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Lombardy, Italy

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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. Reviews of Higher Education in Regional and City Development are the OECD's tool to mobilise higher education for economic, social and cultural development of cities and regions. They analyse how the higher education system impacts local and regional development and help improve this impact. They examine higher education institution's contribution to human capital and skills development; technology transfer and business innovation; social, cultural and environmental development; and regional capacity building. The review process facilitates partnership building in regions by drawing together higher education institutions and public and private agencies to identify strategic goals and work together towards them. More information is available about the OECD review process and requirements on the Higher Education and Regions' website: *www.oecd.org/edu/imhe/regionaldevelopment*.

These reviews are part of a wider multi-annum work of higher education in cities and regions co-ordinated by the OECD Programme on Institutional Management of Higher Education (IMHE). In 2004-07, the OECD/IMHE conducted an extensive study with 14 regional reviews across 12 countries. This resulted in the OECD flagship publication *Higher Education and Regions: Globally Competitive, Locally Engaged* (OECD, 2007) with recommendation to benefit both higher education institutions and national and regional governments. In 2008, the OECD/IMHE launched a second series of OECD reviews of Higher Education in Regional and City Development to address the demand by national and regional governments for more responsive and active higher education institutions and to support the OECD strategies on innovation and green growth. As a result, 14 regions in 11 countries, including the Lombardy region in Italy, underwent the OECD review process in 2008-11. The reviews were carried out by the OECD/IMHE in collaboration with international organisations and associations, and other OECD programmes and directorates.

Lombardy was the first Italian region to participate in the series of reviews of higher education in regional and city development. The review

was undertaken during the time when the university sector was in flux due to the launch of the new university law. The Regional Government of Lombardy had also requested greater competencies from the State in terms of universities, research and innovation.

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Numerous national and regional stakeholders, and representatives of higher education institutions provided valuable insights during the review visit and in the form of comments. The OECD would like to thank the Regional Government of Lombardy, the Rectors of the Lombardy universities, other representatives of higher education institutions, as well as numerous regional stakeholders who provided valuable insights during the pre-visit and the review visit.

The OECD would like to thank: Alberto Brugnoli (Director General, IReR – Lombardy Regional Institute for Research)[1], the Regional Co-ordinator; Carlo Secchi (Professor of European Economic Policy, Bocconi University) and Paolo Trivellato (Professor of Sociology, University of Milan-Bicocca), President and Vice-President, and all members of the Regional Steering Committee, Giuseppe Catalano (Professor of Public Economics, Politecnico di Milano), Cristiana Cattaneo (Associate Professor of Business Administration, University of Bergamo), Manuela De Carlo (Associate Professor of Business Administration, IULM), Gioacchino Garofoli (Professor of Economic Policy, University of Insubria), Enrico Marelli (Professor of Economic Policy, University of Brescia), Alberto Martinelli (Professor of Political Science and Sociology, University of Milan), Vito Moramarco (Professor of Economic Policy, Università Cattolica del Sacro Cuore), Antonio Emilio Scala, (Professor of Biochemistry, Vita-Salute San Raffaele University) Andrea Taroni (Rector of Carlo Cattaneo University – LIUC), Antonella Zucchella (Professor of Marketing and of Innovation Management, University of Pavia), Ignazio Gadaleta, (Professor of Painting, Brera Academy of Fine Arts), Nadia Nigris (Vice-Director General, Teatro alla Scala Academy), Pietro Paraboni

[1] In January 2011 IReR merged with IReF (Istituto Regionale Lombardo di Formazione per l'amministrazione pubblica) to form a new organisation: Éupolis Lombardia - Istituto superiore per la ricerca, la statistica e la formazione (Éupolis Lombardia - Institute for Research, Statistics and Training).

(President, Compagnia delle Opere Monza e Brianza), Fabio Ramaioli (Regional Secretary, APIlombarda), Roberto Albonetti (Director General, Social Welfare and Family Affairs Department), Marco Carabelli (Deputy Secretary General, Program Implementation), Ferruccio Ceccarelli (Executive, Planning Department), Armando De Crinito (Director of University and Research Unit) and Ada Fiore (Executive, Education Training and Labour Department).

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This publication draws on interviews carried out during a week-long review visit that took place on 27 June – 2 July 2010, on the findings of Self-evaluation Report of Lombardy (IReR, 2010), additional information provided to the review team as well as other OECD work, especially the reviews of the 14 regions involved in the second series of OECD reviews of higher education in regional and city development. The OECD review team had a full and intensive programme and were received openly by a wide range of stakeholders for review visit agenda, see Annex II. The team were also able to rely on a range of other reports, including *OECD Reviews of Regional Innovation: Piedmont, Italy* (OECD, 2009), *OECD Territorial Reviews: Venice, Italy* (OECD, 2010), *OECD Economic Surveys: Italy* (OECD, 2011) and tested their conclusions and recommendations within the higher education sector in Lombardy.

