.91	41 107	37 544
Masters	3 396 815	0.92	4 730	4 355
PhD	5249 673	0.94	173	163
ANTIOQUIA				
Level	1 756 674	0.83	26 292	21 910
Undergraduate	1 376 126	0.81	21 058	17 024
Technical-professional training	820 693	0.55	373	205
Technology	1 072 086	0.80	6 248	4 973
University	1 530 163	0.82	14 437	11 846
Postgraduate	3 062 938	0.93	5 234	4 886
Specialisation	2 991 852	0.93	4 501	4 194
Masters	3 382 277	0.94	694	653
PhD	4 928 864	0.83	39	39

Source: Observatorio Laboral de la educación (2011)

The survey of graduates at the time of graduation (2010) shows that 76.1% of the graduates in Antioquia were working, a higher percentage than that for the graduates in Bogotá (71.9%). The percentage of unemployed graduates is lower in Antioquia than in Bogotá (12.2% and 14.3% respectively) as is the share of those that continue their education (8% and 9.7%). Furthermore, 71.7% of Antioquian graduates are employees, 24.5% independent workers, 2.7% business owners and 1.1% non wage family workers. Most employees have an indeterminate labour contract (36.2%), while 20% have a fixed term contract and 14.7% have service contracts. In terms of the relevance of formal education training received, 75% of graduates feel that their training has been useful or very useful. While the graduates in Antioquia have a better perception of the relevance of their training than the graduates from Bogotá (69%), a third of the unemployed graduates noted that lack of experience was a major obstacle in finding a job. (SECA, 2011)

Among the departments of Colombia, Antioquia has the highest proportion of locally-trained graduates working (85.7%). Table 2.8 shows the percentage of students who find employment in the region where they completed tertiary education. Regions are numbered (1) to (4), in relation accordance with their level of enrolment (1) being the highest.

Table 2.7. Percentage of 2001-2010 graduates who work in the region (department) where they did their tertiary studies, by region

Antioquia (1)	85.7	Boyaca (1)	49.1
Atlantico (1)	59.2	Cundinamarca (3)	17.7
Bolivar (2)	66.0	Meta (2)	67.4
Cesar (3)	64.8	Norte de Santander (1)	52.7
Cordoba (3)	65.4	Santander (1)	67.2
Guajira (3)	69.0	Amazonas (4)	45.5
Magdalena (3)	55.4	Arauca (4)	56.1
Sucre (3)	56.9	Casanare (2)	51.3
Bogota dc (1)	74.8	Guaviare (4)	65.7
Caldas (2)	42.3	Putumayo (4)	84.7
Caqueta (3)	57.7	Cauca (2)	65.2
Huila (2)	75.4	Choco (2)	45.0
Quindio (1)	53.9	Nariño (3)	76.4
Risaralda (1)	66.1	San Andres y Providencia (2)	84.5
Tolima (2)	39.1	Valle del Cauca (2)	78.4

Notes: The percentage calculations exclude those graduates for whom there is no information. Vaupes, Vichada and Guainia are not shown due to very small numbers.

Source: Observatorio Laboral para la Educación; OECD/World Bank 2012, forthcoming.

Relevance of tertiary education

In spite of the good employability of graduates, the interviews undertaken during the OECD review visit in July 2011 showed a clear division of opinions when evaluating the quality and relevance of tertiary education training. While tertiary education institution representatives expressed confidence in the labour market relevance of their programmes and attributed the problems of inadequate quality to primary and secondary education, the external stakeholders – representatives of both the private and public sectors – considered that there were serious deficiencies of relevance and quality, especially in the areas of “soft” or “generic” skills such as entrepreneurship, a functional use of English, mastery of ICTs, working in teams, the ability to take initiatives and to apply acquired knowledge to solving practical problems. As well, a general skill gap among young graduates from lower socio-economic backgrounds was reported. These challenges can be partly attributed to the deficiencies in curricula design,

teaching methods and the lack of encouraging entrepreneurial skills among young people.

Current research on the local and national labour markets does not allow an analysis of the mismatch and discrepancies noted above. There is no recent study on Antioquia's labour policies (SECA, 2011) so it is impossible to provide a thorough diagnosis of the relationships between tertiary education and the labour market or about the supply and demand for skills.

The background report produced in Antioquia for the OECD review (SECA, 2011) and the interviews with different participants and stakeholders together with available documentation discuss various initiatives to match the demand and supply of skills, to better co-ordinate local labour market needs with tertiary education programmes, and to ease the entry of new graduates into the labour market. The most important measures are the Survey for the Identification of the Training and Work Needs (*Encuesta de Identificación de Necesidades de Formación y Trabajo*), the Antioquean Education Network for Work and Human Development (*Red Antioqueña de Educación para el Trabajo y el Desarrollo Humano*), the Bilingual Antioquia Programme (*Antioquia Bilingüe*), the University-Firm-State Committees (See Chapter 1, Box 1.2) which operate in the fields of biotechnology, environment, health, infrastructure, energy, agro industry, information and communication technology and wood, pulp and paper. Other important initiatives include the Medellin Community Cluster (*Comunidad Cluster Medellín*) and the Technical and Technological Education Network of the Municipality of Medellin (*Red de Educación Técnica y Tecnológica del Municipio de Medellín*), that includes the Metropolitan Technological Institute (*Instituto Tecnológico Metropolitano*), the Grand College of Antioquia (*el Colegio Mayor de Antioquia*) and the *Tecnológico Pascual Bravo*.

Entrepreneurship

The development plans at the national and departmental level in Colombia acknowledge the importance of entrepreneurship and the need for entrepreneurship training. The National Development Plan (2010-2014) underlines the need to design national strategies to foster entrepreneurship in educational institutions, stimulate pedagogic projects to boost production and entrepreneurial attitudes in students and teachers, strengthen basic skills and citizenship at the level of secondary education. For tertiary education, the emphasis is on the need to support research, development, innovation and entrepreneurship projects in order to transform educational processes and give rise to pedagogical models that encourage creativity (DNP, 2011). The Development Plan for Antioquia (2006-2011) emphasises the need to stimulate academic training in entrepreneurship and to create and

consolidate a culture of productivity and competition in different sub-regions of Antioquia.

Box 2.3. The EAFIT University and entrepreneurship

The EAFIT entrepreneurial programme provides a comprehensive system that integrates training, research and extension with the goal of creating new enterprises with social responsibility. This approach has allowed the university to develop networks with other universities, state organisations and private entities that support entrepreneurship. Today, EAFIT provides advice and guidance to other universities that want to develop entrepreneurial programmes.

In undergraduate training, students, using materials developed by the university, develop a business plan or redesign an existing enterprise. Projects developed by the university are linked with the private sector through research groups made up of university professors and students working with incubators, as well as MA students working on their test projects. EAFIT Enterprises (*Empresarismo EAFIT*) offers training programmes to graduates and other people through diploma and short courses which introduce participants to the world of business and the development of business plans. In addition, potential entrepreneurs are sent to national and international competitions, allowing them to present their projects to external judges.

Over the last ten years the programme has helped create 56 firms of which 42 continue in existence; and 22 have placed 171 new products in the market. Over 50% of the firms have reached annual sales of around COP 200 million; eight entrepreneurs have annual sales between COP 1 to 200 million; and three have sales above COP 1 million with total average sales for the group of COP 220 million annually. Approximately 280 students graduate every year from the entrepreneurship courses. In 2008, about 15 new projects were being developed by students. Students have helped rural communities develop projects in the municipalities of Sonsón, El Retiro, Granada and Rionegro. This has allowed for greater links between teachers, students and communities to develop more sustainable production chains.

Source : Parra Ramírez, Rubén Darío; Mesa Cano, Jorge Hernán; Correal Franco, Sara (2009) Historia del empresarismo en EAFIT, Revista Universidad Eafit, Vol. 45, No. 154, April-June pp. 78-97

In Antioquia and particularly in Medellín, which has a strong entrepreneurial tradition, tertiary education graduates provide an important, but largely untapped source of entrepreneurship: 43% of fresh graduates would like to start their own business. Tertiary education institutions feature diverse stages of entrepreneurship support, the EAFIT University featuring a long term and broad commitment to entrepreneurship (see Box 2.3).

Learning outcomes

The learning results of Colombian tertiary education are measured by the SABER Pro test (known previously as the State Examination on Higher Education Quality, *Examen de Estado de Calidad de la Educación Superior*, ECAES). In 2008, there was a shift of focus on this national examination from evaluating discipline specific skills and specific knowledge towards the evaluation of generic skills, such as critical thinking, problem solving, written output and interpersonal understanding (Orozco *et al.* 2011).

As stated in Decree 3963 (2009), the objectives of the current examination are: *i*) to verify the level of skill development of students near the end of their academic undergraduate programmes; *ii*) to develop indicators which show the value added of tertiary education in terms of skill levels, participants and the supply of information to allow comparisons of tertiary education programmes, institutions and methodologies and their evolution over time; *iii*) to serve as a source of information for the construction of evaluative indicators concerning the quality of tertiary education programmes and institutions and of the public service of tertiary education, to encourage the improvement of institutional processes and policy formulation; and *iv*) to support decision making in all parts and components of the educational system.

According to the public body that administers these examinations, good results in SABER Pro are an important tool for future professionals since, apart from being a requisite for graduation, they have become a comparative advantage in the field of labour. Good results make it easier to obtain a scholarship to study in Colombia or abroad. Thus, what might have been considered solely an examination has become a key, which opens doors to the public or private sectors by giving a signal to potential employers about the quality of skills developed during the years of study at a tertiary education institution. So, while the professional title is important, so too is the skill profile evaluated by the State.

Box 2.4. The SABER pro examination (previously ECAES) in 2011

Law 1324 (2009), Decree 4216 (2009) and Decree 3963 (14 October 2009 which regulates tertiary education quality through the administration of the Examination of Higher Education Quality – SABER Pro formerly known as ECAES) have established new parameters and criteria to be applied to all tertiary education undergraduate programmes (technical-professional, technological and university) in all public and private institutions.

Article 4 of Decree 3963 places the responsibility on tertiary education institutions: “It is the responsibility of tertiary education institutions to undertake, through SNIES or any other mechanism established by ICFES, to report on all students that have completed at least 75% of their academic programme credits or who expect to graduate in the following year, consistent with the terms and procedures that ICFES has established. Each student thus reported should sign up – personally or through his/her respective educational institution – and submit to it according to ICFES procedures”.

All students at the point of leaving tertiary education, irrespective of their study programmes, must take this examination since it is a requirement for receiving a degree.

Source: Universidad Católica Del Norte, Comunicación N° 1, 11 February 2011.

Despite the importance of the SABER Pro, the results of these examinations studies appear to have limited impact on tertiary education institutions which remain critical towards this type of examination and its utilisation for rankings.

Conclusions and recommendations

The field visits, documents reviewed and the analysis carried out by the OECD team show that tertiary education in Antioquia demonstrates a series of strengths that can be summarised as follows:

- There is an ample supply of tertiary education which is differentiated among public and private institutions, and between universities and non-university institution, and which is absorbing a growing proportion of students who have completed their secondary education, thus increasing coverage and participation.
- At the same time, this platform of tertiary educational services is made up of a diversity of institutions with different missions and responsibilities which are autonomous and pursue various educational

projects. These target different audiences and yet work together in various fields and are linked through different institutional mechanisms.

- The provision of technical and technological education (T&T) has been growing recently and, moreover, its attraction and prestige appear to be increasing, which is allowing it to compete with universities for students.
- When examining access to tertiary education, there has been an improvement in equity, using various national, departmental and local programmes and measures. These include scholarships and student loans, regional programmes, training cycles, bridge programmes between secondary and tertiary education etc.
- Antioquia's tertiary education has played and continues to play an important role in advanced human capital training by providing a labour force with an inflow of more than 21 000 highly qualified people annually, most of whom continue to work in the region (Campo Saavedra, 2011).
- The labour market looks for and employs a high proportion of this group, recognising their value with a salary premium that shows a positive return on their investment to obtain a degree.
- The tertiary education institutions are now beginning to link more systematically with stakeholders, both in the public and private sectors, by understanding their requirements for qualified personnel and an ability to respond with education in the quantity and quality needed.

At the same time, there are weaknesses, delays and shortcomings in tertiary education and its contribution to the economy, society and culture at the national and departmental level. The OECD review team recommends that following measures are taken in promoting human capital and skill development in Antioquia:

Recommendations for the national level

- Continue the efforts to improve access and success to tertiary education, and enhance the relevance and quality of education at all levels. Pursue the goal of achieving 50% gross tertiary participation by 2014, emphasising the connections between equity, quality and relevance.
- Expand ICETEX student support and improve targeting on the least advantaged groups, by improving the accuracy of socio-economic

classification for all education-related purposes. Ease the loan repayment burden by an income-contingent loan repayment system or a graduated repayment system.

- Develop and implement a National Framework of Qualifications (NQF), supplemented by a national credit transfer system to promote student mobility and create clearer and more universal pathways between tertiary levels and institutions. Integrate SENA fully into the tertiary system and into national databases.
- Commission an external evaluation of CERES to identify the strengths and weaknesses of CERES programmes relative to other T&T programmes (including those at SENA centres), with particular reference to quality of programmes, cost to students, value for money, impact on employability and long term financial sustainability and governance.
- Improve teaching quality in tertiary education institutions by attracting highly-qualified new staff and upgrading the qualifications of existing staff, encouraging peer observation of teaching, and developing indicators of teaching quality to be included in performance appraisals of tertiary institutions.
- Build strong links between institutions and industry at all tertiary education levels. Ensure that tertiary education programmes include work placements and build broad competencies, such as analysing problems, organising time, writing skills, working in teams and groups.
- Commission an external review of the supply of and demand for tertiary education graduates at all levels. The review should take into account employment rates and salary levels related to field of study as well as qualification level. Address disparities between regions in tertiary enrolment, by increasing the number of municipalities with their own provision and expanding distance learning.
- Maintain and improve the state examinations for higher education quality (ECAES) known today as Saber Pro, a valuable experiment in Latin America, which together with the information of the Labour Observatory (Observatorio Laboral de la Educación), provides valuable instruments to guide institutional and Departmental policies in tertiary education, its relevance and quality.

- Enhance the quality of training programmes for primary and secondary teachers, design induction and professional development programmes for new school teachers and leaders. Given the unsatisfactory results obtained by Colombian students in the PISA assessment (2009), it is important to focus on teacher training issues such as recruitment for pedagogical programmes, initial teacher preparation at the tertiary education level, special accreditation of teacher training programmes, professional accreditation according to high standards in all subjects and levels and further education opportunities.

Recommendations for the departmental level

- In collaboration with the national government, tertiary and other education institutions and key public and private stakeholders of the economy and society work to develop a Regional Human Capital and Skill Development System to define region-wide goals, policies, priorities, measures and milestones for the medium term strategic development. As part of this system, establish a tertiary education co-ordinating body that develops a vision and strategy in a collaborative effort by the system participants to ensure support and legitimacy to sustain political cycles that affect the departmental, municipal and local governments. It is vital that such an organisation is autonomous, can rely on its own resources to commission studies and evaluations and is run with complete independence from the corporate interests of its participants.
- Develop a portfolio of robust data on graduate labour market related to the regional context and the situation of individual tertiary education institutions to support decision making at the regional and institutional levels. The most effective region-wide graduate labour market systems are based on the collection of comprehensive labour market intelligence, 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 increase students' chances of finding employment. Use the data strategically to identify regional priorities and respond to the data in terms of course offerings and the provision of employer/cluster-specified skills by educational institutions.
- In collaboration with tertiary education institutions continue and expand efforts to improve the access and success of students from lower socio-economic backgrounds (strata 1 to 3), and strive for greater efficiency in education, by reducing dropout rates as well as by increasing graduation according to the minimum time for degree completion. These efforts

should build upon the best international practices related to effective academic, social and financial support for students; long-term collaboration with secondary education institutions to improve students' learning outcomes; efforts to raise aspirations among students; and adoption of more student-centred learning methods. International experience shows that early warning systems, as well as individual tutorial programmes, are effective for students at risk. These systems entail attendance at remedial and compensatory classes, the identification of key subjects in the different fields that are difficult to master for at-risk students, student welfare measures that provide emotional support and counselling services, and the organisation of teams to support students in danger of dropping out.

- Improve links between secondary and tertiary education and between education and work, thereby making education programmes more attractive and relevant for young people who expect to enter the labour market quickly. Antioquia has achieved relatively high levels of absorption but, in some sub-regions it is still registering high desertion rates between secondary and tertiary education. Follow the example of the national “Programme for the Development and Strengthening of Links between Secondary, Technical and Tertiary Education” (*Programa para el Fomento y Fortalecimiento de la articulación entre la Educación Media, Técnica y la Educación Superior*), which - through agreements and alliances among secondary institutions and different tertiary and postsecondary institutions – allocates subsidies to those enrolled in both secondary and technical-professional programmes in areas with a high occurrence of dropouts.
- Focus efforts on improving the quality of education at all levels. The OECD evidence shows that economic growth is not driven by a greater number of years of schooling and wider coverage of subjects, but by the quality of that education. A tertiary education system with increased absorption and enrolment rates must develop strategies at the departmental level to address quality issues.
- In collaboration with tertiary education institutions, take steps to significantly expand tertiary education opportunities for working age adults. These steps should create clear and transparent pathways to advance 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 particular needs and interests of adults

who often combine work and study. Consider establishing an agency to help recognise prior informal and non-formal learning.

- In collaboration with employers encourage entrepreneurship as an inherent feature of a society and economy. To meet the goals of the Development Plan for Antioquia (2006-2011) to stimulate academic training in entrepreneurship and to create and consolidate a culture of productivity and competition in different sub-regions, provide entrepreneurial training both at the secondary and technical levels, as well as in the technological and university levels, with particular emphasis on the less developed areas.
- Ensure sustainable and balanced sub-regional provision of tertiary education by conducting a region-wide assessment of current and planned capacity against anticipated student numbers, and identify gaps in staff and infrastructure. When developing or rationalising the network of education providers, ensure to have access to lifelong learning and industry-related services through flexible multi-provider learning and extension centres that draw on a range of providers, including both universities, T&T institutions and CERES, and are supported by adequate IT infrastructure that ensures high speed, low cost connectivity.

Recommendations for tertiary education institutions

- Develop policies, programmes and measures to improve, on a continuous basis, the quality and relevance of study programmes. Firstly, review the curriculum content and pedagogical methods of study programmes to align them with the needs of the labour market and the local and regional economies. The opinion of employers and graduates should play an important role in the systematic and continuous revision of the education programmes of tertiary education institutions. Secondly, take full advantage of the results of *Saber Pro* examination that evaluate generic skills such as critical thinking, problem solving, written output and interpersonal understanding in curriculum design and the development of teaching and learning. Thirdly, create robust methods to monitor the student progress and graduate employment outcomes. Fourthly, monitor studies that analyse the entry of graduates into the labour market, using the information generated by the Labour Observatory for Education, which facilitates the identification of the most profitable employment sectors and tertiary education programmes, promotes awareness and monitoring of demand for different knowledge areas, assures follow-up with regard to regional demand and supply of human capital, publishes regional relevance analyses, measures career

success by universities (employment and salary levels), monitors remuneration and income inequalities, undertakes follow-up studies on formal employment and stimulates awareness of the relevance, quality and supply of T&T education.

- Collaborate more actively with industry for stronger alignment of the educational provision with regional and labour market needs and in order to ensure the entrepreneurial skills of graduates and their employability. Engage employers in the curriculum development, invite professors from industry to deliver courses, and develop problem-based, interdisciplinary and work-based learning methods to develop employability, entrepreneurial and transferable skills. Place a greater emphasis on generic and soft competencies and on values that guide action, such as taking responsibility for shared goals and co-operating to achieve these.
- In order to improve the quality of all tertiary education programmes, gradually reserve academic positions only for candidates with a Masters degree or higher and fix a period for those who wish to follow an academic career to complete their doctoral studies. Provide comprehensive professional development programmes for university teachers. Provide regular short courses to improve teaching skills, encourage assessment and feedback from students, and support and reward excellence in teaching. Increase the number programmes that pursue a high quality accreditation.
- Expand general education courses progressively in the first years of university programmes and reduce specialised materials to establish a curriculum structure of shorter duration at the undergraduate level with later specialisation at the Masters level following the European Bologna model. Gradually introduce, in all programmes, a greater component of English teaching, more intensive use of ICTs to facilitate autonomous learning, and the development of key competencies linked to the capacity of learning to learn.
- Seek to match global levels of excellence in supporting entrepreneurship in the curriculum and build comprehensive support programmes encompassing entrepreneurship training, practical experience of creating new businesses for groups of students, and incubation and hatchery facilities together with seed funds for new graduate ventures.

Notes

1. Agencia Presidencial para la Acción Social y la Cooperación Internacional.
2. Economic strength refers to the capacity (assets and processes) and performance of the economy of the Department to face macroeconomic pressures.
3. Between 2006 and 2009, COP 132 428 were allocated in subsidies for tuition and living expenses and in 2010 COP 74 000 million were assigned to new subsidies and the renewal of those previously allocated.

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Chapter 3:

Research, development and innovation

The promotion of regional innovation and the development of a Regional Innovation System are important drivers of long-term economic growth and competitiveness. All regions can improve their capacity to adapt and transfer knowledge to regional needs.

This chapter examines the effectiveness of current innovation policies and practices in Antioquia and the role of research and knowledge transfer conducted by tertiary education institutions. It considers the efforts made by the national and departmental governments and by tertiary education institutions. It examines the current knowledge transfer and exchange mechanisms and highlights good practice from other regions. The chapter concludes with specific recommendations to improve the regional innovation outcomes in Antioquia.

Introduction

Antioquia, Colombia's second largest department, is one of the economic engines of the country and a home of important universities and companies. Its 6 million strong population, major tertiary education institutions and companies are concentrated in the Medellín Metropolitan Region. Antioquia's diverse tertiary education and its growing student population represent a high potential for innovation. The regional economy is in the process of transformation.

At the same time, poverty and poor labour market outcomes are partly related to the low levels of education and professional qualification of the population; another factor is related to the way the regional economy is organised, with most of the resources and investments concentrated in highly productive, capital-intensive sectors not requiring much labour. These two conditions tend to reinforce each other.