This publication was co-ordinated by Jaana Puukka (OECD/IMHE), assisted by Austin Delaney (OECD/IMHE) and Òscar Valiente (OECD/IMHE). Jaana Puukka led the expert team who participated in the review visit and contributed to this report: Susan Christopherson (Cornell University, United States), Patrick Dubarle (former OECD Secretariat, France), Helena Nazaré (Portugal) and Giuseppe Ronsisvalle (University of Catania, Italy). In addition, Andrea Hofer (OECD/LEED) participated in the review visit. Further details about the review team can be found in Annex 1 of this report. Rachel Linden supervised the publication process and Freya Damrell provided valuable assistance in the final editing phase.

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Acronyms

AFAM	*Alta Formazione Artistica, Musicale e Coreutica* (Higher Schools for Art, Music and Dance)
AIFI	Italian Venture Capital and Private Equity Association
ANVUR	*Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca* (National Agency for the Evaluation of the University and Research System)
AIS	*Agenzia Innovazione e Sviluppo* (Agency for Innovation and Development)
BERD	Business expenditure in research and development
CEFRIEL	*Centro di ricerca e formazione nei settori ICT* (Centre for research and training in the ICT sector)
CESTEC	Lombardy Centre for the Technological and Productive Development of Crafts and Small Businesses
CIVR	*Comitato di indirizzo per la Valutazione della Ricerca* (Committee for Research Evaluation)
CNAM	*Consiglio Nazionale per l'Alta Formazione Artistica e Musicale* (National Council for Artistic and Musical Higher Education)
CNSVU	*Comitato Nazionale per la Valutazione del Sistema Universitario* (National Committee for the Evaluation of the University System)
CNSU	*Consiglio Nazionale degli Studenti Universitari* (National Council of University Students)
CERST	*Centro di Ricerca per lo Sviluppo del Territorio* (Research Centre for Regional Development)
CRUI	*Conferenza dei Rettori delle Università Italiane* (Conference of Italian University Rectors)
CUN	*Consiglio Universitario Nazionale* (National University Council)

DU	*Diploma Universitario* (University Diploma)
ECTS	European Credit Transfer System
EHEA	The European Higher Education Area
EIS	European Innovation Scoreboard
ENDEAVOUR	Entrepreneurial Development as a Vehicle to Promote European Higher Education
ENQA	European Association for Quality Assurance in Higher Education
EPO	European Patents Office
EQAR	European Register for Quality Assurance agencies
ERDF	European Regional Development Fund
ESIB (ESU)	European Students Fund (European Student Union)
ESG	European Standards and Guidelines
EUA	European University Association
EU	European Union
EUR	Euro
EURASHE	European Association of Institutions in Higher Education
FAR	*Fondo Agevolazione Ricerca* (Fund for Faculty Research)
FFO	*Fondo per il Finanziamento Ordinario* (Fund for University Finance)
FIRB	*Fondo per gli Investimenti della Ricerca di Base* (Basic Research Investment Fund)
FISR	*Fondo Integrativo Speciale Ricerca* (Special Supplementary Research Fund)
GDP	Gross domestic product
GITT	University of Bergamo Centre for Management of Innovation and Technology Transfer
HE	Higher education
HEI	Higher education institution
HESIN	Higher Education Support for Industry in the North (United Kingdom)
HOFO	*Hochschulforschung* (Higher Education Research)
IBAN	Business angel association (Italy)
ICREA	Catalan Institution for Research and Advanced Studies (Spain)
ICT	Information and communication technology

IFTS	*Istruzione e Formazione Tecnica Superiore* (Higher Technical Teaching and Training Institute)
IHF	*Bayerisches Staatsinstitut für Hochschulforschung und Hochschulplanung* (Bavarian State Institute for Higher Education Research and Planning) Germany
IMHE	OECD Programme on Institutional Management in Higher Education
INVITALIA	Agency for foreign investment (Italy)
IP	Intellectual property
IPR	Intellectual property right
ISMU	*Fondazione Iniziative e studi sulla multietnicità* (Foundation on multi-ethnic studies, research and projects)
ISTAT	*Istituto nazionale di statistica* (Italian National Institute of Statistics)
KR	Kilometro Rosso science park
LERU	League of European Research Universities
MIP	Politecnico di Milano School of Management
MIUR	Ministry of Education, University and Research
MURST	Ministry of Universities and Scientific and Technological Research (now part of MIUR)
MPI	*Ministero della Publica Istruzione*
NETVAL	*Network per la valorizzazione della ricerca universitaria* (Network for the promotion of university research)
OECD	Organisation for Economic Cooperation and Development
PON	*Programma operativo nazionale* (National operational programme)
PTP	*Parco Tecnologico Padano* (Padano Technology Park)
PPP	Purchasing Power Parity
QA	Quality Assurance
RDA	Regional development agency
RIDITT	*Rete Italiana per la Diffusione dell'Innovazione e il Trasferimento Tecnologico alle imprese* (Italian Network for Innovation and Technology Transfer to SMEs)
RIS	Regional innovation system
RTDI	Research, technological development and innovation
SER	Self-evaluation Report