In line with the national drive for human capital development and innovation, the Department of Antioquia has promoted education and skills and the development of a regional innovation system, including stronger university-industry collaboration. A diverse set of strategies, institutions, initiatives, regional plans and collaborative mechanisms have been launched.

In this context, this chapter examines the following dimensions to assess the effectiveness and coherence of innovation and R&D policies and practices in Antioquia and the role played by universities and tertiary education institutions in the regional innovation system:

- Is the regional innovation system well connected and responsive to the needs of the region and its industrial structure?
- Do the universities and other tertiary education institutions support the regional innovation system in an optimal way?
- Are there gaps in delivery where performance could be improved?

3.1. The concept of innovation

In the current context of economic globalisation and highly competitive markets, innovation – the ability of firms to create new products, processes and services – is increasingly perceived as a key factor in economic development in all countries. The concept of innovation is usually associated with the development of new knowledge through research, carried on in higher education institutions, independent research centers or

research laboratories and department in firms. The concept of “national innovation systems” was introduced in the 1990s to describe the network of institutions that interact in a country to make knowledge flow among research institutions, firms and government agencies (Nelson, 1993). OECD notes that:

The study of national innovation systems focuses on flows of knowledge. Analysis is increasingly directed to improving performance in “knowledge-based economies” – economies which are directly based on the production, distribution and use of knowledge and information. Knowledge, as embodied in human beings (as “human capital”) and in technology, has always been central to economic development. But only over the last few years has its relative importance been recognised, just as that importance is growing. Economic activities are becoming more and more knowledge-intensive as seen in the growth in high technology industries and the increasing demand for highly skilled people. Investments in knowledge, such as in research and development, education and training, and innovative work approaches, are considered key to economic growth (OECD, 1997).

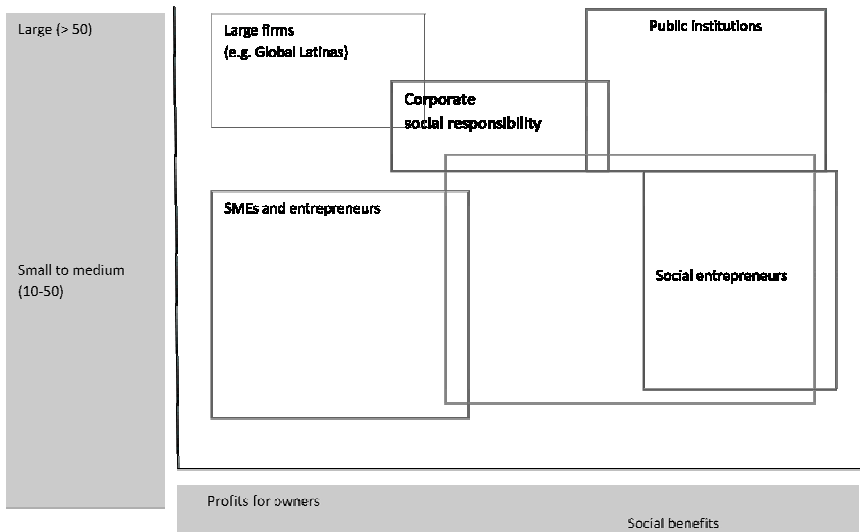
The growing importance of knowledge-based economic activities does not mean that traditional, low technology economic activities have lost their relevance. In a study of low-tech industrial clusters in Denmark, the authors note that:

In spite of this widespread view low tech industries still provide a substantial contribution to the Western economies and there is a growing literature that criticise the overemphasis both policies and economic analyses often put on high tech industries. It is argued in that literature (Hirsh-Kreinsen and Jacobson 2008; Smith, 2003; Tunzelman and Acha, 2005) that the economic relevance of high tech industries remains small. Quantitatively between 90% and 97% of GDP is accounted for by low and medium tech industries in Western European countries (Hirsch-Kreinsen *et al.*, 2003) and despite the debate on and widespread perception of the opposite, the relative share has remained fairly stable. It is also argued that indeed also the low-tech industries are innovative even if they do not display large R&D intensities (Christiansen, 2010).

Low-technology industries and services also need to innovate if they want to remain competitive, but the kind of innovation they need is different from that of high tech industries and services, based on sophisticated, knowledge-intensive research and technology. Innovation in firms can relate to products, but also to processes and institutional organisation; it can be new regarding the firm, the country or the regional market in which it is located, or global.

There is a growing recognition that innovation for a country or region includes not only what takes place within the firms, but also the broader environment that includes the quality of its institutions, human capital, infrastructure, market and business sophistication. If innovation is indeed taking place and is generating wealth, it should be measured by quantifiable indicators related to scientific market and products. All these dimensions are taken into account in the Global Innovation Index published by INSEAD in 2011 and its accompanying volume, *Innovalatino* (Dutta, 2011; INSEAD and Telefonica, 2011).

Figure 3.1 Six different innovators based on two dimensions



3.2. Science, technology and innovation policy in Colombia

In practically all international indicators of science, technology and innovation, Latin American countries rank low, and Colombia lower still in the region if compared with its largest countries, Brazil, Argentina, Chile and Mexico.

In the Global Innovation Index prepared by INSEAD, Switzerland, Sweden, Singapore, Hong Kong and Finland take the first five places, with scores ranging from 63.2 to 57.5 in a 100-point scale. The countries with the highest places in Latin America are Chile (38th with 38.48 points), Costa Rica (45th, with 37.92 points), Brazil (47th with 37.75 points) and Argentina (58th with 35.36 points). Colombia is in 71st place with 32.32 points.

In Latin America, only Brazil spends more than 1% of its GNP on science and technology (1.1%, compared with 2.1% for the OECD average and 1.66% for the European 27 countries). The latest figure for Colombia, namely 0.16% for 2007, is lower than ten years ago when it was 0.27% according to data compiled by the Inter-American Development Bank (Melo, 2001).

Colombia has established a national policy for science, technology and innovation that begins with a critical assessment of its conditions. According to an official document (*Consejo Nacional de Política Económica y Social*, 2009) from the National Council of Social and Economic Policy in 2009, innovation in the country was characterised by:

- Low levels of innovation in firms;
- Weak institutional consolidation of the science, technology and innovation system;
- Insufficient human resources for research and innovation;
- Limited social appropriation of science and technology achievements;
- Lack of focus on long-term strategic areas;
- Regional disparities in scientific and technological capabilities.

The national policy for science, technology and innovation proposes six strategies to address the challenges:

- Stimulation of innovation in industry through a series of instruments with adequate resources and capabilities to support entrepreneurs and innovators;
- Strengthening of the National System of Science and Technology through the creating a national fund for science and technology (*i.e.* the Fondo Francisco José de Caldas) and by transforming Colciencias (previously an institute) into the Administrative Department of Science, Technology and Innovation, responsible for the co-ordination of the National System of Science, Technology and Innovation;
- Improvement of national capabilities in research and innovation, through an investment project by Colciencias;

- Promotion of the social appropriation of knowledge through diffusion in the mass media, the training of science and technology mediators, and support for institutions involved in these dissemination activities;
- Focusing public investments in strategic sectors requiring long-term investments, characterised by the production of goods and services of high scientific and technological content and with high added value;
- Development and strengthening of regional competencies in science and technology through co-operation plans for these areas, providing the regions with support for the acquisition of modern equipment and encouraging the development of complementary capabilities.

To strengthen co-operation with other Latin American countries, the Council also recommended the establishment of regional systems of science and technology that could improve the ability of regional bodies to plan, organise, implement and assess their related activities.

The document expressed the hope that “with this strategy, investments in science and technology in Colombia, currently at around 0.6% of the national product, could reach 2% by 2119, with 500 PhDs being graduated every year in strategic knowledge areas. This combination of increased human resources and investment should allow Colombia to export the equivalent of USD 17 500 per capita by 2019, increasing the per capita income of all Colombians”. It should be noted, however, that this figure of 0.6% is much higher than the 0.16% that appears in the IADB compilation for international statistics.

3.3. The regional system of innovation of Antioquia

Antioquia does not have a coherent regional system for innovation, but has created several initiatives emanating from the departmental government, the municipality and private companies. Some of these follow the orientations coming from Colciencias and the Ministry of Commerce, Education and Tourism, as well as national, departmental and private tertiary education institutions.

One of the oldest agencies in the region is IDEA, the Institute for the Development of Antioquia. Established in 1964 as a public and autonomous agency, IDEA provides credit for projects in the areas of banking, energy, infrastructure, mining, reforestation and others.

Since October 2008, there is a Directorate for Science, Technology and Innovation¹ under the Department’s Secretariat for Productivity and

Competitiveness which is in charge of establishing a policy for science and technology for the Department of Antioquia and of motivating the different sectors of the departmental government in innovation. This Directorate has no resources to invest and its main task is stimulate co-operation and to develop a regional plan for Science, Technology and Innovation².

In 2010, according to the 2009 legislation that re-organised Colciencias, the Department of Antioquia created its Council for Science, Technology and Innovation (CODECTI), composed of 16 members from different sectors of government, business associations and tertiary education institutions. Supposedly, CODECTI will be responsible for the distribution, in the region, of the royalties derived from the production of oil and gas, 10% of which will be used to create a national fund for science, technology and innovation. The legislation establishing the rules for using these resources was signed in July 2011, but the way they will be distributed is still to be regulated.

There is also a Regional Commission for Competitiveness (*Comisión Regional de Competitividad*), created by the initiative of the Ministry of Commerce, Industry and Tourism, in co-operation with the local Chamber of Commerce (*Confecámaras*).

The regional strategy for innovation

In line with the national drive for innovation, the Department of Antioquia has established several institutions to co-ordinate its efforts in this area. Moreover, there are many initiatives to strengthen the links between tertiary education institutions and the private sector with strong involvement from government authorities both in Antioquia and in the Municipality of Medellín in these initiatives.

There has also been an important effort to identify the main social and economic characteristics of each sub-region and to align policy efforts to address their needs and missions (Corporacion Consejo de Competitividad de Antioquia, 1999).

In 2007, key strategic productive chains were identified in order to provide guidance for regional development strategies (Table 3.1). The hydro-electric sector is the largest in economic terms, although the textile industry used to be the largest exporter and the largest in terms number of firms and persons employed.

Table 3.1. Strategic productive chains for Antioquia

Agro-industry	Forestry, natural rubber, cacao, coffee, banana, avocado, asparagus, flowers, meat and dairy products.
Mining and energy	Coal, gold, calcareous products, electric energy generation and distribution.
Industry	Textiles (design) and manufacture and goods and services to the industry
Services	Tourism for biodiversity, business and events; specialised health services.
Others	Management of water resources for the environment and the production of bottled water.

Source: (Departamento Nacional de Planeación (2007).

Main challenges for the region

The economy in Antioquia is skewed in two overlapping ways. Firstly, there is a very strong concentration of population and income in the Medellin metropolitan area, while most of the sub-regions are sparsely populated and poor (Table 3.2).

Table 3.2. Demographic characteristics of the sub-regions in Antioquia

Sub-region	Population 2005	area	% poor	% Covered by social security
Oriente	606 775	7 021	59	71
Norte	255 242	7 390	79	75
Suroeste	398 342	6 513	78	69
Urabá	495 195	11 664	92	89
Nordeste	181 365	8 544	86	81
Magdalena Medio	94 714	4 777	91	7
Occidente	228 200	7 294	88	71
Bajo Cauca	234 706	8 485	95	85
Valle Aburrá	5 761 175	62 840	54	89

Source: DANE (2009), Informe de Coyuntura Económica Regional Departamento de Antioquia Bogotá: Departamento Nacional de Estadística.

Secondly, there is a strong mismatch in terms of the leading fields of economic growth and development and the places where most people work (Table 3.3). Three sectors – commerce, manufacturing and personal services

– employ 72% of the workers, but absorb just 6.7% of the region’s net investments. At the other extreme, utilities, transportation and financial services absorb 85% of the investments, but use only 10% of the investments. As elsewhere in Colombia, Antioquia’s labour market is characterised by a high degree of informality: about half of the work force is outside the formal labour market, which means that their employers do not pay taxes and the employees do not have the benefits of labour legislation.

Table 3.3. Investment in the sector and job creation in Antioquia. 2009

	Employment (thousands)				Net investments	
	Formal	Informal	Total	Percentage%	Million COP	Percentage
No information	1	1	2	0.1		
Agriculture, cattle husbandry, fishing	5	6	11	0.7	82 968	3.7
Mining	1	1	2	0.1	70 920	3.2
Manufacture	211	99	310	21.0	34 629	1.6
Utilities (electricity, gas, water supply)	4	0	4	0.3	290 276	13.0
Construction and real state	135	105	240	16.2	28 841	1.3
Commerce, hotels, restaurants	145	299	444	30.1	81 692	3.7
Transportation, communications	45	74	119	8.1	638 442	28.7
financial activities	25	3	28	1.9	964 361	43.3
Personal and community services	191	126	317	21.5	32 550	1.5
Total	763	714	1 477	100.0	2 224 679	100

Source: DANE (2009), Informe de Coyuntura Económica Regional Departamento de Antioquia Bogotá: Departamento Nacional de Estadística.

Antioquia’s traditionally important textile industry has been declining because of international competition and this is not being replaced with other labour-intensive, high productivity economic activities. This had led to increased informal employment and high levels of unemployment.

The discrepancy between employment and investment is one the most serious challenges facing Antioquia as it tries to become a modern and more equitable society.

3.4. Intermediate organisations for knowledge transfer and exchange

There are many institutions and programmes in Antioquia dealing with innovation with the participation of government agencies, entrepreneurs, tertiary education institutions and other organisations and persons. In spite of the efforts to create a Regional System of Innovation, such a system does not exist in that a well-organised co-ordinating body can integrate these efforts and multiply their capabilities. For instance, based on information from the various agencies, it was not possible to assess the total amount of investments in innovation activities in the region, nor to ascertain their source – regional, national, public or private.

Since 2003 Antioquia has had a voluntary association called the University-Firm-State Committee (*Comité Universidad – Empresa – Estado, CUEE*), which brings together representatives from these three sectors. This is regarded as the most active association of its kind in the country, bringing together 21 companies, 11 institutions of tertiary education, 7 centres for technological development, representatives of the National Association of Colombian Entrepreneurs (ANDI) and the National Association of Micro, Small and Medium-sized Companies (ACOPI), the Secretary of Productivity of the Antioquia Department and the Municipal Planning Secretariat of the City of Medellín³. CUEE has undertaken several studies on innovation-related issues and it is developing a system of indicators for education and innovation activities in the region. It was also instrumental in the creation of *Tecnova*, a corporation meant to develop projects linking supply and demand with regard to the use of technology for development. (See Chapter 1, Box 1.2 for more details about CUEE).

Another national initiative implemented in Antioquia is the Alliance for Entrepreneurial Innovation (*Alianza para la Innovación Empresarial*), the local chapter of a partnership promoted by Colciencias and ANDI, the National Association of Entrepreneurs. One of the main outcomes of the Alliance is the Centre for Science and Technology of Antioquia (CTA), a non-profit corporation created in partnership by the government of the Department, Colciencias, EAFIT (a private university), members of different business associations and *Proantioquia*, which is a private foundation created by the business sector to foster the development of the region.

In 2009, the city government (*Alcaldía*) and the Chamber of Commerce of Medellín created a programme called *Medellín, Ciudad Cluster* (Medellín, Cluster City). This identified the main areas for economic development in the region (electricity, textile industry, dressmaking, design and fashion, construction, business tourism, medical and dentistry services and technologies for information and communication). Each cluster has a

director hired by the Chamber of Commerce and an Advisory Board with representatives from the main companies and research centres in the field. The clusters work by identifying the main companies active in the field, organising events and initiating studies and other activities of interest to the participants.

Foundations, institutes and long-term programmes

Thanks to the activities of these different institutions and networks, several foundations, institutes and long-term programmes have been created in Antioquia to drive the development of science, technology and innovation at the regional level.

Tecnova

Tecnova is a corporation created by the universities and companies belonging to CUEE to stimulate demand and supply with regard to applied knowledge and to manage projects resulting from these partnerships. It works through business round meetings that bring together research groups and companies. 260 research groups and 23 institutions participated in the 5th round of 2009, thereby generating projects with large companies to the value of COP 6.5 million (Colombian pesos; about USD 3.6 million).

Entrepreneurship Park (Parque E or Cultura E)

The Entrepreneurship Park is an initiative of the municipality of Medellín and the University of Antioquia to identify business opportunities based on research outcomes. Among other activities, there is a competition through which the municipality provides seed funding for small entrepreneurial activities. The total amount allocated for 2011 was COP 200 million (USD 113 000) with the expectation that this would allow 1 500 new entrepreneurs to start their projects. Of those, 150 received additional support of COP 7.5 million (USD 3 000), plus technical assistance and follow up.

Ruta N (Road N)

Ruta N is a high technology district established by the Municipality of Medellín. According to its 2010 Activities Report Ruta N Corporation, one of its first achievements was to attract Hewlett-Packard's global services centre on its premises. It also has a partnership with Pipeline Studios, in cooperation with the *Instituto Tecnológico Pascual Bravo*, which is one of the pillars of an ambitious programme to make Medellín a centre for the development of digital entertainment. Its working capital for 2010 was about USD 12 million obtained from the municipality, public and private

companies in the region. Its board of directors includes representatives of the Medellín municipality, EPM, Colombia's Telecommunications Company, the rectors of the Universities of Medellín and the EAFIT University, and representatives of different business associations.

Entrepreneurship

There are several institutions in Antioquia involved in the development of entrepreneurship. One of them is CREAME (*Centro Integral de Servicios Empresariales*). It has several initiatives for the creation and strengthening of entrepreneurial activities in the region and works in partnership with the University of Antioquia in the Node IEBTA for technology-based companies. Since its establishment 15 years ago, CREAME claims to have contributed to the creation and strengthening of 2 104 firms in the sectors of high technology, agro-industry and others.

SENA, the National Learning Service, makes an important effort to stimulate the creation of small business. Basically, it operates a Fund that provides seed money for business projects approved through a competitive process (*Fondo Emprender*) and provides tutorship to the entrepreneurs for a period of time. SENA seeks to work in partnership with universities and local governments, both for funding and for providing tutorship once the project starts, under SENA's general orientation. If the business project succeeds, the seed money invested in the company does not have to be paid back. If it does not succeed, then this must be returned with low interest after a grace period of four years. Despite the favourable conditions, there is more money available than qualified applicants.

One of the difficulties in boosting knowledge-based business creation is that the potential partners, including the universities, do not want to commit the necessary resources and manpower to provide the necessary follow-up for the new companies. In general, out of each 100 projects submitted to SENA, only 10% get approved and the failure rate is above 50% in the first few years. Other institutions, such as the Pontificia Universidad Bolivariana, only deal with incubator programmes if these are in partnership with the new start-ups and by sharing the risks and eventual profits.

3.5. Tertiary education and research

The link between research and innovation

Beyond its role in training human capital, tertiary education institutions can contribute to innovation by developing research activities and projects that generate new products, processes or services, and by providing technical services and consultancy to firms and institutions.

Research literature has described two different “modes” of knowledge production, with “mode 1” being more academic, self-directed, curiosity-driven and discipline-oriented, and “mode 2” being more applied, pragmatic, interdisciplinary and problem-based (Gibbons et al., 1994). Other authors have described the different ways of doing science in terms of the links between the academy, the business sector and the state, or the different traditions of pure and applied science that exist in different fields and contexts (Etzkowitz, 2008; Schwartzman, 1981; Stokes, 1997).

Universities in Latin America tend to prioritise the more traditional “mode 1” of knowledge production, which seems better to preserve their autonomy. In so doing, they often pay the price of being isolated from society and face limited resources and support, since these tend to flow to institutions more strongly linked to society’s needs (Schwartzman, 2007; Schwartzman, 2008). This focus is often strengthened by the reward systems developed by research councils and other supporting agencies assess the quality of research by the number of papers published in prestigious journals and quoted by other scientists, not by their practical outcomes.

Since the 1990s, science policy in Colombia has been marked by a concerted effort to strengthen the country’s research capabilities and link research with the national productivity system. Before 1990s, the first graduate and research programmes were created with the help of the Inter-American Development Bank. Since then, research was transferred from the National Ministry of Education to the Ministry of Planning, Science and Technology that became part of a national system of innovation. This arrangement was made to emphasise research that is relevant for an open and internationally competitive economy. Additional institutional reforms have been launched to make the system more consistent and to consolidate the country’s research capabilities (Jaramillo Salazar, 2009).

Research outputs

Despite the efforts of the national government and the high expectations of the 2009 COMPES document mentioned earlier, research in Colombia has not developed in a robust manner and links to industry remain weak.

Table 3.4 gives the main indicators of science, technology and innovation for Colombia in comparison with selected Latin American countries. The size of scientific production, in terms of 2 184 papers indexed in the Science Citation Index, is smaller than Brazil, Mexico, Chile and Argentina. No country in the region has an impressive number of patents granted to residents and Colombia makes no exception in this regard. The number of PhDs graduated in 2008 as reported in this table (*i.e.* 98) is much smaller than the official figure of 515 reported by the Colombian

Observatory of Science and Technology (Salazar, 2010). By any measure, this a very small number in terms of the size of the tertiary education sector in the country.

Table 3.4. Main indicators of research activities and graduate education, Latin America, selected countries, 2008

Main indicators	Venezuela	Peru	México	Colombia	Chile	Brazil	Argentina
Papers in SCI search Total	1 535	673	9 637	2 184	4 251	31 903	7 618
Papers in SCI search % world	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Papers in SCI search / R&D expenditure ¹	0.19	--	--	5.96	--	5.96	4.43
Papers in SCI search / GDP ²	5	5	9	9	25	20	23
Granted patents to residents	0	0	197	31	95	529	244
Doctorates	19		4 144	--	395	10 611	746

Notes: 1. per million USD; 2. per billion USD; -- missing data.

Antioquia is the largest economic region after Bogota, but its investment in innovation is proportionally much lower than that of Bogota. In 2010, Antioquia produced 15.4% of Colombia's GDP, compared to 22% by the District of Bogota. Antioquia contributed 23.4% of the science, technology and innovation activities and 17.8% of total R&D in the country. In comparison, the District of Bogota concentrates 44.2% of the science, technology and innovation activities, and 53% of R&D.

Table 3.5. Number of researchers in Antioquia, Bogota and Colombia, 2000-2009

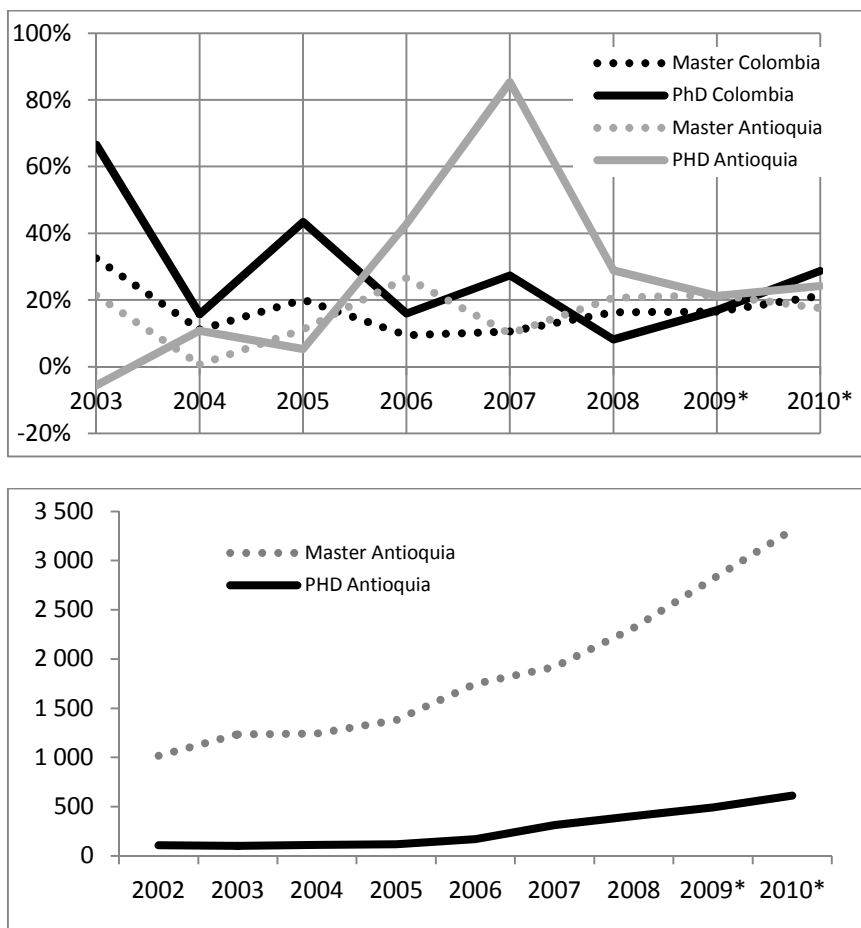
Researchers	Antioquia	Bogotá	Colombia	Antioquia /Colombia
2000	932	1 744	4 471	20.8%
2009	2 781	6 615	17 014	16.3%
Growth (%)	3.0	3.8	3.8	n.a.

Source: Calculations based on information from the Science and Technology Observatory. *Indicadores de ciencia y tecnología, Colombia 2010*. Bogotá: OCYT, 2010. Investigadores p. 63.

In 2009, there were about 3 000 projects approved by Colciencias, of which 961 were from Bogota and 782 from Antioquia. Of those, 238 were in health, 178 in industrial technology, 94 in basic sciences, and 80 in energy and mining. The publication from the Science and Technology Observatory

gives very detailed information about patterns of publication and inter-departmental co-operation in research activities but no data concerning the economic or social impact of these research activities. (Salazar, 2010)

Figure 3.2. Graduate enrolments in Antioquia and Colombia, 2002-2010



Source: Antioquia, Background Report, 2011. Based on SNIES - Ministry of Education

Graduate education occupies a minor place in Antioquia's tertiary education sector despite progress in recent years. Data from the National Ministry of Education for 2009 shows that there were 206 000 students in tertiary education in 54 institutions in the region (including those in Learning Service), 2 270 of whom were in Masters programmes and only 388 in doctoral programmes. The total number of graduates at the doctoral level between 2001 and 2008 was 147, which is less than 20 a year.

Enrolment in Masters programmes grew by 225%, while doctoral students increased by 465% between 2002 and 2010. In both cases, this growth was lower than the national average. However, Antioquia's shares grew more rapidly than the rest of the country at both levels from 2006 to 2009 (see Figures 3.2 and 3.3).

3.6. Universities and knowledge transfer and exchange

Of the 41 tertiary education institutions that exist in Antioquia, eight of them participate in RENATA. This is a national network of tertiary education and research institutions in Colombia, created in a partnership with the national Ministry of Education, the Ministry Information Technology and Communication and Colciencias, to foster interchange and co-operation on issues of science and technology. These institutions – Universidad de Medellín, Universidad Pontificia Bolivariana, Universidad EAFIT, Instituto de Ciencias de la Salud (CES), Universidad de Antioquia, Universidad Nacional, Escuela de Ingeniería and Universidad Lasallista – also form the “Group of 8”, an informal association of institutions whose rectors meet regularly to discuss matters of common interest.

Among these eight tertiary education institutions, there is branch of the Universidad Nacional de Colombia, the country's flagship tertiary education institution, and the University of Antioquia. The University of Antioquia is a regional university: its running costs, including salaries, are paid by the National Government but it receives investments and support from the departmental government. Besides being the largest and the best-endowed public institutions in the area, the two universities both place emphasis on research as a central component of their identity, and they are involved in many of the innovation initiatives mentioned in this report. A third university, EAFIT, is a private institution created by the business sector with the explicit goal of contributing to regional innovation.

Universidad Nacional de Colombia (National University of Colombia)

The National University of Colombia is the flagship tertiary education institution in the country, with about 50 000 students in Bogotá, Medellín and six other locations in the country. The Medellín location, with about 10 000 students, is considered the pioneer and leader of engineering studies in the country. According to the 2009 statistical report, the university has 62 research groups, 10 of which are classified by Colciencias at the level A (*i.e.* the top level). Investments in research in 2009 amounted to COP 7 380 million (about USD 4 million) of which 31% came from external sources, especially from Colciencias. Projects for extension activities

amounted to COP 20 181 million or about USD 12 million (Universidad Nacional de Colombia and Sede Medellin, 2010)

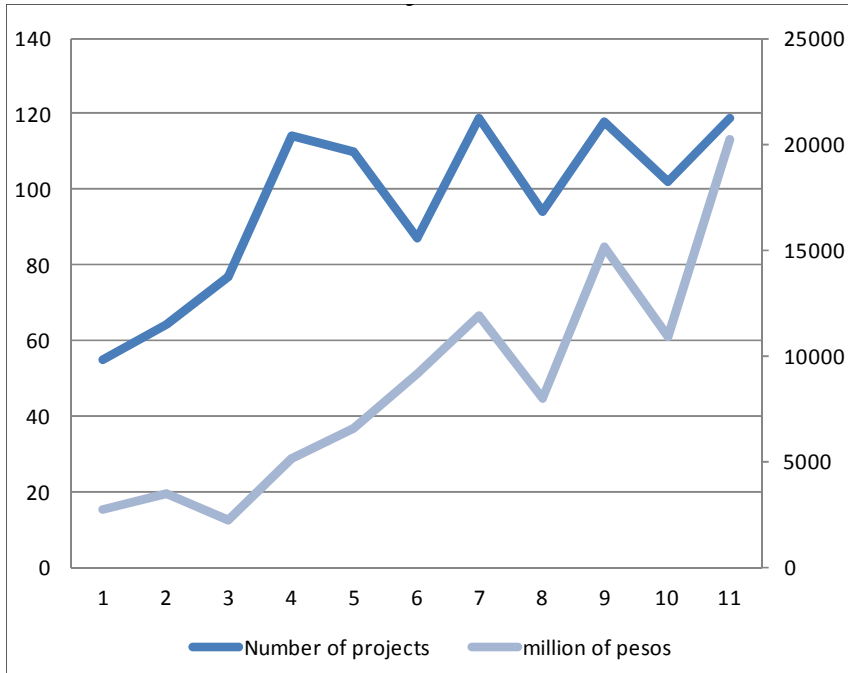
In 2009, the campus in Medellin had 126 doctoral students, admitted 22 and graduated 5. Most of the students were in engineering. Enrolments in Master's and specialisation programmes were higher – 614 and 204, respectively, in the second semester of 2009. While the Medellin campus of the Universidad Nacional is making efforts to become more involved with graduate education, its main focus is on education provision at bachelor's level.

Table 3.6. Universidad Nacional de Colombia – Medellin: students in doctoral programmes

Subjects	Places available	Applicants	Admitted	New Students	Enrolled	Graduated
Statistics					6	
Mathematics	6	3	0	1	6	
Agrarian Sciences					13	1
Ecology	5	10	1			
History	10	10	6	5	23	1
Engineering - materials science	5	8	6	7	27	
Engineering - Water resources	5	4	2	2	11	1
Systems engineering	5	5	4	3	24	1
Engineering - Energy Systems	5	3	3	3	22	1

The statistical yearbook refers to about 800 research projects in existence in 2009, 90% of which financed by the university itself, and 10% from external resources, with a strong emphasis on engineering. The university invested about COP 3 000 million in 221 projects that year, or about USD 15 000 in each. One would expect that good quality, relevant projects would be much more expensive and able to obtain external support.

Compared with research, the extension activities were much more significant in 2009. There were 119 projects, 68 of which in consulting and technical assistance, particularly in engineering, and 51 in continuous education. The value of projects since 1999 has increased tenfold, which is evidence of the growing importance of this type of activity for the university.

Figure 3.3. Universidad Nacional de Colombia – Medellin: extension projects. 1999/09

Source: Universidad Nacional Medellin.

Universidad de Antioquia (University of Antioquia)

Established in 1878, the University of Antioquia is a public university associated both with the department and with the national government through the National Ministry of Education. In Colombian terms, it is a regional public university, meaning that the national government provides it with resources for running costs including salaries, while the department provides additional resources for capital investments and projects.

With 30 000 students in its main campus in Medellin and an additional 4 000 in other regions, the University of Antioquia is the largest tertiary education institution in Antioquia and the second largest in the country. It offers 228 undergraduate and 167 graduate programmes, of which 43 are specialisations, 101 are Masters programmes and 23 are doctoral programmes. It has an academic staff of 7 239 persons, of whom 447 have a doctoral degree and another 1 665 hold a Masters. It lists 199 research groups recognised by Colciencias, of which 55 are classified as A1 or A. In

2009, it had 405 documents indexed in the database of the Institute for Scientific Information with an average citation of 4.2.

The University of Antioquia has a budget of about USD 400 million, of which 42% are part of a special fund derived from various sources such as income generated from administrative stamps and revenues from technical assistance, consulting and other services provided to public and private clients. These resources can be used to pay for all kinds of expenses, including research support. In contrast, the direct budget funding from the the national government, is used for salaries and regular maintenance.

The University of Antioquia has made institutional efforts to boost its research, development and innovation activities. Initially carried out through the Programme of Technological Management (PGT), under the vice-rector for extension activities, this work is presently undertaken by the Committee for the Development of Research (CODI), under the vice-rector for research, responsible for the institution's development plan for science and technology.

In its stated mission and vision for the future, the University of Antioquia does not define itself as a regional institution, but as an autonomous public university “committed to the integral education of human talent based on criteria of excellence, the generation and diffusion of knowledge in all fields and the preservation and revitalisation of the cultural heritage”. By 2016, the university aims to become “the main research university in the country and one of the best in Latin America, with undergraduate and graduate programmes meeting top international standards, and a leader in the contribution towards the socio-economic transformation of the country in a scenario of diversity and intercultural dialogue, based on respect for pluralism and the environment”. (Universidad de Antioquia, 2009).

To reach a goal of world class excellence, a university requires a solid advanced graduate sector combined with first class research. In 2009, the University of Antioquia had less than 300 students enrolled in its 23 doctoral programmes and graduated just 19 PhDs. The total number of students in graduate programmes in 2009 was about 1 500, but most of them were in specialisations or Masters programmes.

The 2009 statistical yearbook does not give much information on the research undertaken in the University of Antioquia except the number of research groups and their main field of activities: 79 in natural sciences, 77 in health, and 52 in social science. A document from 2007 gives more information on research activities and their costs. The total number of listed projects, including those approved, on-going and finished, was 901, with the participation of 956 faculty members and 1 081 students from the Antioquia

University. The total financing for these projects was COP 133 012 million, or about USD 78 million; 43% of the resources were provided by the university itself, 20% by Colciencias, 23% from other public institutions, and 8.7% from private and public corporations. The projects tend to be small (less than three researchers per project and a little more than one faculty member) and it is likely that a sizeable part of the computed costs relate to the time for full contracts supposedly dedicated to research and hence not to research expenditures as such.

The strongest research sector within the University of Antioquia is health, with 40% of the projects, 35% of the total budget and 30% of the resources coming from Colciencias. The university has identified five centres of excellence in research and innovation (CIIE), which work in partnership with other universities and companies and receive special support.

Universidad EAFIT

The EAFIT University is a private, non-profit institution established in 1960 by a group of entrepreneurs from the Medellín region, first as a School of Administration and Finance and later adding an Institute of Technology which gained a university status in 1971. Currently EAFIT has about 9 000 students enrolled in 19 professional degree courses, 49 specialisations, 16 Masters programmes and two doctoral programmes in business administration and engineering. Besides the main campus in Medellín, EAFIT has locations in Bogotá, Pereira (which is in the coffee region) and Llanogrande.

EAFIT does not aspire to become a research-intensive university, but a good teaching institution that makes use of research and modern technologies to improve the quality of the education that it provides. It lists 41 research groups, only 7 of which with an A or A1 status in Colciencias' rankings. According to the institution, in 2010 these groups developed about 100 research projects, with a total budget of COP 14 000 million (about USD 8.2 million) or the equivalent of USD 84 000 per project. 30% of these projects have the participation of, and are partially financed by, the private sector. According to EAFIT University, this “contributes to the social appropriation of its outcomes and the strengthening of the links between the university, the companies and the state” (Universidad EAFIT, 2010b).

EAFIT runs an annual competition for research projects to be supported by the institution, which are assessed in terms of their academic quality, social relevance and links to graduate and undergraduate education. There is a programme of scientific initiation (*semilleros*) through which professors

and students receive some seed money and institutional support to develop small research and study projects of different kinds.

EAFIT has also established the Centre for Innovation, Consulting and Entrepreneurship (CICE) that provides technical assistance to governments, companies and teaching institutions in management, ITC, environment issues, technical questions and training. According to estimates, CICE generates an annual revenue stream of more than USD 2 million for the university (Universidad EAFIT, 2010a).

Box 3.1. EAFIT Consulting (CICE)

Based on the long term industry collaboration and permanent services to firms since 1960, EAFIT University created the Centre for Innovation, Consulting and Entrepreneurship to provide companies, entrepreneurs, governments and education institutions with solutions to their needs through the design and implementation of projects based on the research groups and academic sectors of the EAFIT University. Support is provided to large companies, small and medium-sized companies, governments, entrepreneurs, education institutions. Expected benefits of the work include financial and academic returns, social impact and institutional image building.

CICE draws its resources of the Faculties of Engineering, Administration, Law, Sciences and Humanities. It consists of research groups and maintains more than 40 laboratories and workshops. It provides specialisation, master's and doctoral programmes. CICE has a broad range of internal and external consultants with extensive business experience who are based in Medellín, Llanogrande Bogotá and Pereira. CICE has also a network of regional, national and international partners.

CICE has 100 to 200 projects implemented at any one time. It has worked with more than 400 organisations, with 120 consultants and researchers. It delivers about 6 business projects a year, and has 8 spin-offs in incubation. Approximately 40% of the projects are carried out outside of Medellín. CICE has published 6 manuals (10 in preparation), 4 books in the series “EAFIT entrepreneurs”. It follows more than 200 social institutions.

Conclusions and recommendations

In Antioquia, many public and private institutions are working to improve the quality of education at all levels and to encourage tertiary education institutions to be more involved in activities of scientific research, technological development and innovation. One important asset is that, over the years, a strong climate of trust and partnership has developed between representatives of public institutions, companies and universities, who meet regularly in different settings to discuss potential opportunities and create

new initiatives for the benefit of the region. Other positive elements are the presence of a segment of strong, high- technology firms in Antioquia and the gradual growth of research and development capabilities in public universities. Thanks to several planning exercises, the departmental government, business community and tertiary education institutions have developed a relatively clear idea of the region's potential and of the needs of the different municipalities and sub-regions. The next step is to build on the existing good examples and mechanisms and scale them up in order to develop a well functioning regional innovation system.

At the same time, there is a need to make a significant impact on resolving the main problems of social and economic imbalances that characterise Antioquia. These include: high levels of poverty and unemployment, the concentration of resources in the Medellin region, the high number of persons outside the formal economy, the decline of the more traditional industrial activities and the social and economic consequences of this situation. Innovation, with a significant contribution from the universities, can help to improve the situation. But it is obviously not a replacement for broader policies that should include, among other things, a very concerted effort to improve the quality and retention capability of the region's system of basic education.

The kind of innovation most needed in Antioquia is probably not the high-tech, research-based knowledge produced in sophisticated research centres and laboratories and necessary for firms to compete in international markets. What is required is more incremental improvements in the way products are made and commercialised in low and middle-tech firms that are still the bulk of the economy anywhere. Large, internationally oriented companies in the areas of mining, energy and banking can get the technologies they need on the international market and only in special conditions would need to develop their own, local research and innovation capabilities.

Tertiary education institutions can play important roles in the development of Antioquia's innovative capabilities, but probably less in terms of high-level research and more in terms of technical assistance and extension work. Currently, Antioquia does not seem to have achieved the research capacity and production level corresponding to the importance of the University of Antioquia on the national higher education scene. The best way for the University of Antioquia to realise its vision of becoming an institution of excellence is to continue to build its research and graduate education capabilities and at the same time strengthen its role and relevance as a regional institution, strongly committed to education, technical assistance and extension activities which are locally relevant and undertaken in partnership with other regional institutions. The University of Antioquia

is already doing many things in this direction but it needs to make this focus more explicit.

The national government should play an important role in focusing the existing resources for science, technology and innovation on the big challenges of the Colombian and Antioquian society and on giving proper weight to innovation work in relation to academic research. It should avoid the risk of spreading resources too thinly and instead build critical mass by linking researchers throughout Colombia to strong research groups and networks, rewarding excellence wherever it exists. It should enhance the university-industry linkages and reduce the remaining administrative constraints.

Public universities in Colombia, as well as in other Latin American countries, are governed through collective bodies that represent their internal stakeholders – academics, students, employees – and are subject to rigid budgetary restrictions typical of a civil service administration. Private universities, by their nature, are more flexible and have more autonomy to set their own goals, but they do not have the same human and financial resources and need to respond to short-term demand in order to survive. However, there is no reason why private institutions which commit themselves to activities related to the development of their region and to improving the social and economic conditions of the population should not receive public support for these activities.

The governance of tertiary education institutions and to what extent the institutions can be more made open to external needs should be the subject of a detailed analysis by local and national governments. In Antioquia, external stakeholders already participate in the governing bodies of tertiary education institutions and representatives of universities sit in most high-level coordinating bodies and innovation agencies. It is important to make sure that this healthy pattern of integration and collaboration becomes more than a formality, leading to effective mutual influence and co-operation projects.

One way of making the universities more focused on regional needs is to bring regional industry in the top decision-making bodies of the institutions, as members of university councils or in similar positions. A second policy is to make the resources received by the universities contingent upon their specific contributions to regional development. For this, the universities need to develop middle and long-range plans and their leadership needs to have the necessary autonomy to work in order to achieve these goals.

The OECD review team recommends that the following measures are taken to promote regional innovation in Antioquia:

Recommendations for the national government

- Increase investments in research, development and innovation; Stimulate research beyond the National University and Bogota, but avoid spreading resources too thinly by building critical mass and linking researchers throughout Colombia to established R&D groups. Through Colciencias support high quality and high potential centres of excellence in both academic and applied R&D. Stimulate national and international networking, collaborative projects among tertiary education institutions and university-industry collaboration.
- In collaboration with the departmental governments improve the evaluation and assessment of funded RDI initiatives to ensure accountability for the use of publicly allocated resources. These include criteria and measures of quality and relevance to the socio-economic needs of society such as: *i)* the continued relevance of the RDI programme to its original stated objectives; *ii)* programme results and the achievement of objectives; *iii)* the impact of the programme on its stakeholders; and *iv)* the cost-effectiveness of the programme. Develop a robust system of indicators, particularly of outputs and cost-benefit analyses, to evaluate and assess RDI initiatives.
- Through Colciencias and other agencies, strengthen the incentives for tertiary education institutions to engage in systematic and institutional collaboration with local business and industry to drive socio-economic development in Colombia and its regions. These incentives should encourage tertiary education institutions to undertake collaborative activities, such as applied research, consulting and partnerships with other regional stakeholders, in areas where the regions have a real or potential comparative advantage. Government policy should allow tertiary education institutions and their researchers to obtain additional resources and funding from external sources based on the projects in which they participate. This will facilitate tertiary education institutions to balance the current focus on knowledge production (through academic papers) with knowledge exchange and transfer and to participate in university-industry partnerships and other innovation activities.
- Ensure that the expected creation of a new research and innovation fund based on royalties from the production of oil and gas is used for the commercialisation of promising research and technologies and for the creation of innovative firms. It is expected that these investments will pay back the public investment through the generation of increased

private sector activity and valuable publicly-provided advancements that would not have come about without the initial government investments. It is necessary to ensure that resources are not used to subsidise current practices, leading to a situation of dependence and lack of local initiative, and that only projects with good prospects of becoming self-sustaining are supported. No benefits are gained by funding uneconomic innovations, unless the innovation has a value as a public good which can justify its subsidisation.

Recommendations for the departmental level

- Apply a systemic approach in developing a regional innovation system with a well-organised co-ordinating body. A regional innovation system can overcome the current fragmented approach and facilitate stronger collaboration and networking, consensus-building for economic development and partnering between educational institutions and industry in order to create close collaboration across tertiary education and research and industry, particularly small and medium-sized enterprises.
- Foster entrepreneurship and the development of small and medium-sized enterprises, which are able to employ a larger number of people and make a significant contribution to the reduction of poverty and inequality. The OECD evidence of several case studies shows that governments should reorient their policies more towards individuals and individual behaviour and less towards SMEs as entities; more towards measures to develop the supply of competent entrepreneurs and less towards “picking winners” among existing firms or sectors; more in favour of measures to support the early phases of the entrepreneurial development process, including the nascent as well as the start-up phases; and more in favour of developing an entrepreneurship culture, while creating a more favourable business environment.
- In co-operation with the national government, play a stronger role in steering the resources for science, technology and innovation towards the needs of the region and in sectors in which the region holds a comparative advantage. This could include developing the existing funding models of the tertiary education institutions to improve their accountability, specialisation and efficiency. A performance-based funding system which introduces competitive funds could provide greater incentives for industry and for the regional engagement of universities.

- Co-ordinate the policies, programmes and initiatives between the regional and local authorities in Antioquia and Medellín for encouraging and funding innovation activity in order to develop a more robust regional innovation policy and to reduce duplicated efforts and wasted resources and energy.

Recommendations for tertiary education institutions

- Widen the scope of innovation activities to focus also on low-tech sectors and on organisational and social innovation, and concentrate efforts on challenge-driven innovation related to key issues in the region, such as poverty reduction and health. Use the region as a “laboratory” for research, knowledge transfer and outreach to reach global levels of excellence. Combining community outreach with training and challenge-driven research can generate improvements in life quality and low-tech innovations.
- Improve capacity to engage in long-term collaboration with local businesses, technology transfer, innovation and new business creation. This co-operation can play an important role in improving the region’s innovative capabilities, particularly in terms of technical assistance and university-industry collaboration. Encourage single entry points for industry and SMEs within a tertiary education institution or a group of institutions to help businesses identify where best to provide support for innovation in the tertiary education sector.
- Collaborate with local business to design RDI programmes and other activities that are more strongly aligned with regional needs and allow not only for high-tech development but also for incremental advances. Ensure that local firms are aware of the benefits of hiring graduates. Within tertiary education institutions, foster linkages between science and technology departments and business departments and facilities, and with other disciplines to provide support for service and industry. Promote technologies with cross-sector fertilisation potential.
- The University of Antioquia should strengthen its efforts to build world class excellence in regionally relevant activities and strengthen its role as a regional institution by providing technical assistance and extension activities which are locally relevant and undertaken in partnership with other institutions.

Notes

1. Dirección de Ciencia, Tecnología y Información, under the la Secretaria de Productividad y Competitividad”.
2. www.colombiaaprende.edu.co/html/home/1592/article-211994.html
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Chapter 4:

Social, cultural and environmental development

Social, cultural and environmental development underpins, stabilises economic growth and improves community health and welfare and social cohesion as well as clean, healthy and sustainable environment.

Tertiary education institutions in Antioquia have taken many steps to respond to the social, cultural and environmental needs of the region. The mission statements and development plans of the institutions address social and cultural development, and to a lesser degree also environmental development. Institutions implement a range of extension activities in the region. However, the lack of mechanisms to monitor and follow-up projects and programmes makes it difficult to assess the real impact of these activities. The chapter concludes with a set of recommendations for the regional and local authorities and institutions.

Introduction

After decades of social instability and violence, Antioquia finds itself in a constructive period, oriented towards economic and social development. Today, Antioquia has one of the most dynamic economies in Colombia, with GDP and growth rates above national averages, but its principal challenges continue to be of a social character: ending violence, addressing the issues that cause poverty, improving health conditions, and increasing access to and the quality of education, while at the same time reducing social inequality and the disparity in development between urban and rural areas and among sub-regions.

Addressing the social, cultural and environmental challenges requires collaborative efforts among stakeholders in designing and implementing policies, as well as strategies and programmes that will foster sustainable and inclusive economic and social development within a framework of regional integration. The contribution of tertiary education institutions through their teaching, research and outreach functions will be key to solving the problems in all areas, as they are in the position to inject knowledge and expertise, provide highly-trained human capital, create opportunities to exchange experiences and offer an international perspective.

This chapter highlights the social issues in Antioquia and provides an overview of the interventions and good practices implemented by its tertiary education institutions that contribute to regional development in the areas of equality, health, education, culture and the environment. Examples of good practice in other countries are also cited. Specifically, this chapter examines:

- What is the contribution of tertiary education institutions to Antioquia's cultural, social and environmental development?
- Are the activities of the tertiary 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 tertiary education institutions?
- What lessons can be learnt from international experience?

4.1 Principal social and educational challenges in Antioquia

Urban-rural divide

Antioquia is divided into nine sub-regions with an economy dominated by the service sector (60%) and industry (24%), whereas primary sector

represents a much lower percentage (6%). Antioquia has a bigger share of urban population than the national average. While Antioquia's population is concentrated in the Aburrá Valley, there is also a high proportion of rural dwellers and marked cultural diversity. The Aburrá Valley consists of ten municipalities, including Medellín, and it is the place of residence for over half of Antioquia's population (see Table 4.1).

Table 4.1. Antioquia: urban and rural population

	Antioquia	Aburrá Valley	Colombia
Population	6 065 846	3 269 000	45 508 205
% Urban population	77.29	90.9%	75.61
% Rural population	22.71	9.0%	24.39

Source: Gobernación de Antioquia (2009a), Anuario Estadístico de Antioquia 2009 (Statistical Yearbook of Antioquia 2009). <http://www.antioquia.gov.co/antioquia-v1/organismos/planeacion/estadisticas/anuario2009.html>, accessed 7 July 2011; Secretaría de Educación para la Cultura de Antioquia (2011), Antioquia, Colombia: Informe de Auto-Evaluación (Antioquia, Colombia: Self-Evaluation Report), OECD Reviews of Tertiary education in Regional and City Development, IMHE: www.oecd.org/edu/imhe/regionaldevelopment, accessed 14 July 2011; and DANE (Departamento Administrativo Nacional de Estadística) (National Bureau of Statistics) (2009), Encuesta sobre calidad de vida. Presentación de resultados Antioquia (Quality of Life Survey. Antioquia's Results Presentation), www.dane.gov.co, accessed 4 July 2011.

Antioquia has fewer households with Unsatisfied Basic Needs (UBN) (14.2%) than the national average (17.7%). There is, however, a significant contrast between households in rural zones and urban zones (49.1% vs. 8.8%, respectively). This marked difference also surfaces among sub-regions. For example, the sub-region of Oriente has a UBN of 21.48%, where as in Bajo Cauca it reaches 60%. These figures point to intra-regional disparities and inequality between urban and rural areas.

Table 4.2. Human Development Index and the Gini Coefficient: Antioquia and Colombia

	Medellin	Antioquia	Colombia
Human Development Index	M	0.811	0.807
Gini Coefficient	0.566	0.591	0.578

Source: Gobernación de Antioquia (2009b), Departamento de Antioquia 2009 (Department of Antioquia 2009). Dirección Sistemas de indicadores: www.antioquia.gov.co/antioquia-v1/organismos/planeacion/estadisticas/estadisticas.html, accessed 5 July 2011; with 2006-09 data.

Poverty and inequality

Antioquia's Human Development Index (HDI) is higher (0.811) than that of Colombia as a whole (0.807). This is partly due to Antioquia's significant contribution to the national production of goods and services where it occupies second place with an index of 14.43%, just behind the capital, Bogotá (24.95%), and followed by the Department of Valle (10.4%). Moreover, Antioquia shows greater growth rates of *per capita* GDP (3.77%) than the national average (3.65%), having reached 10 679 583 Colombian pesos, compared to the national figure of 9 831 050 Colombian pesos (Gobernación de Antioquia, 2008a).

However, in terms of the Gini Coefficient, Antioquia shows greater inequality (0.591) in income distribution than Colombia as a whole (0.578). For Medellín, this indicator is lower (0.566) than the figure for the region (see Table 3.2).

Other indicators based on the “Medellin Quality of Life Survey” (Encuesta de Calidad de Vida de Medellín, 2008), such as the multi-dimensional Quality of Life Index, reveal socio-economic disparities also within the city (Medellín Cómo Vamos, 2010). The key challenges in the social development of the metropolitan area include: extreme poverty, the consequences of armed conflict and other types of violence, vulnerable households and people, discrimination against the disabled and unequal development within the municipality (El Consejo de Medellín, 2008).

A factor that increases the levels of inequality in Antioquia is the presence of vulnerable groups, such as displaced peoples and ethnic minorities. The displaced population in Antioquia includes 21 093 people expelled and 23 002 received, and has contributed to a high rate of school drop-out of nearly 9% (DNP, 2007). About 10.9% of the population is Afro-American, mulatto, Afro-Colombian or of African descent, while 0.5% is indigenous, belonging to three main groups: Emberas, Tules and Senúes.

Environmental challenges

The environment of Antioquia has been subject to extensive exploitation due to a long history of natural resource extraction. This causes the deterioration of 750 km² of land annually, equivalent to 1.2% of the entire territory. The situation is exacerbated by the deforestation of 1 000 km² every year.

At the same time, Antioquia's alluvial plains and maritime zones are insufficiently exploited: “... Antioquia backs on to three large rivers. Not only does it undervalue this particular character of its geography and culture but it also seems not to appreciate that its Caribbean coast (323 km) is the

second longest after that of Guajira, and thus wastes the possibilities, both alimentary and economic, of this resource...” (PLANEA, 2006).

Also problematic is the current use of soil on the alluvial plains, which has been largely reduced to grazing. This represents a waste of soil fertility and the potential for agro-industrial uses. Furthermore, despite the fact that 69% (44 027 km²) of Antioquia’s territory was once woodland, only 34.6% (22 043 km²) now has forest cover. In contrast, while just 22.4% of the land (14 220 km²) is suitable for agriculture, 42.2% (27 138 km²) of it is devoted to such activities. Worse still, large expanses of productive land have been transformed for recreational purposes, especially in the eastern, south eastern and western sub-regions. Also of concern is the growing of illicit crops in zones once devoted to legitimate farming.

Finally, there is a considerable demand for environmental services due to the rapid growth of population in Medellín and other municipalities in the Aburrá Valley, which comprise one third (21 000 km²) of Antioquia’s total land area (63 612 km²) (PLANEA, 2006).

Education provision and territorial inequalities

With respect to the education sector, compared to national figures, average years in formal education are higher in Antioquia (8.74 vs. 8.11 years), though this number falls to just 6.33 years for rural dwellers. The illiteracy rate is lower for Antioquia than the national average (5.1% vs. 6.6%), and rises in rural zones (10.6%). What stands out is the limited participation at the junior high school (92.1%) and high school (62%) levels in Antioquia, compared to national averages of 102% and 75.8% respectively. Despite these data, the level of tertiary education participation in Antioquia (38.6%) exceeds the national average (35.55%). Widening access and reducing dropouts in the two earlier levels could bring a further improvement in the participation and success rates in tertiary education (Ministerio de Educación, 2011; Gobernación de Antioquia, 2009a). There is a marked inequality in participation in education between urban and rural zones, with the largest gap in tertiary education (47.7% vs. 12.43%) (see Table 4.3).

Table 4.3. Antioquia: participation in education, urban and rural

Gross index of coverage			
	Urban	Rural	Total
Pre-school	101.2	81.9	95.4
Primary	109.8	122.4	113.6
Junior high school	106.3	59.6	92.1
High school	73.6	32.6	62.0
Tertiary education	47.7	12.43	38.6

Source: Gobernación de Antioquia (2009a), Anuario Estadístico de Antioquia 2009 (Statistical Yearbook of Antioquia 2009). <http://www.antioquia.gov.co/antioquia-v1/organismos/planeacion/estadisticas/anuario2009.html>, accessed 7 July 2011.

In Antioquia, the largest imbalance of coverage – which appears in tertiary education – can be explained in part by the high concentration of tertiary education institutions in the Aburrá Valley, where 42 of the total of 52 tertiary education institutions are located and serve a student population that accounts for 96.27% of the total (Secretaría de Educación para la Cultura de Antioquia, 2011). While Antioquia has 14% of the tertiary education institutions in Colombia, 27% of the institutions accredited by the National Accreditation Council are located there. As a result, 6 out of the 22 public and private institutions recognised for their high quality are in Antioquia, constituting an important asset for regional development (see Table 4.4).

These indicators suggest that one of the most important contributions of tertiary education institutions should consist in striving to broaden coverage towards the interior of the Department; *i.e.* in rural zones and vulnerable localities, because while coverage in urban areas is almost universal (47.7%), the corresponding figure for rural zones is much too low (12.43%). Therefore, the Colombian State and the government of Antioquia must intensify their efforts to widen access to tertiary education in those sub-regions. This initiative should aim not only to raise educational levels among populations in those areas, but also to support local development in specific niches and to promote regional development and integration. Hence, in addition to tertiary education programmes, it is crucial to establish research centres in the sub-regions to increase the critical mass.

Table 4.4. Accredited TEIs in Colombia by municipality

Pontificia Universidad Javeriana	Bogotá
Universidad de Antioquia	Medellín
Universidad EAFIT	Medellín
Universidad Pontificia Bolivariana	Medellín
Universidad Externado de Colombia	Bogotá
Universidad del Valle	Cali
Universidad Industrial de Santander	Bucaramanga
Universidad Tecnológica de Pereira	Pereira
Colegio Mayor de Nuestra Señora del Rosario	Bogotá
Universidad de Los Andes	Bogotá
Universidad de La Sabana	Chia
Universidad de Caldas	Manizales
Escuela Naval de Suboficiales ARC Barranquilla	Barranquilla
Universidad de La Salle	Bogotá
Universidad de Medellín	Medellín
Escuela de Ingeniería de Antioquia	Medellín
Universidad Nacional de Colombia Sede Medellín	Medellín
Universidad ICESI	Cali
Universidad Pedagógica y Tecnológica de Colombia	Tunja
Fundación Universidad del Norte	Barranquilla
Universidad Tecnológica de Bolívar	Cartagena
Escuela de Suboficiales de la Fuerza Aérea Colombiana Andrés M. Díaz	Madrid

Source: CNA (Consejo Nacional de Acreditación) (National Accreditation Council) (2011), Instituciones de educación superior acreditadas (Accredited Tertiary Education Institutions), <http://201.234.245.149/cna/Buscador/BuscadorInstituciones.php>, accessed 6 June 2011.

In this context of adverse social conditions and inequality, the willingness of the tertiary education institutions to support regional development through solidarity is clearly noticeable. All the tertiary education institutions are committed to programmes of civil participation, community and collective development, social integration and attention to vulnerable populations. There are numerous initiatives and examples of successful practices that reflect the contribution of tertiary education to regional development. For example the University of Antioquia was included among the institutions that earned the highest evaluation, an achievement for which it received resources from the Inter-American Development Bank (IDB) to provide technical assistance for its actions that support social responsibility, in line with the Inter-American Initiative for Social Capital, Ethics and Development (*Iniciativa Interamericana de Capital Social, Ética y Desarrollo*).

4.2. Widening access and community wellbeing

Contributions of TEIs to community wellbeing

A national regulation obliges all tertiary education institutions in Colombia to devote 2% of their budgets to programmes of community wellbeing. Colombian tertiary education institutions see widening access and increasing participation of students from lower socio-economic backgrounds as their key social contribution to community wellbeing. (Community is understood as the students, professors and employees of the same tertiary education institution.) Colombian tertiary education institutions use the funds for developing this wellbeing. Public and private universities in Antioquia (such as the University of Antioquia, EAFIT University, the Medellín University, the National University of Colombia in Medellín) see the human capital development of the members of their community as an important part of their Institutional Development Plans, whose objectives entail creating a sense of belonging to the institution. This is achieved through academic support, scholarships and incentive programmes for students, professors and employees, along with the active promotion of sporting competitions, artistic expression and psycho-physical health (See Box 4.1.)

These examples help to augment the amount of resources invested in these programmes designed to help needy students. However, given the dimensions of the social challenges in the region, they are still insufficient. The financial resources available only suffice to help 50% of the students who apply for aid. Although these support programmes for needy students are very positive, they also continue to maintain and reproduce the imbalance of coverage in education and social development between the Aburrá Valley and the interior. This obliges students from the sub-regions who wish to pursue post-secondary education to move to the metropolitan area where they often find employment after graduation. The vast majority of graduates do not return to their home communities, but remain in the city of Medellín and its surrounding area. Therefore, broadening tertiary education access among the most vulnerable populations entails not only increasing the scope of these support programmes, but also achieving greater regionalisation and decentralisation in tertiary education, principally by expanding public institutions towards the interior of Antioquia. This has been the strategy followed by the University of Antioquia through its Regionalisation Programme, which aims to develop structures for tertiary education in sub-regions.

Box 4.1 Social wellbeing programmes for students

The University of Antioquia operates a social wellbeing programme for students with economic difficulties. This includes a form of socio-economic aid to help satisfy their basic necessities – food, transport, tuition – and provides an auxiliary fund for cases of domestic calamity or problems related to housing. Also, the institution attends to students’ physical and emotional wellbeing by encouraging participation in sports and cultural activities.

The Medellin University has a programme that fosters wellbeing by promoting human development and improved quality of life through sports, arts and culture, health, and socio-economic orientation. This programme involves not only students, professors and employees, but also graduates and even retirees of the university.

The Metropolitan Institute of Technology operates a programme which provides support to vulnerable groups within its student body through economic assistance that allows them to remain in school to graduation. This initiative adopts an integrating strategy that begins before students are admitted and follows them right up to their entry into their professional life.

The Universidad Pontificia Bolivariana stimulates integral human capital training and promotes the identification with the institution through a policy called The Healthy University (*Universidad Saludable*). This revolves around the following axes: “To be well” (*Bien ser*), to develop institutional life and atmosphere; “To do well” (*Bien hacer*), related to promoting culture and projecting solidarity; and “To be healthy” (*Bien estar*), devoted to promoting healthy lifestyles, sports and physical activity. This programme is cross-sectional in the sense that it covers all phases of students’ lives and includes all of the institution’s employees in an effort to produce a healthy milieu and safe working environment.

The task of addressing the educational challenges of rural populations also requires non-traditional programmes and new modes of learning. In this area, the virtual education programmes operated by the Northern Catholic University (*Universidad Católica del Norte*) and the University Foundation CEIPA are welcome initiatives. Given the needs of the population, these initiatives remain limited and should be broadened and extended. The Government of Antioquia should strengthen and build on the existing initiatives, while also developing new ones, to address the educational needs of the general population: *i.e.* students at all levels, employees, professional people, homemakers, retirees etc.

Contributions of TEIs to widening access of vulnerable groups and ethnic minorities

In primary and secondary education, it is important to acknowledge the commendable work of the *Gerencia Indígena de la Gobernación de Antioquia* and its contribution of the education sector, which, over the period 2007-11, has made it possible for 26% of the indigenous population of Antioquia (28 000 people) to study at some level of the educational system. These achievements include: an increase of 224% in pre-school enrolment, 65% in primary school, 87% in junior high school, and 112% in high school (Gobernación de Antioquia, 2011).

In 2004, in tertiary education in Colombia, an estimated 6 000 indigenous students were admitted to different tertiary education centres (from a potential group of 17 750 primary and secondary school students). Despite this, progress elsewhere in Antioquia has been slow: in 1994-04, only 16 indigenous students were admitted to the University of Antioquia, an institution with a total enrolment of 21 900. Today, 202 indigenous students are enrolled at this level in Antioquia (Gobernación de Antioquia, 2011). The low access to tertiary education is explained by a complex web of variables, including funding difficulties, geographical distance to urban centres, equity and quality gaps in primary and secondary education, the delegitimising of native worldviews and languages, and the lack of suitable pedagogies that recognise the bilingual character of this population. Although robust data on graduation rates are not available, reported indexes of school dropouts run from 21% to 64% in different regions. The principal cause of this phenomenon is the fact that academic programmes lack relevance for the realities of the indigenous milieu.

Efforts to improve this situation occur through a series of initiatives implemented by the tertiary education institutions in Antioquia. These include the BA programme in pedagogy at the University of Antioquia called *La Madre Tierra* (Mother Earth) that receives orientation from the DIVERSER Research Group (*Grupo de Investigación Pedagogía y Diversidad Cultural*). This focuses on training indigenous university students in an effort to bridge the gap between indigenous people and other population groups. The training in research offered conserves the knowledge accumulated by the Indigenous Organisation of Antioquia, which carries out a variety of projects on the indigenous milieu and regional problems in different areas (education, government, health, territory, gender) with the active participation of wise men, leaders, teachers and young people from the community. Also outstanding is the linking work done by the MES Research Group (*Grupo de Investigación MES*, Mathematics, Education and Society) at the Faculty of Education of the University of Antioquia, which is

conducting projects such as “Mathematical knowledge in the context of indigenous schools”. In conjunction with the *Organización Indígena de Antioquia*, the university has also created a Programme in Indigenous Education at the Faculty of Education. Its co-ordination is entrusted to an indigenous professor with a long trajectory in community work, since its mission to negotiate teaching (formal and informal), research and extension proposals with indigenous regional and national communities and organisations in order to improve the quality of life of the indigenous population and strengthen its cultural identity.

With regard to public policies, in 2010 the School of Government and Public Policy of the Government of Antioquia at the Antioquia University proposed a programme on indigenous public policies and a project to train indigenous leaders, both in co-ordination with the *Gerencia Indígena de la Gobernación de Antioquia*. These initiatives make it possible to improve the participation of indigenous communities in areas of local and departmental government.

Another example of interventions by tertiary education institutions in this field is the BA in Ethno-education offered by the Universidad Pontificia Bolivariana (UPB) in collaboration with the Missionary Institute of Anthropology. This programme contributes significantly to local development in communities with intercultural characteristics, such as indigenous localities, those of Afro-descendants and frontier populations. The objective is to train educators and leaders who will later implement productive projects. Among the students enrolled are rural teachers and community leaders, the vast majority of whom are from populations that currently live in circumstances of violence and displacement in areas that lack basic public services. To avoid uprooting students, this programme is offered in the municipalities of Leticia in the Department of Amazonas; Puerto Asís, Department of Putumayo; Toribio, Department of Cauca; and Medellín, Department of Antioquia. The study programme consists of 11 semesters taught in a mixed delivery modality that requires formal classes for 20 days each semester and adopts an articulated disciplinary approach that includes courses on linguistics, anthropology, pedagogy and social sciences. The rest of the learning process takes place through fieldwork on topics related to implementing productive projects – e.g. rice, corn or coffee plantations, fish farms, fruit and vegetable cultivation, artisanal workshops – supervised by professor-tutors via the Internet or telephone. Students receive a scholarship from the UPB and pay only 10% of tuition costs. The professors in this BA programme are anthropologists, linguists, pedagogues, researchers and philosophers with Masters degrees or Doctorates, all of whom have multicultural experience and have worked in rural areas. In 2011, 1 465 students from 48 indigenous communities were enrolled. In 23

years, it has produced 2 000 graduates in 20 departments in Colombia, and is recognised by the National Ministry of Education as a tertiary education programme that primarily serves vulnerable groups (Universidad Pontificia Bolivariana, 2011).

Finally yet another initiative that deserves mention is the one organised by the centre *Colombo-Americano de Medellín* through an agreement with the U.S. State Department, which offers Afro-American and indigenous students in the municipality of Medellín “Martin Luther King, Jr.” scholarships to study English. This programme entails a component of social responsibility as recipients must participate in activities that contribute to the continuing development of vulnerable communities. Upon completing their studies, these scholarship students are chosen to take the TOEFL-IBT examination and their results may allow them to apply for programmes of tertiary education at international institutions.

The following section describes two international cases of good practice which are examples of providing educational services to vulnerable populations. These can serve as a basis for developing innovative models in Antioquia to broaden participation and increase the levels of education attainment and to improve productivity (see Box 4.2 and Box 4.3).

Box 4.2. Educational programmes to improve the participation rate, quality and equity of education in Veracruz, Mexico

In the rural areas of Veracruz, characterised by a population that lives in small isolated communities where the mountains, jungles and waterways make difficult to provide public services from the municipalities, the state government has implemented a strategy which consists of 5 programmes aimed at raising education attainment and developing productive skills in the general population. The strategic role of these programmes is to support the school system in critical areas of coverage, quality and equity, given that 53.1% of the population above 15 years of age has not completed basic education and where the illiteracy rate is almost 12%.

The objective of the **Vasconcelos Project** is to provide educational services to remote communities in the region. **Rébsamen** deals with the updating of elementary education teachers. The **Clavijero Project**, together with the **Educational Channel**, which are devoted to the population unable to attend educational institutions, offer distance learning programmes with intensive use of ICT and a TV Channel. As well, there is a complementary programme entitled **Mobile Museum “The Way of Science”**.

Box 4.2. Educational programmes to improve the participation rate, quality and equity of education in Veracruz, Mexico (continued)

The Vasconcelos Project is a state-wide basic education programme to promote school attendance targeting socially disadvantaged communities and employing mobile units. This programme works to empower individuals and communities in Veracruz by teaching them technological skills. It seeks to improve the conditions of stagnation and marginalisation in the rural communities of Veracruz, increasing coverage and improving the quality of education of its population (mostly indigenous) that, in great part, has not completed basic education and has low work productivity. As a result, a significant number of people have attained a higher level of education which improves their labour market position and provides opportunities to increase their incomes. The programme serves people from all age groups, with a special focus on public school students who represent one third of the state population.

The programme offers a wide variety of educational services, including literacy programmes, promotion of good health practices, work experience related to social organisation, technical assistance for the development of community infrastructure and for developing productive skills, support for the curricula of primary, secondary and tertiary education and preparation for ENLACE and PISA assessments. These services are taken to the communities in buses that have been transformed into mobile classrooms equipped with very recent technology, including computers, Internet connectivity, interactive whiteboards, digital collections and a traditional library. Locations where the project will be offered are chosen through the study of each community's needs and their existing technological resources, thereby developing specific training and educational plans for each community.

Vasconcelos Project has been running for more than five years and its working team consists of 240 persons, who are mainly recent graduates in 38 disciplines with many of them speaking a local indigenous language. Its infrastructure includes 30 buses and three trucks, and benefits 197 149 users in 522 communities, distributed among 212 municipalities. This programme has benefited agricultural producers and artisans, who have learnt to market their products. In 2008, the Vasconcelos Project received the Access to Learning Award from the Bill and Melinda Gates Foundation.

The Clavijero Consortium Institute (ICC). The Clavijero Project is competencies-based learning programme for upper secondary and tertiary education. Its objective is to evaluate the participation rate in upper secondary (45.87%) and tertiary education (22.30%) through distance learning programmes with extensive use of ICT. The Institute offers secondary education, seven technological programmes lasting two years and seven bachelor programmes. Due to its distance-learning mode, students do not leave their hometown, not even for the admission process. This gives students the opportunity to continue with their work activities, adjusting their learning hours to their needs. Students who

Box 4.2. Educational programmes to improve the participation rate, quality and equity of education in Veracruz, Mexico (continued)

do not have a computer or connectivity can go to the Clavijero classrooms where the technological resources are provided at no additional cost. Currently, 295 Clavijero classrooms have been opened in the state, attending to 1 114 high school students, 1 311 in tertiary education, and 23 630 in continuing education. Out of these totals, 89.6% of the students live in the State of Veracruz and 10.4% live in other states of the country or abroad. 17% of the students receive a scholarship through institutional grants. In 2010, 380 terminals were installed in 19 Clavijero classrooms with the assistance of 9 591 persons and 41 teachers were trained for certification through the National Laboratory for Advanced Computing, A.C. (LANIA).

RÉBSAMEN. Its objective is to improve the quality of basic education in Veracruz, taking into consideration that Mexican children and youth have a poor performance in national assessments like ENLACE and international assessments like PISA. To improve their cognitive abilities, it is necessary to have, among other resources, a training model for teachers. RÉBSAMEN provides a programme of this kind for 90 000 elementary and secondary teachers in the state. The RÉBSAMEN Centres consist of library services with an intensive use of ICT for improving teacher performance and providing non-conventional courses for the populace, with individual or group counselling, in person or remotely, using computers with broadband Internet. The centres also have a multimedia room for the transmission and reception of video-conferencing. Libraries located in the centres have 6 000 documentary resources, including books, CDs, multimedia and virtual library services.

The Veracruz Educational Channel is oriented to improving teacher performance through the use of audio-visual materials in radio, television and the Internet. Three broadcast media are presently used: i) radio and television with complete state coverage; ii) closed-circuit television with a channel dedicated to the updating of teachers of elementary education; iii) broadcast of data to the RÉBSAMEN centres which are converted into television and radio signals that are broadcast locally from short-wave outlets. These programmes assist Veracruz to overcome its educational shortcomings, both in terms of its position compared to other Mexican states and also the disparity that exists within the state of Veracruz itself. They are clear proof of what public policies can do to help and sustain regional development. This channel supports the Rébsamen and Vasconcelos projects using “Pisa for Teachers”, which is an interactive online course that explores the characteristics of PISA. Another example of how the channel and Rébsamen work together are the educational programmes to improve student performance on ENLACE.

Mobile Museum “The Ways to Science”. Its objective is to stimulate an interest in and vocation for science and technology among children and encourages a culture of science and technology as the basis to achieve the state’s development. The project brings to remote communities a mobile museum that

Box 4.2. Educational programmes to improve the participation rate, quality and equity of education in Veracruz, Mexico (continued)

has interactive stations of physics, mathematics, biology, human health and ecology. The vehicle also has a projection room and planetarium. The project is an initiative of Veracruz's Council of Science and Technology (COVECyT), with the participation of the Universidad Veracruzana and the Interactive Museum of Xalapa (MIX).

Source: Programa Vasconcelos (2011), ¿Quiénes somos? (About Us) www.proyectovasconcelos.com.mx/wpz/acerca_about/, accessed 18 July 2011; Herrera, F. (2010), *VI Informe de Gobierno 2010. Veracruz es futuro* (Sixth Government Report 2010. Veracruz is future), Gobierno del Estado de Veracruz, Jalapa; Bill and Melinda Gates Foundation (2008), www.gatesfoundation.org/atla/Documents/ATLABrochure_ESLA.pdf, accessed 18 July 2011.

Box 4.3. Learning Communities and Academic Services

The project “Learning Communities and Academic Services” (*Casa Universitaria*), is a forum to share knowledge and improve community development. It facilitates access to the Virtual University System of University of Guadalajara for people who cannot attend a university campus due to the vulnerable situations.

Casa Universitaria centres have computers with Internet connectivity and educational television, as well as videoconferencing and audio conferencing software. The programme offers the following educational services: virtual tertiary education, distance learning, online curriculum courses, continuing education, open learning, audio conferences, counselling, academic tutorials and educational materials.

These centres are supported by all levels of government (federal, state and municipal) and NGOs, private enterprises, civic organisations and indigenous communities. Another innovative characteristic of this programme is the launch of twelve sustainable projects of eco-tourism, production of handicrafts, waste recycling and the application of hydroponics for food production; all of these projects are in response to the conditions and specific characteristics of the communities.

Source: Sistema de Universidad Virtual (2010), Cuaderno estadístico del Informe de actividades 2010 (Statistical Notebook of the Activities' Report 2010), Universidad de Guadalajara, Guadalajara.

4.3. Rural development

Tertiary education institutions in Antioquia contribute to establishing and implementing strategies, policies and programmes for local and regional development through joint undertakings with governments and communities. In this context, it is worth noting the role of the University of Antioquia in elaborating a policy for local development in the region fostered by the Department of Antioquia.

The EAFIT University works with several organisations in implementing productive initiatives, such as child-care organisations, food companies and tourism ventures. Furthermore, in 2011, work was underway to create seven new social companies that focus on gender, while two projects of an economic and social nature are in different stages of development through the collaboration of the Government of Antioquia and the Centre for Innovation, Consulting and Entrepreneurship (CISE) at EAFIT (see Box 4.4).

In order to broaden initiatives of this kind, it is important to encourage collaborative work and greater co-ordination among different stakeholders at the departmental level. Recommendations include accessing network data from different organisations and strengthening the participation of the educational and fieldwork research sectors for strategic and model design. Hence, the Department of Antioquia should create incentives to spur active participation by academic actors; foster the installation of research capacities focused on regional development; incentivise network collaboration among the various organisations and actors involved; stimulate the capacity to find solutions to common problems; cultivate openness to change and promote the production of new knowledge. Also, it is recommendable to tap into the potential of international co-operation to carry out pilot projects for local development by utilising new instruments of intervention based on national and international co-financing (Garofoli, 2006).

One case with potential that could be generalised for the development of rural areas in agriculture and forestry is the initiative of the Bío Bío University in Chile. This has developed its sphere of influence through the analysis of local economic circuits (see Box 4.5.).

Box 4.4. EAFIT University supporting frugal innovation and social enterprise

The EAFIT University has launched an initiative that aims to transform the municipality of El Carmen de Viboral into a model community utilising that locality's rich tradition of artisanal ceramic production. It seeks to increase the productive capacity of artisans and develop their entrepreneurial competence. To this end, the university runs *Talleres Creativos* (Creative Workshops) as a means of generating new ideas which are distinct from those of traditional artisanal production including, for example, ceramic products for industrial applications. In the area of commercialisation and marketing, the project has succeeded in registering the *Del Carmen* brand name, created a design for its commercial image and related logos and launched an advertising campaign. It has also opened franchises. The programme is planning two more phases for the near future: developing tourism in the municipality, and incorporating alternative energy sources using biomass fuels from waste product treatment and fostering environmental conservation among residents.

The EAFIT University also runs a programme, first conceptualised in the municipality of Frontino in 2004, which offers training and technical assistance for jewellery production, including formal classes on the theory and practice of welding and casting, formulas for alloys, acids and solutions, case-making and invisible and bezel settings. Participants attend supplementary sessions on topics like occupational health, industrial safety, design, association, teamwork and the basic principles of costs and budgets. The objective of this initiative is to achieve greater competitiveness in the jewellery market, a task that requires raising the quality of the artisanal production that characterises the vast majority of the family-run workshops that represent 95% of all jewellery production in Colombia

Source : Gobernación de Antioquia - Universidad EAFIT (2010); Monsalve (2010).

Box 4.5. 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 Bio Bio (Coilemu, Province of Ñuble) the University of Bio Bio, through its Centre for Urban and Regional Studies (CEUR), launched a study of local economic circuits within the AMDEL territory with support from SERCOTEC (Technical Cooperation Service, Ministry of Economy) and the regional government. This study entitled *Networks and Opportunities for Development: the case of local economic circuits in the inner prairies of the Region of Bio Bio* (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:

Box 4.5. Universities supporting rural economic diversification (continued)

- A vision of education and training at the level of the territory aiming at 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 and which has benefitted around 20 local civil servants up to now, includes: i) elaboration and management of projects; ii) management techniques; and iii) co-operative 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 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.

Source: OECD (2010b), Reviews of Higher Education in Regional and City Development: The Bío Bío Region, Chile, OECD, Paris.

4.4. Public and community health

Antioquia, like Colombia in general, faces serious health challenges: life expectancy for the population of Antioquia (74.1 years) is just below the national average (74.5), while the mortality rate is slightly higher (6.0% vs. 5.8% nationwide), homicide being the most common cause of death. Also, health coverage within the Social Security System (92.5%) is lower than the average for the country (93.3%) (Gobernación de Antioquia, 2009a). The most urgent public health problems include mortality among children below five years (24.6 deaths per 100 000 children); the high fertility rate among adolescents (24.7%); and murder as the leading cause of death (Secretaría de

Educación para la Cultura de Antioquia, 2011). All these issues represent areas where the tertiary education sector could play a more active role.

All tertiary education institutions that offer study programmes in health participate directly in community health care, in addition to making their infrastructure and services available to regional and local authorities. In order to be able to provide tertiary education programmes in health, the institution is obliged by law to sign an agreement called a “teaching-service relation”, which seeks to guarantee the quantity and quality of the situations where students will practise. These contracts are signed by tertiary education institutions and public or private health facilities, according to the profiles of the medical specialisations that they offer. Furthermore, the tertiary education institutions provide spaces for practice through university-run hospitals or clinics. Antioquia has the *Clínica Universitaria Bolivariana* (part of the Universidad Pontificia Bolivariana), and three public hospitals: *General de Medellín*, *Pablo Tobón Uribe* and *San Vicente de Paúl*. It should be noted that providing health services to the public sector represents a source of income for tertiary education institutions.

Another important form of collaboration of tertiary education institutions in the health sector is through the University of Antioquia’s participation in the Epidemiological Surveillance Committee, an agency of the Department of Antioquia which aims to strengthen the public health monitoring system and to identify deficiencies in the operations of the health system. This is an important institutional space occupied by the education sector which allows it to influence social development in the region through the contribution of knowledge and research to the infrastructure of the National School of Public Health at the University. However, several recommendations for improvement are relevant: strengthening the development of academic activities; systematising and assuring follow-up to the cases that are presented to, and decided upon, by the Committee; and increasing and rotating participating institutions to share a larger number of successful experiences, thus making it possible to better stimulate innovative interventions.

In Colombia, each municipality is obliged by law to maintain an active Municipal Epidemiology Surveillance Committee, the composition of which is decided by each municipality. Some 92% of the municipalities in Antioquia have such councils but, according to a report by the Department of Health and Social Protection of Antioquia, only 75% of them have drawn up action plans. Participation by tertiary education institutions in these municipal committees is not stipulated, so collaboration with the education sector takes place mainly through research projects and offers of services and medical consultations. Nonetheless, indicators related to the epidemiological profile of this Department reveal evidence of the need for

greater intervention by the tertiary education sector, not only in the area of health practices, but also through a multi- and interdisciplinary perspective that is specially designed to address high-priority public health problems, such as infant mortality, high pregnancy rates among adolescents and homicides. The regional health agenda includes such issues as mental health, occupational safety, and managing solid hospital residues. These are areas in which tertiary education institutions conduct research and provide consulting services, though this has yet to make its impact felt in the region, at least in the opinion of the main actors involved (Secretaría de Educación para la Cultura de Antioquia, 2011).

In conclusion, the contribution of tertiary education institutions to the health sector has focused primarily on generating specialised knowledge in the area of medicine and offering the services of its human and medical infrastructure. But these have not yet realised their full potential in addressing the health challenges through a preventive, multi-dimensional, interdisciplinary approach. Finally, the participation of tertiary education institutions in designing and conducting public policies is limited because they are not members of the Municipal Epidemiology Committees and since they play only a limited role in the Departmental Committee, where the University of Antioquia is the sole participant. Thus, the field of medicine is definitively an area of opportunity for greater collaboration and intervention by the education sector, especially when one considers the region's negative balance in this domain.

There are international cases of good practice in which first level services are offered to communities, together with the production of knowledge in global level academic programmes, such as introducing health services into indigenous communities by melding them with traditional medicine. This is already widely accepted because it results from the knowledge accumulated to prevent disease and maintain health by a people's own culture and because it reinforces their cultural identity (see Box 4.6).

Box 4.6. Universidad Veracruzana: preserving traditional medicine

In 1995, the Universidad Veracruzana launched a Regional Group to Support the Traditional Indigenous Medicine (GRAMIT) with the support of several government agencies. The group was established as a joint effort of the Universidad Veracruzana in partnership with the Organisation of Indigenous Traditional Healers (OMIT) of central Veracruz and the Mexican Social Security Institute, with the aim of developing traditional medicine in the State of Veracruz.

GRAMIT helps around 300 indigenous healers in providing technical support to develop specific equipment and procedures, including the: *i)* development of a regional catalogue of healing plants; *ii)* methods to guarantee the quality assurance of herbal remedies; *iii)* a register of herbal remedies at the Federal Ministry of Health; *iv)* guidelines and support in the establishment of a healing plants' garden; *v)* establishment of commercialisation protocols for herbal remedies; and *vi)* small-scale manufacturing of herbal remedies at the Herbal Products Regional Lab in Ixhuatlancillo, Veracruz.

The participation of students and academic staff from several disciplines, (e.g. biology, chemistry, agronomy) in GRAMIT has brought benefits in terms of knowledge acquisition and dissemination. The group has released publications on alternative therapy methods used by indigenous healers as well as the identification of social, cultural and economic factors influencing the health of people living in rural communities. An important contribution of GRAMIT is the development of a set of hygiene standards that have been followed by the traditional healers in the preparation of remedies.

Source: OECD (2010a), Higher Education in Regional and City Development: State of Veracruz, OECD, Paris.

4.5. Environmental and sustainable development

A key factor that affects social development and the quality of life is the environment, through its impact on health and sustainable development, *i.e.* the capacity to ensure the availability of resources for both current and future generations. According to the World Health Organization (WHO), the health of a population can be improved by reducing environmental risks such as pollution, ultraviolet radiation, noise, climate change and the transformation of ecosystems, among others.

The environmental features of Antioquia would benefit from greater attention from public and private actors, especially with regard to conservation, recognition of the value of natural and environmental resources and the exploitation and appropriate use of water and biodiversity. All of these are conditions for sustainable development. The *Plan de*

Gobierno 2008-2011 acknowledges that there is no integrated diagnosis of the environmental situation in Antioquia: "... we recognise that the efficacy of the planning system depends to a great extent on the possibility of having a thorough, pertinent diagnosis of the causal relations of the problems, the biophysical and social bases that characterise our territory, and the logic of resource appropriation..." (Gobernación de Antioquia, 2009c). This document proposes the planning and orientation of integrated sectorial and environmental action for the region's large hydrographic basins – Atrato, Cauca-Porce, Magdalena and the coastal zone – and mentions the following programmes: the integrated management of hydrographic basins; departmental planning and environmental management; good environmental practices; protecting and conserving natural resources; participative environmental follow-up for the development of large infrastructure projects; institutional reinforcement; environmental management of solid waste; environmental education and attention to disasters caused by natural, anthropic and technological events.

In the case of the city of Medellín, the government plan identifies a number of environmental problems, such as atmospheric pollution caused by mobile and fixed sources; noise pollution; the loss and deterioration of public spaces; the risk of mass population movements; the deterioration of water quality and quantity; risks of floods; reduced water availability; deterioration and fragmentation of strategic eco-systems; the loss of diversity and quantity of flora and fauna; the lack of efficiency in institutional environmental management; technological risks and the lack of an environmental culture in the population. The Development Plan of Medellín 2008-2011 focuses on four broad issues: i) public spaces; ii) equipment and the sustainable habitat; iii) environment and mobility; and iv) transport and public services (El Consejo de Medellín, 2008).

Tertiary education institutions in Antioquia train human resources through a substantial number of undergraduate and graduate programmes. In terms of research, numerous projects exist in this field, the most important of which are those at the Institute for Environmental Studies at the National University of Colombia (Medellin campus), the Antioquia School of Engineering at the University of Antioquia, the Medellín University and the EAFIT University. Generally speaking, the interventions by tertiary education institutions are of a technical character and consist of providing services through contracts, such as organising training projects in the area of risk management and the prevention of emergencies and disasters, environmental education programmes, training in the management of coastal zones, and the sustainable management of hydrological resources, to name just a few.

Other contributions of tertiary education institutions to environmental sustainability involve participating in public governmental bodies like Antioquia's Environmental Department, which includes a representative of the education sector elected by universities with their principal seats in the Department of Antioquia through their faculties devoted to environmental themes. This Council formulates Antioquia's environmental policies, co-ordinates environmental management in the Department, and promotes regional and sectoral programmes. Tertiary education institutions also participate in the Technical Inter-institutional Committees for Environmental Education (CIDEA), which are organs responsible for environmental education at the departmental level and where conceptual, methodological and financial efforts to promote this theme are pooled. These committees are also responsible for defining plans to adapt the environmental education policy to the needs of environmental management in the territory under its jurisdiction through "Territorial Ordering Plans" (TOP), "Territorial Ordering Schemes" (TOS) and plans for institutional, municipal and departmental development. In the case of Antioquia, participants in the Department committee include the Corporación Universitaria Lasallista, the University of Antioquia and the Universidad Pontificia Bolivariana.

At the municipal level, tertiary education institutions are also active in the Municipal System for Disaster Prevention and Attention (SIMPAD) created in 1994. This system brings together the public and private institutions in charge of orienting and developing plans, programmes, projects and actions related to prevention, handling disasters, immediate reaction during emergencies and catastrophes, and recovery, all under the co-ordination of the Environmental Office in Medellín. Hence, there is a mechanism that co-ordinates, articulates and effectuates exchanges at the municipal and community level so as to permit the appropriation and dissemination of knowledge, experiences and methodologies for formulating and implementing plans to prevent disasters, to react when these occur, and to prepare and train neighbourhood and school committees including the Specialised Committee for Disaster Prevention and Attention (COPADES). Other tasks are: education about risk management, reducing vulnerability, and implementing social action projects that provide assistance during emergencies and which formulate studies and strategies (Secretaría de Medio Ambiente de Medellín, 2011).

While Antioquia's campus areas have ample green areas and their construction has taken into account some concerns which seek to maintain a balance with nature and the landscape, none of the tertiary education institutions had developed an environmental management plan that would address the consumption of the goods and services for their daily operations.

Environmental sustainability has so far not yet received the attention that it deserves and the responses to the changes in the eco-system of Antioquia are likely to arrive too late (Secretaría de Educación para la Cultura de Antioquia, 2011).

Of the three dimensions of impact analysed – social, cultural and environmental – the environmental sustainability appears to be the least well elaborated and thus represents an opportunity for development and interventions by the education sector. One critical opportunity is environmental problem-solving: for example, undertaking an integrated diagnosis that considers all existing environmental conditions and sustainability, the population’s environmental culture, the efficiency of environmental management, and research into solutions to the Department’s environment. Academic knowledge, an inter- and multidisciplinary approach and, especially, an international perspective and much greater familiarity with good practices that exist in other countries with similar problems, are all indispensable means of assuring the viability and maximum success for the strategies proposed in this field.

One international case of good practice that brings together the interests of indigenous communities with those of university-based research and the authorities’ need to protect the environment is that of the creation of the “Biosphere Reserve of Sierra de Manantlán in Mexico” (see Box 4.7).

Box 4.7. The Biosphere Reserve of Sierra de Manantlán

The Biosphere Reserve of Sierra de Manantlán is a protected area between the southeast part of Jalisco and north-western Colima, with a length of 1 395 km² of mountains covered by forests of oak, conifer, mountain mesophyll and agricultural land, home to 3 000 species of vascular plants and 570 vertebrate species. The creation of the reserve in 1987 was the result of two common interests; the first to protect the natural resources of the indigenous communities of Ayotitlán and Cuzalapa from the logging and mining companies established in the region; and the second, the concern of the researchers from University of Guadalajara (UDG) to conserve the Sierra biocultural diversity and ecosystems. To this end, UDG established the Manantlán Institute for Ecology and Biodiversity Conservation, which set up the long-term programme for socio-ecological research related to the management of the area. Later, the institution established the “Las Joyas” scientific station. Finally, in 1994, participative management of the reserve began, with directors appointed by the federal government, giving rise to the establishment of advisory councils in Jalisco and Colima, with large-scale local participation and close collaboration between the councils of the area and the UDG research institute.

Box 4.7. The Biosphere Reserve of Sierra de Manantlán (continued)

The benefits of the reserve have been multiple, such as the introduction of participative management mechanisms within different agencies and organisations, amongst these being agrarian communities, rural organisations and local civic associations, and state and local governments. This operational structure, along with the establishment of educational programmes and the training of the population from the region, has strengthened the capacity to manage the natural resources and the environment, establishing community projects for better use of the reserve and its area of influence. Another benefit has been the creation of the Inter-municipal Environmental Board for the Integrated Management of the Lower Basin of the Ayuquila River (JIRA), where 60% of the reserve is located (see Box 4.8). JIRA has brought together 10 municipalities in order to create their own environmental agency, implementing the first programmes for the recycling of solid wastes in the state of Jalisco, and the establishment of a compensation mechanism for environmental hydrological services, which links community-based forest conservation with the water supply for the capital of the state of Colima.

With regard to research, information and knowledge has been generated by monitoring the natural and cultural values of the area, as well as the ecological processes and interactions between society and nature within the Reserve. These results have been disseminated in different forums, gaining awards and recognitions, both nationally and internationally, thus making the project a worldwide model.

Source: Carabias, J., *et al.* (Edits.) (2010), *Patrimonio natural de México. Cien casos de éxito* (Mexico's Natural Heritage. One Hundred Cases of Success), Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México.

A good practice case from Mexico that demonstrates how small municipalities with limited economic and human resources can greatly benefit from tertiary education institutions' capacity in order to generate synergy among social stakeholders and establish partnerships enabling them to set up a long-term local agenda for environmental management and adaptation to climate change, is that of the Inter-municipal Environmental Board for the Integrated Management of the Lower Basin of the Ayuquila River (JIRA) (see Box 4.8).

Box 4.8. The Integral Management of the Lower Basin of the Ayuquila River in Jalisco

The Lower Basin of the Ayuquila-Armería River is a hydrologic region of national priority, located north of the Sierra of Manatlán Biosphere Reserve in the states of Jalisco and Colima. It comprises five protected areas with a high diversity of endemic species and three large water catchments that irrigate 54 000 hectares of crops. For 30 years, the main problem in the area was pollution produced by wastewater from the sugar industry and human settlements, affecting people's health and the food sources of three municipalities which were considered to be highly marginalised communities. To repair the environmental degradation, the JIRA was established in 2001 as a result of the joint initiative by several municipalities in the region, of the Biosphere Reserve of Sierra de Manatlán and the Manatlán Institute for Ecology and Conservation of Biodiversity of the University of Guadalajara. A decade later, this is now a public, decentralised organisation with legal status, assets, a budget and judicial powers of its own, and having strategic partnerships with the Ministry of Rural Development and the Environment for the Sustainable Development of the State of Jalisco and the Manatlán Foundation for the Biodiversity of the Western Region.

JIRA is in charge of the joint operation of environmental management of projects in association with a private trust created with contributions from the municipal, state and federal governments. It also serves as an office to provide specialised technical services for municipalities, supporting them in fulfilling their responsibilities for territorial management. The results obtained include the reversal of the river's pollution, including the first treatment plant for wastewater in the basin. The first recycling programme of solid wastes was also consolidated in the state of Jalisco. Another achievement is the establishment of environmental education and civic participation. This process took the complaints of citizens in relation to public health and citizen participation to the highest state forums and gathered more than a thousand volunteers.

The generation of this social dynamic has led to the continuity of programmes across different municipal administrations, regardless of political party change. JIRA has developed partnerships and projects of international co-operation with the governments of Canada, United States and Spain and with organisations from these countries, thereby becoming a model for the creation of other municipal management programmes such as the Alliance for the Integral Management of the North Coast of Yucatán, the Inter-Municipal Association of the Lake Chapala Basin and the Inter-Municipal Systems of Integral Management of Solid Residues in Jalisco.

Source: Carabias, J., *et al.* (Edits.) (2010), *Patrimonio natural de México. Cien casos de éxito* (Mexico's Natural Heritage. One Hundred Cases of Success), Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México.

4.6. Cultural development

With respect to cultural development, 50% of the municipalities in Antioquia have Municipal Councils for Culture. To date, the number of municipalities with formulated cultural development plans is 71, equivalent to more or less half (56.8%) of the 125 municipalities in Antioquia. However, these Councils often report difficulties at the operational level and argue that their role has been relegated to that of purely circumstantial actions with little impact (Gobernación de Antioquia, 2008b).

Medellin, in contrast, drew up its first *Plan for Cultural Development* in 1990, a document that still serves as the basis for the city's cultural policy and guidelines for its implementation. This plan has been a model for similar documents from other cities in Colombia. The latest version – *Plan de Desarrollo Cultural de Medellín 2011-2020* – revolves around the axis of promoting cultural diversity from the perspective of cultural rights (Alcaldía de Medellín, 2011).

At the departmental level, the principal contribution of the education sector takes the form of the “Cultural Table of the Institutions of Tertiary education” (*Mesa Cultural de Instituciones de Educación Superior*) in Antioquia. In this group, the tertiary education institutions are organised in a network that promotes, designs and strengthens policies, programmes and projects for the benefit both of the academic community and of the wider society. The aim is to consolidate a public cultural policy in the education sector that integrates the diverse cultural activities, artistic groups and communication media present in the region's tertiary education institutions. This strategy articulates five main programmatic lines: cultural policies, training in cultural management, circulation of university cultural goods and services, research, communication and culture.

Among the *mesa's* main achievements is the recognition by Colombia's Ministry of Culture to Antioquia's tertiary education institutions' cultural policy. Tertiary education institutions also contribute to the national policy development in culture and university extension. In this context, the aim is to undertake an inventory of the resources existing at different institutions for cultural and artistic activities, including their means of communication, research groups and lines of investigation related to culture. Another result of this *mesa* is its participation in the Planning Department Council and in formulating the Development Plan of Antioquia 2008-2011, the Development Plan of Medellín 2008-2011 and the Cultural Development Plan of Medellín 2010-2020.

Box 4.9. Berlin universities of applied sciences contributing to creative industries

The Berlin tertiary education institutions provide a wide range of relevant study programmes for both “creative professionals” who work in management, business, finance and legal issues, health care, etc., and in the “creative core” i.e. those working in ICT, architecture, arts and science and education. In addition, the tertiary education institutions offer dedicated studies in performing arts - for example, jazz courses by the Jazz Institute Berlin (JIB) and contemporary dance courses by the Co-operative Dance Education Centre.

The JIB was established in 2005 through a fusion of the jazz departments of the Berlin University of the Arts (UdK) and the Hans Eisler College of Music. This concentration of capacities has enhanced the institution’s status in the international creative scene. The JIB strives to assist each student to find his/her own artistic identity as a jazz musician. The JIB provides individual free spaces that allow for exchange of attitudes and ideas. In addition to musical knowledge which is diverse and cross-cultural, international networking offers students important professional points of contacts. The Berlin Jazz scene and the music industry both benefit from the JIB. In the Winter semester, the JIB moves into its own building on Einsteinsufer which was renovated with European Union funding. Its centre piece is a concert hall that seats 300 guests. There is also a professional sound studio with excellent acoustics, rehearsal rooms and a caf  teria.

The Co-operative Dance Education Centre, created in 2006 at the initiative of the Berlin Senate, a collaboration of the Berlin University of the Arts and the Ernst Busch School of Performing Arts integrates education and vocation in contemporary dance and choreography. The centre is financially supported by the Berlin Senate, the Foundation for Cultural Training and Consultation as well as by Tanzplan Deutschland. This approach and form of institutional anchoring has been nationally recognised as a model for Arts’ education. The UdK offers a non-consecutive postgraduate Masters programme entitled “Art in Context” and directed at people who seek to position their artistic work in the context of society. The “Art in Context” Programme was first established in 2002 and offers four specialisations: artistic work with social groups, artistic work with cultural institutions (including art museum studies), artistic work in public spaces and artistic work in the context of media and academia. The institute has 70 to 80 students of whom 60% are non-German, and almost 75% female. The institute co-operates with different partners, such as museums, city institutions and private organisations.

Source: OECD (2010c), Reviews of Higher Education in Regional and City Development: Berlin, Germany, OECD, Paris.

In conclusion, this organisation has enabled tertiary education institutions to contribute, together with state and municipal governments, to promoting culture in the region, and to set itself up as a model for intervention by the tertiary education sector and of how institutions can create a synergy directed towards development. The actions by tertiary education institutions could be adopted as a model for other areas of social development.

Another way in which tertiary education institutions can contribute to the development of cultural and creative industries is the case of applied science universities in Berlin that have formed a synergy with the cultural community to develop creative industries in areas such as design, advertising and the performing arts (see Box 4.9).

Conclusions and recommendations

Antioquia has one the most dynamic economies of Colombia, with a GDP per capita, Human Development Index (HDI) and growth rate above the national averages. Nevertheless, its main challenge remains to generate inclusive growth: to combine economic growth with social equity for the successful and enhanced development and integration of the region. Lack of equity, high levels of disparity in regional development, extreme poverty and violence are crucial problems to be addressed by all social and governmental stakeholders, including the tertiary education sector. This latter is an asset for the region with a good number of quality institutions and a participation rate higher than the national and even Latin American averages. Unfortunately, it tends to reproduce the same disparity as social and economic development, with the Metropolitan Area concentrating 42 out of the 52 tertiary education institutions and 96.7% of the enrolment, and an access rate of 47.7% in contrast with 12.43% in rural areas. As a result, this imbalance poses important challenges for expanding the sector.

Tertiary education institutions in Antioquia have responded in accordance with their own specific mission to the social, cultural and environmental needs of the region. A very positive, constructive and supportive attitude from the whole sector is observed. In their mission and development plans, all tertiary education institutions include contribution to the social and cultural development. There is an impressive range of initiatives, such as providing scholarships for students from low socio-economic backgrounds; providing health services to the community and undertaking research in public and clinical health; promoting a wide variety of culturally-specific programmes and infrastructure, such as museums, libraries, theatre groups and sporting facilities; contributing with education and community outreach to sustainable development; fostering local

development with innovative entrepreneurial approaches; and in general, encouraging faculty and student involvement in outreach activities. Tertiary education institutions are strongly contributing with their projects to widening access to students from the lowest quintiles and to the development of local communities by bringing in the training and knowledge required for the definition and implementation of regional strategies.

Although there is some evidence of success in collaboration between tertiary education institutions and governmental areas in the design of public policies, the challenges of implementation and synergy are sometimes neglected at this stage. There is also a lack of co-ordination among actions, programmes and plans amongst the Department of Antioquia, the municipality of Medellin and tertiary education institutions.

There is a considerable underutilised potential in this area. In most cases, tertiary education institutions' activities are supply-driven, rather than demand-led, and based on regional needs. There is scope for stronger collaboration to build joint capacity and to foster joint efforts for regional development. Currently limited resources are spread thinly. Interventions remain isolated, poorly co-ordinated, project-based and dependent on short-term funding with limited collaborative mechanisms among tertiary education institutions themselves.

Success, failure and impact of the different initiatives are difficult to assess, as universities have not yet set up systematic structures for the monitoring and follow-up of projects and programmes.

The OECD review team recommends that the following measures are taken to promote further social, cultural and environmental development in Antioquia:

Recommendations for the national government

- Extend the obligation of tertiary education students in health and law to contribute to social development to all students to multiply interventions and to address social problems with an innovative, multi and transdisciplinary approach.

Recommendations for the departmental level

- Create a forum for the systematic exchange of information and experience amongst tertiary education institutions with regard to social, cultural and environmental matters. This forum could organise thematic events with regular information retrieval and exchange facilitated by a dedicated website. The forum would permit the tracking and monitoring

of different initiatives and their outcomes, along with the identification of best practices for publication and policy fine-tuning. As a first step, all the social initiatives and projects of tertiary education institutions should be mapped and published in a shared platform. Build on existing examples of good collaboration between universities and the Department of Antioquia, most notably the “Cultural Round Table of the Institutions of Tertiary education” (*Mesa Cultural de las Instituciones de Educación Superior*), that could be used as a model for collaborative and joint intervention in other areas.

- In collaboration with a wide range of public and private stakeholders, widen access to tertiary education for the rural population. This should build on successful initiatives, such as the Regionalisation Programme of the University of Antioquia that brings educational infrastructure and services to rural areas and leads the expansion of virtual education. Facilitate connectivity and access to digital devices, virtual learning materials and well trained personnel.
- In collaboration with the tertiary 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 for the culturally 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 training, growth, productivity and employment. This strategy should address the needs of the culturally diverse populations in the region and also enhance Antioquia’s internationalisation.
- Incorporate tertiary education institutions into the governmental bodies responsible for public health and ensure that municipalities do the same in the committees of epidemiology. Encourage tertiary education institutions to address public health problems in a preventive, multi-dimensional and interdisciplinary way, and not only by generating specialised knowledge and providing services through their human and medical infrastructure. Make child mortality, high rates of adolescent pregnancy and other issues of the regional health agenda, such as occupational security and solid waste management, priority areas for this collaboration.
- Collaborate with the public and private sector to support sustainable environmental and economic development through a comprehensive regional approach, where tertiary education institutions can contribute to the diagnosis of regional environmental conditions and

sustainability, the ecological education for the community at large and research on solutions to existing environmental problems.

Recommendations for tertiary education institutions

- Improve the monitoring and follow-up of the success and results of their initiatives, projects and programmes to show the return on public investment. The lack of robust and comparable data constrains the visibility and impact of universities' activities. It also makes it difficult to measure the real success or failure of programmes.
- Align initiatives for social, cultural and environmental development with the plans designed by national and sub-national authorities in order to have a stronger impact at the local and regional level. Collaborate with other tertiary education institutions in the design and implementation of extension activities.
- Develop the international dimension of extension activities in order to maximise their potential impact and promote exchanges and networking with other parts of the world that are experiencing similar problems. Mobilise international co-operation and networks for the social, cultural and environmental development of the region.
- In addition to widening access to education and providing services to disadvantaged communities, make use of the social service obligations to engage in long term community development by seeking ways to empower communities to find their own solutions to economic, social, cultural and environmental challenges.

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Chapter 5:

Capacity building for regional co-operation

Interactions between tertiary 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 tertiary education institutions.

The extent to which tertiary education institutions are engaged in regional human resource development and innovation also depends on the policy context relating to financing, regulation and institutional and national policies.

This chapter examines the capacity and capacity building in the local and regional agencies of Antioquia and its tertiary education institutions. It highlights the capacity in the institutions and processes in light of the efforts made by the regional and local actors and tertiary education institutions. It examines where policies and practices can be improved. The chapter concludes with recommendations on how to improve regional co-operation.

Introduction

Antioquia is one of the oldest territorial entities in Colombia is divided into 125 municipalities and comprises 9 sub-regions which demonstrate significant disparities in terms of economic and human capital development. The Valley of Aburra contributes with 70% to Antioquia's GDP, while the contribution of the other eight sub-regions varies from 8.3% for the Eastern sub-region to 1.4% for the Magdalena sub-region. There is a concentration around Medellín and the metropolitan area in terms of industry, tertiary education, R&D, basic infrastructure and capacities for local and regional development. At the same time, more than 50% of the population in the metropolitan area lives in poverty and nearly 60% works in an informal labour market or is under-employed.

Since 1997, Antioquia has had a long term shared vision: "In 2020, Antioquia will be the best corner in America, fair, peaceful, educated, thriving, and in harmony with nature". The Antioquia 21st Century vision has contributed to closer collaboration and co-ordination among key stakeholders in the region. It has facilitated the identification and assessment of the strengths and opportunities of the region.

In order to fulfil this vision, the Strategic Development Plan of Antioquia-PLANEA was developed in 2002 through a co-ordinated exercise with key public and private stakeholders. The Strategic Development Plan has been approved by the Departmental Assembly with the support of more than 600 leaders of the community. The implementation of the Strategic Development Plan of Antioquia-PLANEA is the responsibility of a steering committee chaired by the Antioquia's Governor, involving representation from more than 40 public and private stakeholders of the region, including 3 university rectors (University of Antioquia, Medellín University and National University of Colombia-campus Medellín).

One of the goals of the Development Plan of Antioquia 2008-11 (Antioquia for everyone, hands on) is balanced development through the improvement of economic, social, environmental and cultural conditions of the sub regions. The plan also seeks to consolidate an "articulated, coherent, well-communicated, and efficient cultural and education system that encourages human capital and leadership development of Antioquia, and that effectively contributes to achievement of the social, economic, political and institutional goals of development". It establishes goals to be achieved by the tertiary education institutions emphasising the quality of academic programmes and academic staff, development of applied research projects and access to tertiary education. The plan stresses the importance of collaboration to support the development processes.

The challenges of Antioquia call for collaborative action from tertiary education sector which consists of a diverse range of public and private institutions to work in partnership with the regional stakeholders to develop skills, build human capital potential and capacities for R&D in the key areas for the region.

In this context, this chapter examines key questions:

- Does the Government of Antioquia have a clear strategy for the development of the tertiary education and capacity to steer the sector to meet the needs of Antioquia?
- Is the tertiary education in Antioquia co-ordinated and governed in an appropriate way to address the needs of the region?
- Do the current structures and mechanisms for co-ordinating the projects and activities of tertiary education institutions help to maximise their impact on the development of Antioquia? Do they support collaboration between and amongst institutions?
- Do the current mechanisms in Antioquia drive the local and regional engagement of universities and other tertiary education institutions? Do they foster inter-institutional collaboration for capacity building and the alignment of institutional policies and activities with regional and local needs?

5.1. Governance of Colombia and Antioquia

Colombia is a presidential representative democratic republic, whereby the President is both head of state and head of government. Executive power is exercised by the government. Legislative power is vested in both the government and the two chambers of congress, the Senate (86 members) and the House of Representatives of Colombia (166 members). The Judiciary is independent of the executive and the legislature.

Colombia is formed by 32 departments (sing. *departamento*) and a Capital District (*Distrito Capital*) i.e. the country's capital, Bogotá. Each department has a Governor (*gobernador*) and a Department Assembly (*Asamblea Departamental*), elected by popular vote for a four-year period. The governor cannot be re-elected in consecutive periods. Departments are county subdivisions and enjoy a certain degree of autonomy.

Departments are formed by a grouping of municipalities (sing. *municipio*). Municipal government is headed by mayor (*alcalde*) and

administered by a Municipal Council (*concejo municipal*), both of which are elected for four-year periods.

One of Colombia's departments, Antioquia is divided into 9 sub regions to facilitate the Department's administration. These 9 sub-regions contain a total of 125 municipalities. Antioquia executes its autonomy in the management of sectoral issues and in the planning and promotion of economic and social development within its territory. Furthermore, Antioquia exercises functions in terms of co-ordination, management and implementation of services required by law. (See Table 5.1).

Table 5.1. The governance structure of Antioquia

Governor (<i>Gobernador</i>)	<p>The Governor is elected every four years by universal suffrage. He is the representative of the President of the Republic in the department in charge of the economic policy and the maintenance of public order.</p> <p>Functions: to lead and co-ordinate national services; to prepare regional development policies; to formulate programmes and plans for economic and social development; to prepare the regional budget proposal; to construct public facilities; to promote activities to enhance cultural, social and economic development etc.</p>
Departmental Assembly (<i>Asamblea Departamental</i>)	<p>The Departmental Assembly exercises political control on regional (departmental) government acts, and is constituted by 25 members elected every four years by universal suffrage.</p> <p>Functions: To regulate the exercise of functions and the provision of services by the Department. To issue provisions relating to planning, economic and social development, financial and credit support to municipalities, tourism, transport, environment, public works, roads and development within its border area. To manage taxes and contributions necessary for the performance of departmental functions, to create and dissolve municipalities, to authorise the governor of the department to draw up contracts, negotiate loans, etc.</p>
Government of the Department of Antioquia	<p>Functions: to enforce the Constitution of Colombia, laws, decrees and ordinances of the departmental assemblies, to direct and co-ordinate national services.</p>
IDEA Institute for the Development of Antioquia	<p>Functions: to promote development and to offer services such as financing, fund-raising, resource management, consulting and training on management, finance and budget, as well as identification and structuring of projects. These functions enable it to act as a Local Development Bank.</p>

Table 5.1. The governance structure of Antioquia (continued)

Secretariat of Education	Functions: to formulate and co-ordinate education policy, to co-ordinate the development of an educational plan for the territory under its jurisdiction, to oversee teachers and administrative staff; to manage the provision of public education at preschool, primary and secondary levels; and to inspect and supervise education to ensure quality, access and equity.
Municipal Council (125) (<i>Concejo municipal</i>)	The municipal council consists of 7-23 members, elected every four years through universal suffrage. Functions: to regulate the areas and their efficient functioning of the public services for which the municipality is responsible; to approve the corresponding plans and programmes to enhance social and economic development; to make regulations required to preserve the cultural and environmental assets of the municipality etc.
Municipal Mayor (<i>Alcalde</i>)(125)	Mayors are elected every by popular vote four years. Functions: to maintain public order; to ensure the allocation of resources and the implementation of public services; to present to the Municipal Council the proposed plans and programmes for social and economic development and for the requested annual budget. Mayors are responsible for administering the territory under their jurisdiction and provide public services that are established by law. Mayors are also responsible for developing projects that are necessary for municipal progress; they promote community participation and social and cultural improvement of their constituents. They plan economic, social and environmental development in compliance with the law and in co-ordination with other entities; they solve problems related to health, education, sanitation needs, water, housing, sports. These responsibilities can be accomplished directly and/or in co-ordination with other local and national authorities.

Source: Colombian Political Constitution, www.comisionseptimasenado.gob.co/Copy%20of%20PDF, accessed 27 June 2011.

5.2. Tertiary education steering, governance, autonomy and accountability

Steering

The Colombian tertiary education system is steered by the National Ministry of Education. It is characterised by many agencies and coordinating bodies, see Chapter 1 for tertiary education agencies.

The national government is responsible for the overall co-ordination of the tertiary education sector, for its international representation, and for the co-ordination and awarding of scholarships and grants. Supported by the Higher Education National Council, the central government is also responsible for inspecting and monitoring tertiary education institutions.

The National Congress, the Departmental Assemblies, and the District or Municipal Councils are in charge of establishing tertiary education institutions, subject to the National Education Council's approval. Also plans to create branch campuses must be approved by the National Ministry of Education with advice from the National Tertiary educational Council.

Public tertiary education institutions in Colombia can be national, departmental, district or municipal. National institutions are linked to the National Ministry of Education, departmental institutions to their respective governments and district and municipal institutions to their corresponding mayoral jurisdiction.

Autonomy and accountability

The Constitution of Colombia grants autonomy for universities (Art. 69) and for the other tertiary education institutions in their respective fields (Law 30 of 1992). Autonomy allows institutions the right to modify their statutes; designate academic and administrative authorities; define and organise training, academic, teaching, scientific and cultural activities; grant the corresponding degrees; select teaching staff and admit pupils; establish the administrative regime; administer and allocate resources to comply with their mission and their institutional function. However, technical or technological departmental or municipal institutions have restricted financial autonomy.

Despite this autonomy, tertiary educational institutions are under the inspection, control and supervision of the State. The National University of Colombia (Universidad Nacional de Colombia) is the exception, as it has its own particular law (Extraordinary Degree, 1210 of 1993), which confers full autonomy.

Autonomy can bring significant benefits to tertiary education but also challenges. It can help institutions to be more responsive to regional needs by allowing new study programmes to be implemented and developed more rapidly. It can reduce administrative costs and remove need for supervision and reporting requirements. At the same time, autonomy can make it difficult to respond to national needs and priorities. It can lead to mission drift, if institutions are free to pursue their own ambitions without consideration to public need and cost.

Affective tertiary education systems need to counter balance the autonomy with information reporting systems and accountability of the institutions to stakeholders and funders, including students, employers, the wider public and the government.

OECD/World Bank review (2012, forthcoming) noted that the Colombian tertiary education system has a satisfactory level of institutional accountability, but significant accountability gaps. While the National Ministry of Education is making the national priorities and needs transparent, it is not always able to steer the system. This became obvious when the proposal to reform Law 30 was rejected.

Governance of public universities

Most Colombian tertiary education institutions, particularly universities, have a traditional governance structure. Law 30 prescribes in detail the governance model of public universities and of other types of tertiary education institutions. While each university has a governing board (*Consejo Superior*), an Academic Council and a rector, other types of tertiary education institutions have a rector, an Executive Council and an Academic Council. (See Box 5.1.)

The State and the academic community must be represented in the governance of all public institutions.

While in public universities the rector is appointed by the governing board, in all other types of public tertiary education institutions, the rector is appointed by the president of the republic, the governor or the mayor, depending on the institution's territorial nature. The governance structure of private tertiary education institutions is similar to that of public institutions.

Law 30 envisages the creation of a National State Universities System of all public universities in Colombia to: *i*) optimise resources; *ii*) implement students and teachers' mobility; and *iii*) offer joint academic programmes. During the OECD review visit, there was no evidence of a similar system in the region. Apart from the "Group of Eight", a cluster of eight public and private tertiary education institutions accredited by the National System of Accreditation that promotes collaboration among institutions and represents their interest *vis a vis* the National Ministry of Education and the regional and municipal governments, the public universities in Antioquia have limited collaboration amongst them.

Box 5.1. Public university governance in Colombia

The Governing Board, made up of nine members, is the executive organ that leads and governs public universities. For national universities, the board is presided over by the National Minister of Education and for departmental or municipal universities, by the governor or by the mayor, respectively. It consists of the rector, a member designated by the Colombian President and one representative member of each of the following sectors: academic staff, board of academic directors, students, graduates, the economic sector and former rectors of the university. The board is responsible for the election of the university's rector. It is also in charge of approving the university's organisation and statutes, budget and academic, administrative and planning policies.

The Academic Council is the academic authority of the university. It is chaired by the rector and its members include representatives of deans, the board of academic directors, academic staff and students in a proportional structure established by the statutes of the university. The Academic Council is responsible for the academic development of the institution and for the design of academic policies with regard to academic staff and students.

The rector is the university's legal representative and executive authority. The rector's appointment process, as well as the requirements and competencies that need to be fulfilled by this position, are stated in the university statutes.

Source: Law 30, 1992. [www.minieducacion.gov.co/1621/w3-property value-43808.html](http://www.minieducacion.gov.co/1621/w3-property+value-43808.html), accessed 27 June 2011.

Resource allocation and generation

Colombian public universities' funding arrangements are defined in Articles 86 and 87 of Law 30 of 1992. Article 86 spells out that the government funding will be based on their 1993 revenues and costs, inflation-adjusted. Since this does not allow for other changes, such as increases in student numbers, Article 87 provided for general increases in government contributions corresponding to at least 30% of the percentage increase in annual GDP growth. The National Ministry of Education has developed a model for calculating the contribution to each university: the model takes account of staff numbers, student enrolment and research output, among other things. All types of tertiary institutions other than universities are funded through direct central or local government contributions from their sponsoring Ministry.

In tertiary education the Colombian government follows a traditional, conservative resource allocation approach. With the exception of the

resources dedicated to student loans, the budget that tertiary education institutions receive is linked only marginally to performance measures, and the direct transfer of public funds to universities and other tertiary institutions is principally based on historical trends and negotiations. The funding allocation model does not take unit costs into consideration, which means that no allowance is made for the distribution of students by levels (undergraduate and graduate students) and academic programme. The model does not reward institutions for efficiency (minimising dropout, maximising completion rates) or relevance (employment outcomes of graduates), and does not even meet the additional costs that institutions incur as a result of increases in the number of enrolled students.

The present pattern of public resources distribution is characterised by considerable disparities across different types of tertiary education institutions and between public universities. Public non-university institutions in Colombia are overwhelmingly under-financed (2%), compared to 56% in Australia, 42% in the US, 59% in Canada, 48% in Germany, 44% in Korea. There is also an unequal distribution of government subsidies and per student budget contribution among the 32 public universities in Colombia. Depending on the public university which they attend, Colombian students receive widely different levels of government subsidies, ranging from less than USD 120 to USD 8 000. The country's top three public universities, Universidad Nacional, Universidad de Antioquia and Universidad del Valle, receive about 47% of all transfers, but enrol only 21% of the total student population attending a public university.

Colombian public universities and non-university institutions have two principal funding sources to supplement the government's budgetary contribution: tuition fees and income generation from contracts and donations. Even though tuition fees in Colombian public universities are about 6 times less than in private ones, they are significant compared to most Latin American countries. Other income sources include donations, contract research, consultancies, continuing education and other miscellaneous activities. Some universities also benefit from dedicated fiscal resources. For instance, Law 122 of 1994 authorises the issue of special administrative stamps to benefit the University of Antioquia, for an annual value not to exceed COP 200 million (about USD 100 000). The resources generated through the sales of these special administrative stamps are dedicated to investment, infrastructure maintenance, sport and arts equipment, ICT, libraries and laboratories.

The proportion of self-generated resources in Colombian public universities, including tuition fees and research contracts, amount to 45% of their total income. This represents significant progress over the past two

decades, up from 18% in 1993 and 27% in 2003. The income generation performance of Colombian public universities is above the average of Latin American countries as well as many OECD countries.

5.3. Strategy for regional development: instruments at regional and local level

Antioquia has a significant number of strategy documents for regional and local development, such as: Antioquia 21st Century vision, the Strategic Development Plan of Antioquia-PLANEA, the Development Plan of Antioquia 2008-2011, the Development Plan of Medellín 2008-2011 and regional development plans. Despite the lack of mechanisms to implement, monitor and evaluate these plans, they have facilitated the development of a shared vision for local and regional development, identification of strengths and weaknesses and mobilisation of key partners for regional development.

Antioquia 21st Century vision

The shared vision of Antioquia's future was established in 1997 and was preceded by the Monitor Study and the project Antioquia 21st Century. The vision was developed as a collaborative effort between key regional stakeholders on the basis of a SWOT analysis (strengths, weaknesses, threats and opportunities). Antioquia 21st Century vision has contributed to agreements among different sectors and the sub-regions about long-term goals. The project is promoted by the Competitiveness Corporation Council of Antioquia, which is a private non-profit organisation bringing together the public, social, private and academic sectors. The Council's mission is to promote structural change and the empowerment of Antioquia's sub-regions through discussion and decision-making forums.

Antioquia 21st Century Vision has also served as the basis of the development scenarios and policy orientation schemes in 12 sectors (education, economic, cultural, business management, infrastructure, environment, communication media, public sector, capital resources, health, social development, and peace and coexistence) and Antioquia's nine sub-regions, which manage a portfolio of key strategies that involve the participation of the education sector (see Box 5.2.).

In practice, however, the extent to which tertiary education institutions are involved in the planning, development and implementation of the Antioquia 21st Century Vision has remained marginal, confined to some specific tasks. In general, the tertiary education institutions do not have an agenda to contribute to the achievement of the goals of this vision, nor are

there any clear efforts from the Government of Antioquia to engage the institutions.

**Box 5.2. Antioquia 21st Century Vision.
Key strategies involving the tertiary education sector**

- Engage tertiary education institutions as partners of Antioquia’s vision.
- Improve the quality and coverage of education provision.
- Strengthen Antioquia’s tertiary education sector academically, institutionally and operationally.
- Create mechanisms to link public, private and non-governmental sectors and universities to improve Antioquia’s competitiveness and productivity and to maximise its capacity for regional development and collaboration.
- Create effective science and technology development system.
- Establish effective knowledge generation and sharing systems.
- Encourage tertiary education institutions to develop clean technologies.
- Establish strategic alliances to enhance the development processes among the public and private sectors and academia that have common or complementary projects to optimise resource allocation.
- Encourage stronger participation by tertiary education institutions in the financial sector and in capital markets.

Source: Vision Antioquia 2020 (1999), Competitiveness Corporation Council of Antioquia, www.visionantioquia.org

The Strategic Plan of Antioquia-PLANEA

The Strategic Plan of Antioquia-PLANEA is the basis of a dynamic regional planning process that steers decision making and actions of regional participants in order to achieve shared targets. PLANEA was formulated by the Antioquia’s Government Planning Management Department as a response to the regulations issued by the Departmental Assembly in 1998 and has undergone several reiterations since then.

The Strategic Plan identifies four strategic action lines to achieve the goals set by the Antioquia Vision by 2020: *i)* strengthening Antioquia, *i.e.*

developing capacities, management models and administrative structures to strengthen regional autonomy and to contribute to local and regional development; *ii*) promoting change to achieve equitable and sustainable human development, which calls for a comprehensive and well functioning education sector; *iii*) revitalising the economy of Antioquia by knowledge, advanced technologies and high-quality resources; and *iv*) rebuilding the community, *i.e.* the strengthening of public and private institutional networks, and their relations with Antioquia's governing bodies.

The implementation of the Strategic Plan of Antioquia is the responsibility of a steering committee which consists of leaders from public and private entities, non-governmental organisations and three university rectors (University of Antioquia, National University of Colombia-Medellin campus, and Medellin University). The Strategic Plan does not identify explicit targets and tasks to institutions to contribute to the achievement of its objectives.

Despite progress made, Antioquia's government and stakeholders should seek a wider and more active participation of tertiary education institutions in the development of the Strategic Plan of Antioquia itself and in the definition of priority areas for RDI, skills development and inter-institutional collaboration for capacity building, and local and regional development. Targeted policies and incentives to institutions, their faculty and staff members are required to mobilise them.

The Development Plan of Antioquia 2008-11

The Development Plan of Antioquia 2008-11 establishes a set of policies based on five strategic action lines to welfare of the regional population and balanced intra-regional development. The plan perceives education as a key tool to achieve regional development and highlights the need "to consolidate an articulated, coherent, well-communicated and efficient departmental cultural and educational system that promotes the human capital and leadership development of Antioquia and that effectively contributes to the achievement of the social, economic, political and institutional goals of development".

In order to achieve its goals, the Development Plan of Antioquia 2008-2011 has identified targets for tertiary education institutions (see Table 5.2) and has established a programme called Synergy (*Sinergia*) which is focused on: *i*) creating and strengthening the pathways among medium-level education, technological education, work-based training and tertiary education; *ii*) generating education provision to meet the needs of the labour market in municipalities; and *iii*) establishing a region-wide board to promote a process of co-ordination and integration of the local education

sector. At the time of the review visit, the implementation of the *Sinergia* programme was still in its early stages and the board had not yet been established. Both measures are essential for the development of the regional tertiary education system in Antioquia.

The Development Plan of Antioquia 2008-2011 also stresses its commitment to develop a science and technology system to co-ordinate effort to promote strategic development fields in Antioquia and its sub-regions.

In the absence of mechanisms to co-ordinate and promote planning activities which ensure the involvement of tertiary education institutions in regional development, it is not clear how the Government of the Department of Antioquia mobilises tertiary education institutions to pursue the strategic goals. Moreover, the budget allocation mechanism does not boost the alignment of academic programmes with regional needs and priorities, nor the engagement of university faculty and staff in the achievement of the strategic goals of the development plan.

The Government of Antioquia should encourage collaboration among tertiary education institutions and support joint projects that address regional needs and build capacities for regional collaboration. It could also consider a new model for allocating funds which would bring better results with regard to engaging tertiary education institutions in the achievement of the strategic goals of the development plan and the establishment of an effective scheme to monitor and assess institutional impacts and tertiary education institution engagement in regional development.

Table 5.2. The Development Plan of Antioquia 2008-2011
Specific goals for tertiary education institutions

Tertiary education institution	Indicator	Goals
University of Antioquia	Percentage of accredited academic programmes	85
	Self-evaluated academic programmes	60
	Percentage of professors with a PhD degree	36
	Percentage of professors with a Master degree	70.1
	Recognised research groups by Colciencias	A= 20 B=25 C=30
	Dropout rate	23%
	Applied local and regional research projects	13
	International agreements and/or alliances to strengthen undergraduate and postgraduate programmes, and research	4
Politecnico Jaime Isaza Cadevid	Percentage of accredited academic programmes	44
	Self-evaluated academic programmes	8
	Percentage of professors with a PhD degree	9
	Percentage of professors with a Master degree	70
	Recognised research groups by Colciencias	A=6 B=9 C= 3
	Dropout rate	1.89%
	Professors involved in an academic committee or commission	60
	Applied local and regional research projects	4
	Courses delivered with the support of ICT	27%
	Students attending courses that are supported by ICT	4.50%
	Agreements and/or alliances to improve quality	4
Technological Institute of Antioquia	Percentage of accredited academic programmes	33.3
	Self-evaluated academic programmes	6
	Percentage of professors with a PhD degree	5.88
	Percentage of professors with a Master degree	82.6
	Recognised research groups by Colciencias	A=1 B=4 C= 1
	Dropout rate	9%
	Professors in an academic committee or commission	2
Technological Institute of Antioquia	Applied local and regional research projects	52
	Agreements and/or alliances	4
CERES	Supported centres	9
Tertiary education sector	Students enrolled in the main campus	30 000
	Students enrolled in a branch campus	8 000
	Programmes linked to the Academic Mobility System of tertiary education institutions	9 000
	Tertiary education participation rate	32.5%

Source: Development Plan of Antioquia 2008-2011, (2008), Government of Antioquia. www.antioquia.gob.co/index.php/plan-de-desarrollo, accessed 27 June 2011.

The Development Plan of Medellin 2008-11

The main objective of the Development Plan of Medellin 2008-11 is to reduce poverty and to contribute to a better quality of life for the population groups which have not benefited from the growth and development. The plan emphasises the need to increase opportunities to access high quality tertiary education in technical and technological fields in order to increase the competitiveness of Medellin.

The Plan aims to strengthen the development of strategic and other sectors that could potentially drive the economic and social development of the city and the region (textile/clothing; fashion and design; construction, electricity; specialised health services; business tourism; fairs and conventions; software development; forest products; processed food; machinery and equipment and logistics and cargo transportation).

Furthermore, the Development Plan emphasises the need to implement the Culture E Programme as a key strategy to attract and retain businesses in Medellin and in the Valley of Aburra with focus on education, work training, support in the establishment of companies, strengthening business structure and funding and innovative processes. In order to achieve its objectives, the Development Plan identifies specific goals for tertiary education institutions, particularly for municipal institutions (Table 5.3).

Despite the progress made, the lack of co-ordination for the development of the strategic plans of Antioquia and Medellin remains a challenge. Taking into account that the municipality of Medellin is a major contributor to the development of Antioquia's economy and society, a stronger co-ordination of governing bodies at different levels is needed. As well, it is necessary to formulate a joint action plan to articulate and enhance capacity to achieve stated goals and to promote inter-institutional collaboration for regional and local development within the tertiary education sector.

The governing bodies of Antioquia and Medellin could consider a more competitive way of allocating their funding to mobilise regional and municipal tertiary education institutions for the goals of the development plans and to foster inter-institutional collaboration.

Table 5.3. The Development Plan of Medellín, 2008-2011**Specific goals for tertiary education institutions**

Tertiary education institution	Indicator	Goals
Major College of Antioquia	Undergraduate and postgraduate programmes with certified registration	10
	Self-evaluation processes used for every tertiary education programme	4
	Programmes with high-quality accreditation	2
	Students enrolled in every programme offered by the institution	1 310
	Permanent professors qualified to work in virtual environments	21
	Research groups recognised by Colciencias	3
	Projects implemented to acquire academic resources and physical infrastructure	5
Metropolitan Technological Institute	Students enrolled in tertiary education	23 600
	Retention rate in tertiary education	90%
	Rate of women participating in tertiary education	46%
	Quality certification ISO-9001 and NTCGP-1000	1
University of Antioquia	Quotas for professors' bilingual training	2 224
Tertiary education sector	Tertiary education participation rate in the metropolitan area for 18-24 year olds	36.50
	Professors receiving municipal support to complete postgraduate studies	90

Source: Development Plan of Medellín 2008-2011(2008). Municipality of Medellín. Official Gazette. Num 3 261. 6.5. The Tertiary Education sector as partner in Antioquia's development.

5.4. Tertiary education institutions

Antioquia has a diverse tertiary education sector including 7 universities, 23 “university institutions”, 10 technological institutes and 1 vocational institution. Out of the overall number of 41 institutions in the department, 29 are located in Medellín, 7 in Antioquia's metropolitan area (in the municipalities of Envigado, Caldas, Bello, Sabaneta and Copacabana), and the rest of the institutions in five of the remaining 117 municipalities (Rionegro, Santa Rosa de Osos, Marinilla, Santa Fe de Antioquia and Apartado). In addition to main campuses, tertiary education is

also provided through 12 regional branch campuses (*seccionales*), nine belonging to universities and three to university institutions.

The public tertiary education institutions in Antioquia include:

- Three regional institutions, *i.e.* University of Antioquia, Technological Institute of Antioquia, and Politecnic Jaime Isaza Cadavid.
- Four municipal institutions, *i.e.* Mayor College of Antioquia, Pascual Bravo Technological Institute, Metropolitan Technological Institute and Envigado’s University Institution.
- Two national institutions, *i.e.* National University of Colombia (campus Medellin), and the School of Public Administration.

Antioquia’s metropolitan area hosts 94% of the total number of students enrolled in the region’s tertiary education sector. Seven institutions - four public and three private – represent 60% of the enrolment. This results in a concentration of the regional capacity for capital human capital development, RDI and inter-institutional collaboration.

Antioquia and its tertiary education sector have made considerable strides in widening access to education (through the programmes entitled “Equity in Participation” and “Expansion of the Technical and Technological Education”) and also in strengthening university-industry collaboration. (See Chapter 1 and 2 for details.)

However, despite the progress made, the tertiary sector in Antioquia does not seem to operate as an integrated system. There is a co-ordination deficit within the sector and an absence of an underlying culture of collaboration to build capacities and to support the development of joint projects that address regional and local needs. Each tertiary education institution is delivering its own range of activities and services with limited co-ordination or collaboration and without mechanisms to share good practices. There appears to be a limited number of links between universities and technological institutions, which has a negative impact on regional and local development. There is also a lack of capacity among tertiary education institutions to promote collaboration around projects that address regional and local needs and pursue regional development objectives. Most institutions respond more to national initiatives than to regional or local ones.

According to Law 30, tertiary education institutions should formulate institutional development plans that address local and regional strategies. It is unclear how this task is performed by the institutions in Antioquia and what mechanisms exist for monitoring the plans. In general, institutional

development plans do not seem to be aligned with the strategic plans of the region; nor is regional and local engagement acknowledged as the mission of the institutions. Furthermore, inter-institutional collaboration is not addressed in university strategies. Tertiary education institutions should recognise that they could do more for regional and local development through collaborative efforts and by aligning their activities with regional priorities. The lack of robust data and information impedes the assessment of institutional impact on regional and local development and also evaluation of the success of various initiatives, projects and programmes.

To address the challenges of Antioquia, there is a need to develop a tertiary education system in which institutions work together and in partnership with the region in order to build human capital potential and capacities both for R&D and for local and regional development. The existing gaps could be bridged through establishing a set of co-ordinated and targeted policies at the national, regional and institutional levels. Without an explicit regional development task assigned to tertiary education institutions in Antioquia, regional and local engagement is basically left up to the initiative of individual institutions. Regionally and locally relevant activities are often perceived by tertiary education institutions as the “third mission” and not clearly linked to research or academic subjects.

The tertiary education institutions in Antioquia should embrace a more holistic approach to regional engagement, create systematic mechanisms to monitor and evaluate their activities in this area, share good practices with other institutions and benchmark this experience with regard to other institutions. To drive the regional agenda, institutions could consider adopting several effective measures: training staff with a specific knowledge of regional development, tangible incentives to mobilise academic and administrative staff to engage in activities which benefit regional and local development and a specific office mandated to manage regional interface. In addition, regional engagement needs should be considered as part of the institutional vision, planning, development and resource allocation. The University Rovira i Virgili in Catalonia offers a good example of institutional policy and strategy which support the regional and local engagement of tertiary education institutions and of their faculty and administrative staff (see Box 5.3).

Box 5.3. Rovira i Virgili: Creating incentives for faculty participation in third mission activities

The University Rovira i Virgili in Tarragona has an active third mission agenda, including entry points for small and medium-sized enterprises (SMEs) into the university knowledge base, social and cultural programming in 22 cities in southern Catalonia and active participation in fostering a knowledge-based petro-chemical industry cluster in the sub-region.

Contracts for the university faculty recognise their importance in these outreach efforts and give value to their participation. The university faculty contract has been re-organised around a system with a ten-point base.

All faculty are expected to undertake research and to teach with the minimum contractual obligations constituting six of the expected ten points. To reach the expected ten points, faculty can contribute in a variety of ways, according to their interests and expertise. For some faculty, this may mean giving presentations in programmes in which the university is developing a presence. For others, it may mean working with a SME to implement a technology transfer or technology commercialisation project. For other faculty, reaching the ten points may mean additional research and publication.

The goal of this governance strategy is to set a base expectation for faculty performance in core activities. This evaluation method also creates the flexibility to allow faculty to contribute in arenas related to the university's goals which expand its third mission activities. All of the criteria for performance constitute a unit contributing to the ten-point base. These are publicly available and the activities of each faculty member toward achieving the base standard are available to all members of the department. The goal of the university in developing this evaluation programme is to create a more transparent and accountable institution. In future, it would be useful to give even greater visibility to the university's expertise in this area.

Source: OECD (2010), Higher Education in Regional and City Development: Catalonia, Spain, OECD Publishing. <http://dx.doi.org/10.1787/9789264089006-en>.

The Government of Antioquia has not yet developed a strategic plan for the development of the tertiary education sector in the region, although universities and other tertiary education institutions are considered to make a vital contribution to regional development. Perceived weaknesses include:

- Limited co-ordination of tertiary education institutions.
- Inadequate funding incentives to mobilise institutions to support regional development and inter-institutional collaboration.

- Weak monitoring and assessment.
- Lack of information and robust data on the impact that tertiary education institutions have in regional and local development.
- Few indicators of overall success or successful process management.

The Government of Antioquia could strengthen its role in tertiary education by the development of:

- A regional tertiary education strategy with the participation of key stakeholders from the economy and society that can help guide the development of the tertiary education sector and highlight the potential contribution of tertiary education institutions to regional and local development;
- A permanent co-ordination body linked to this strategy that brings together the regional tertiary education sector and key public and private stakeholders. This body could help define region-wide goals, policies and priorities for tertiary education, mobilise the full potential of tertiary education institutions for regional development, and organise capacity building through targeted leadership and development programmes addressing the major challenges of the region;
- A set of criteria to analyse and assess the impact of tertiary education institutions on local and regional development;
- A funding scheme to supports inter-institutional collaboration, the development of academic and research projects aligned with regional development priorities and building the capacities required of tertiary education institutions so that they can contribute to regional development. For example, the Higher Education Innovation Fund in the United Kingdom considerably increased locally relevant activities of tertiary education institutions (see Box 5.4).

Box 5.4. The Higher Education Innovation Fund (HEIF) in the United Kingdom

The Higher Education Innovation Fund (HEIF) was designed to support and develop a broad range of knowledge exchange activities which result in economic and social benefit to the UK. The fund builds capacity and provides incentives for higher education institutions to work with business, public sector bodies and third sector partners with a view to transferring knowledge and thereby to improving products, goods and services. In September 2007, the UK Government announced a fourth round of HEIF from 2008-09 with funding rising to a final year allocation of GBP 150 million for 2010-11.

Funds were provided through a formula allocation to all eligible tertiary education institutions which are released once their knowledge exchange strategy has been assessed as satisfactory. The formula was based on two components: *i*) the first component (40%) had a focus on capacity-building and tertiary education institutions' potential and was based on full-time academic staff numbers; *ii*) the second component (60%) was allocated on the basis of performance, using various measures of income from business and non-commercial sources as a proxy for the value placed on tertiary education institutions' activities by users of knowledge in the wider economy and society.

Evaluation of the use of HEIF monies suggested that it had generated significant changes to the institutional management of knowledge transfer and that the scope of knowledge transfer and exchange activities had increased. There had also been investment in development/training for academic staff and collaboration with one or more tertiary education institutions in the region.

Source: HEFCE (2009), "Higher Education Innovation Fund 4", HEFCE, Bristol, www.hefce.ac.uk/econsoc/buscom/HEIf/.

5.5. Collaboration for regional and local development

CERES - Regional Higher Education Centres

As a response to a national initiative six Regional Higher Education Centres (CERES) have been developed on the basis of collaboration of national, regional and local governments, tertiary education institutions, the local industry and civil society to support regional and local development. The National Ministry of Education has established the basis for the operation, monitoring and assessment of CERES. For the establishment and operation of a CERES, active participation from industry is required to identify the technical training needs for local and regional development. The members of the alliance contribute to the work by providing funding,

technical facilities, academic expertise or logistic support. The key objectives of these centres are to:

- Generate opportunities for social and economic development in communities by widening access to tertiary education, particularly in vulnerable communities;
- Offer high quality tertiary education programmes that contribute to the economic development of the area and respond to the region's needs identified by the alliance;
- Enhance equity by offering low-cost education provision to the population of low socio-economic backgrounds with priority to access public loans;
- Gain greater efficiency in education provision by the shared use of resources.

Even though the functioning of the CERES relies on one tertiary education institution which provides the academic and technical capacities (see Table 5.4), other institutions might also offer programmes that are relevant for the region. During the period 2004-2008, the National Ministry of Education contributed with USD 330 000 to support the operation of the CERES in Antioquia.

Table 5.4. CERES in Antioquia

Municipality	Tertiary education institution	Students
Apartadó	Politecnico Jaime Isaza Cadavid (public)	275
Bello	University Minuto de Dios (Private)	2 685
Puerto Nare	University Foundation CEIPA (Private)	43
Santa Fé de Antioquia	West Catholic Technological Corporation (Private)	258
Yarumal	University of Antioquia (Public)	312
Sansón	University of Antioquia (Public)	150

Source: Regional Higher Education Centres. National Ministry of Education, University of Antioquia,

www.colombiaaprende.edu.co/html/estudiantesuperior/1608/propertyvalue=39482.html, accessed 25 July 2011; www.udea.edu.co/portal/page/portal/portal/L.sedes/, accessed 25 July 2011; www.colombiaaprende.edu.co/html/estudiantesuperior/1608/propertyvalue=39482.html, accessed 25 July 2011; www.udea.edu.co/portal/page/portal/portal/L.sedes/, accessed 25 July 2011.

Since 2007, the National Ministry of Education has supported the self-evaluation of the CERES and the identification of good practices to achieve a higher level of efficiency in their operations and in their academic and

administrative management. However, to date, there is no publicly available information regarding the assessment of the Antioquia's centres with regard to their impact, the quality and level of engagement of industry, civil society and the academy in the operation and decision-making processes of CERES.

OECD/World Bank review (2012, forthcoming) pointed to the small scale of individual centres, inadequate resources, inefficiencies and concerns that the centres were teaching outdated technology. Given that students are paying significant fees (either with an ICETEX loan or with local government funding) the centres may not be offering good value for money. Increasing the size and resources of existing centres could achieve better economies of scale through increased demand and could also build critical mass, which could improve the quality and relevance of the programmes offered. Finally, despite the links with universities, the CERES are not well integrated in the tertiary education system.

University of Antioquia and Centres of Excellence for Research and Innovation (CIIE)

The Development Plan of the University of Antioquia 2006-2016 has established a vision to become the leading research university in the country. For this purpose, Centres of Excellence for Research and Innovation (CIIE) have been established by the University of Antioquia, bringing together an alliance amongst industries, social and governmental institutions and tertiary education institutions. The alliance is supported by a collaborative network of research groups to develop a RDI programme financed by its members. Five centres are already in operation in Antioquia. They respond to regional and national strategic topics and reflect some of the main capacities of the University of Antioquia for research and innovation: health, energy, biotechnology, and ICT (see Table 5.5). Through these centres, a series of strategies have been established to build capabilities for inter-institutional collaboration and regional development. However, only limited information is available to assess the effectiveness of the alliance or the contribution to and impact on regional and local development.

The University of Antioquia should create systematic mechanisms to monitor and measure the impact of its Centres of Excellence for Research and Development in addressing regional and local needs, to publish the results and to benchmark good practices with other tertiary education institutions.

Table 5.5. University of Antioquia: Centres of Excellence in Research and Innovation

Centre of Excellence	Tertiary education partners of the University of Antioquia	Industry/organisation Partners
CIDPRO Centre of development of products against tropical disease	UPB, IPS Universitaria CECIF	Tecnoquímica Humax-Pharmaceutical
EDIMEI Centre of epidemiology and molecular diagnosis	CIB	Pablo Tobon Uribe Hospital
BIOINTROPIC Centre of Research and Innovation of Biotechnology and Biodiversity	UNAL, UPB, U Medellín EIA, EAFIT.	PTA Ecoflora
CIEN Centre of Research and Innovation of Energy	UNAL, UPB, ITM	Public Industries of Medellín
ARTICA Applied Regional Alliance in ICT	UNAL, EAFIT, UPB, IPS Universitaria	UNE

Source: Government of Antioquia (2011), Ministry of Education. “Self-evaluation Report”. ESOCEC, Ltda., University of Antioquia, http://aprendeenlinea.udea.edu.co/portal20091002/index.php?option=com_content&task=view&id=184&Itemid=407, accessed 2 August 2011.

The University-Firm- State Committee of Antioquia (CUEE)

The University-Firm-State Committee of Antioquia is a regional body created in 2003 under the leadership of the University of Antioquia. The CUEE brings together 12 public and private tertiary education institutions, 21 industries, 7 regional research and development centres and the governments of Antioquia and of the municipality of Medellín (see also Chapter 1 Box 1.2). The main targets of the CUEE are to:

- Establish a sense of confidence between the academia and industry to develop collaboration projects that are of interest to both parties;
- Identify the RDI needs of industry and the related capabilities of the universities;
- Strengthen the technology management of both companies and universities;

- Spinout companies, promote and provide incentives to invest in science and technology;
- Study successful good practice cases of university-industry collaboration;
- Drive policies and projects that facilitate the dissemination of knowledge for the benefit of society.

The model of the University-Firm-State Committee of Antioquia has been emulated elsewhere in Colombia but remains the best example of its kind in the country. In 2009, it received national recognition for its management capabilities, for the development of good practices focused on building capacity for local and regional development, and for designing initiatives aimed at promoting the linkage amongst tertiary education institutions, companies and governments.

In 2010, the CUEE established a set of criteria with the purpose of measuring its own performance and that of its participants in achieving objectives (see Box 5.5). However, the criteria do not address issues related to the collaboration among tertiary education institutions to build capacities for regional development and to develop joint projects that meet company needs. Also, the regional impact of this co-operation does not figure among the criteria used to analyse and measure the performance of the University-Firm-State Committee.

Box 5.5. Criteria to measure the performance of the University-Firm-State Committee of Antioquia

- University professors providing consultancy services to industries
- University professors in industry internships that last more than two months
- University professors sitting on the board of directors of companies
- Foreign professors in internships in industries that last longer than a semester
- Company executives studying for a Masters or PhD programme
- Businessmen/women in the governing bodies of tertiary education institutions
- Annual projects of consultancy, assessment and RDI activities with the public and private sectors
- Annual revenue earned by universities from the public and private sectors for consultancies, assessments, and RDI projects
- Annual revenue earned by universities from the public and private sectors for consultancies, assessments, and RDI projects
- Annual revenue of the Tecnova Corporation
- Patent applications per year
- Patents granted per year
- New companies annually supported during their incubation process
- Results of the national assessment of learning outcomes (SABER) at Grade 5, 9 and 11.

Source: University-Industry-State Review, (2011) No 6 pp 6.

The following aspects are recognised by regional key stakeholders as the more important goals achieved by the CUEE up to date:

- Increased trust and confidence between the academic sector and industry.

- Establishment of the Tecnova Corporation in order to: *i)* align the tertiary education R&D efforts with the needs of industry; *ii)* support companies in identifying their needs in terms of technological development, and *iii)* support the development of RDI projects and complementary services.
- Building of a portfolio of services offered by tertiary education institutions to the public and private sectors.

Despite these achievements, the CUEE has not yet been able to agree on an explicit policy initiative for innovation and regional development. Furthermore, the CUEE lacks the executive leadership to mobilise relations between the academic and the industrial sectors and to promote the identification of opportunities in order to meet its objectives (Robledo and Quintero 2010). In addition, the Government of Antioquia should strengthen its role in the committee by promoting and supporting the improvement of joint projects that help build capacities for inter-institutional collaboration and regional and local development.

Conclusions and recommendations

The challenges in Colombia and Antioquia are manifold, including the need to address poverty, inequality and security. There is also a need to improve human capital and innovation outcomes and build capacity for balanced development among the sub-regions. In order to address these challenges, strategies, plans, initiatives and programmes have been advanced at the national, regional and local level with the participation of stakeholder groups, including tertiary education institutions. In Antioquia, innovative mechanisms have been developed to support university-industry collaboration and widening access in tertiary education. The universities are increasingly involved in knowledge transfer and some of them have established their own interface to manage this task.

However, national steering of the tertiary education system remains a challenge due to a lack of robust accountability structures. Funding allocation is traditional and does not reward performance. At the departmental level, a co-ordinated tertiary education system that contributes to the economic, cultural and environmental well-being of its region has not been built. There is a align the visions of the tertiary education institutions and their short-term action plans with the national priorities and needs, or the strategic goals of the regional and local development plans. At the departmental level, strategic plans do not explicitly highlight the

contribution of institutions to local and regional development, nor do they establish targets to be achieved for that purpose. Tertiary education institutions have limited inter-institutional collaboration, especially linkages between universities and technological institutions remain underdeveloped, which has a negative impact on regional and local development. The lack of co-ordination among tertiary education institutions remains a major challenge both nationally and regionally. There is a need to strengthen the capacities of tertiary education institutions for local and regional development and at the same time balance the autonomy with accountability. It is also necessary to remove the barriers to industry-university collaboration and collaboration between tertiary education institutions.

The OECD Review Team recommends that the following measures are taken to improve capacity building for regional and local development and inter-institutional collaboration in the tertiary education sector in Antioquia:

Recommendations for the national government

- Reintroduce the tertiary education reform after a period of review and additional consultation with stakeholder groups. Accompany with consultation and communication strategies any funding reform proposal to rally support from potential winners and reduce the political risks. Consider making external and/or regional engagement and its wide agenda for economic, social and cultural development explicit in tertiary education legislation and policy.
- Balance the institutional autonomy of tertiary education institutions (in terms of the use of human, financial and physical resources and responsibility over curriculum) with institutional accountability for results and decisions. Work with tertiary education institutions to develop an agreed accountability framework, which makes clear how each institution will play its part in the achievement of the national goals, and what mechanisms and performance indicators the institutions will use to report their progress. Review the composition of institutional governing boards to ensure adequate representation of the public interest, including the private sector and employers.
- Link financing more closely to performance (quality, outcomes, efficiency and relevance to national and regional economic needs). Introduce performance-based funding mechanisms for allocating a much larger part of public subsidies to redistribute resources to achieve a more equitable sharing of public subsidies across public tertiary education institutions, and to offer incentives to encourage institutions

to be more efficient and responsive to development, labour market needs and needs of their regions. Mechanisms could include: i) long term core funding to support regional engagement, ii) strategic incentive-based funding schemes on a competitive basis, iii) formulae for block grant funding against outcomes, with higher weights for enrolment of students from within the region, from under-represented population groups or for enrolments in academic programmes related to regional labour market needs; iv) policies governing tuition fees that provide for lower fees for in-region students and policies for students' financial aid that provide higher amounts for in-region students and special populations; v) special or "categorical" funding contingent on evidence of regional engagement and focus; vi) requirements that institutions collaborate in order to obtain funding. This could provide incentives for tertiary education institutions to facilitate mobility of students (credit transfer within the region) and share programmes and other resources in efforts to serve the region; vii) special funds that provide matching of funding obtained by tertiary education institutions from contracts with regional employers for education and training services; and viii) investment in the fundraising infrastructure to support regional engagement.

- Explore ways of simplifying administrative arrangements and financial management rules in public universities in order to bring about modern management practices and facilitate effective partnerships between universities and industry. Review tertiary education financial control systems, at both the national and institutional level. In collaboration with the Ministry of Finance put in place adequate regulations and monitoring capacity to ensure that private tertiary education institutions manage their resources according to transparent accounting practices and prepare annual financial reports that are independently audited.
- Improve the robustness and reach of the quality assurance system. Re-examine the criteria for the inclusion to the Register of Qualified programmes to allow for quicker and greater responsiveness to regional needs. Criteria emphasising regional engagement and responsiveness should be included in the review and approval process, for example: *i)* data documenting the specific gaps in access and opportunity for the population and important sub-groups; *ii)* data documenting relevant regional labour market needs and potential future needs arising from regional economic development plans; *iii)* evidence of engagement by regional stakeholders (employers, community representatives and representatives of under-served sub-populations) in programme planning and design; and *iv)* emphasis on regional engagement

(internships, community service, student research on regional issues) within the curricula and student experience. The Commission should seek the advice of regional leaders (employers, community leaders, regional economic development officials) in the programme accreditation process.

Recommendations for the departmental government

- Update Antioquia’s Vision and the Strategic Development Plan of Antioquia-PLANEA to consider the contribution that tertiary education institutions can make to regional development and to achieve the visions of the respective sub-regions.
- In collaboration with public and private sector stakeholders including tertiary education institutions, establish a co-ordination mechanism or body to plan and implement strategic development plans for the region. The co-ordinating body should design a strategic development plan which, in a collaborative way, outlines policies, priorities and goals for tertiary education institutions that are linked to their teaching and research objectives and strengthen their capacities in regional and local development. This should also promote engagement and co-operation between regional and local institutions in achieving regional development objectives.
- Include in the regional development plans policies for monitoring and assessing their strategic implementation and for developing a robust portfolio of socio-economic data about the region. This should entail an evaluation of tertiary education capacities for local and regional development and current practices in inter-institutional collaboration, outreach and community development.

Recommendations for tertiary education institutions

- Develop a clear and collaborative platform with other tertiary education institutions that focuses on the economic, social, cultural and environmental wellbeing of the region to address the needs of the region, promotes shared learning and assist in the implementation of the strategic development plans of the region. This platform could facilitate the development of inter-institutional learning programmes and research projects that address the major challenges for the region. Promote institutional co-operation by enhancing pathways between universities and technological tertiary education institutions and by developing mobility programmes among the tertiary education institutions.

- Improve contribution to regional and local development through aligning institutional planning, development and resource allocation with regional and local needs. Consider establishing a Regional Development Office to create links between tertiary education and other stakeholders from the government and from social and economic sectors in the development of joint projects that address regional needs. Review career incentives to faculty and staff members to include research and activities in collaborative projects for regional and local development. Remove any institutional barriers for multi-disciplinary and institutional collaboration, technology transfer and other forms of engagement in regional and local development. Ensure that the University-Firm-State Committee of Antioquia incorporates in its performance criteria measures related to promoting regional impact, inter-institutional collaboration and capacity building for regional and local development.
- Establish an evaluation mechanism to assess institution's impact on regional and local development and publish the outcomes from this evaluation to ensure accountability and encourage the sharing of good practices examples both within an institution and with other tertiary education institutions.

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ANTIOQUIA, COLOMBIA

Antioquia is one of Colombia's economic engines, but suffers from low skills, poverty, inequity and poor labour market outcomes. How can Antioquia create a more inclusive labour market and education system? How can it improve the quality and relevance of education? How can it turn the potential of its universities into a more active asset for economic and social development?

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Chapter 4. Social, cultural and environmental development

Chapter 5. Capacity building for regional co-operation