SME	Small and medium-sized enterprise
TTO	Technology transfer office
UK	United Kingdom
U4NE	Universities for the North East (regional higher education association in the United Kingdom)
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIVERSITAS	*Universita e Impresa per Valorizzare Esperienze e Risultat I scientifici per Innovare e Transfere Attivita e Saperi* (Universities and businesses promoting scientific experiences and results to innovate activities and transfer knowledge*)*
URV	University Rovira i Virgili (Spain)
VC	Venture capital
WKCI	World Knowledge Competitiveness Index

Assessment and recommendations

With nearly 10 million inhabitants, Lombardy is the most populated region in Italy. The region stands out in the European landscape because of its longstanding industrial strength. It has a diverse economy, which includes a financial capital of Europe, Milan, and one of the continent's most productive agricultural sectors. The region's strength in the arts, design and craft provides the basis for constant creativity.

Lombardy is the most prosperous region in Italy; with GDP per capita about 35% higher than the European average, it represents one fifth of the whole national economy. It is also the leading region in the Italian economy as measured by total production and exports. A strong economy has contributed to foreign immigration flows, making Lombardy the most diverse region in Italy. Immigrants, which represent almost 9% of the population, are a significant potential for regional innovation and partly buffer the region from the effects of an ageing population.

Economic diversity and continued demand for regional products have made it possible for Lombardy to remain resilient in the face of the global recession. Regional unemployment has remained relatively low in comparison to many other countries because of the continued strength of many sectors in the region's economy, and because production in many of the most important industries is carried out in small and medium-sized enterprises (SME).

However, despite the strengths and resiliency of its economy, Lombardy faces critical challenges in maintaining its distinctive global position over the longer term. The region is undergoing an industrial shift towards services and knowledge-intensive activities. The manufacturing firms that will thrive in the changing environment will need to focus on differentiation and a more intense use of knowledge. Success under this emerging manufacturing model relies on the access to skilled and qualified labour, whereas in Lombardy, only 15.9% of the working age population has tertiary education qualifications.

Lombardy has a large higher education system with some of the most specialised universities and the biggest research budget in Italy. Despite the strengths, the university sector features inefficiencies and weak alignment

with the regional needs. The Regional Government of Lombardy has requested greater competencies from the central government in terms of higher education, and science and innovation in order to unleash the potential of universities for regional development. This arrangement would involve a transfer of state resources for university funding to the region. At the same time, Italian and Lombardy universities need to respond to the new requirements laid down in the 2010 law on university reform (law 240/2010), which strengthens the institutional autonomy of universities and builds their public accountability.

In this context, Lombardy and its universities need to address the following challenges:

- How to create knowledge-based jobs and improve the productivity of the SME-based economy under increasing global competition?
- How to attract and retain talent, and capitalise on the existing assets of entrepreneurialism, cultural diversity and creativity?
- How to address long-term challenges associated with the ageing demographics, immigration and environmental sustainability?
- How to improve the quality and relevance of higher education, and build capacity to transform the potential of higher education into an active asset for local and regional development?

The challenge for educators and regional policy makers in Lombardy is to find ways to make the regional education and labour market systems more inclusive for the ageing population, immigrants and women. There is a need to improve the overall educational attainment levels and upgrade the skills of the regional population. Lombardy universities should also adopt a wider innovation concept that is not solely focused on science, helps increase the knowledge intensity of jobs, fosters product and process innovation, and aligns higher education provision with the needs and opportunities of the region and its SMEs. Stronger incentives for regional engagement by universities could be provided through performance-based funding, "challenge-driven" competitive calls, and by favouring multidisciplinary and cross-university initiatives. There is a need to monitor the rate of return and effectiveness of public investment in higher education, both at the national and regional levels, and to build robust data to facilitate evidence-based decision making. The new university law needs to be supported with the forthcoming secondary legislation to translate the principles of autonomy and accountability into operational rules and the new regulation needs to be effectively implemented. Closer collaboration between regional and local governments, private sector and tertiary education institutions is necessary**.**

Human capital development in Lombardy

Italy has been slow to move to a "knowledge economy" model. In Lombardy, the regional labour market has traditionally had many jobs with low skills and limited opportunities for productivity increases. To maintain its distinct global position over a long term, Lombardy needs to develop highly skilled workforce and a knowledge-based economy that can absorb it.

Italy continues to lag behind other OECD countries in terms of educational attainment despite the rapidly closing gap in the last few decades. Only about 20% of the 25-34 year olds and around 10% of 56-64 year olds have completed tertiary education in Italy, compared with the OECD average of 35% and 20%, respectively.

At the regional level, the Lombardy workforce exhibits a low level of educational attainment due to SME-based sectors, which do not require a high level of educational attainment, and the significant informal economy, which may not value educational qualifications. Higher education graduates account for 15.9% of the total population aged 25-64, which is below the European average (25.9%) and considerably below Ile de France (39.9%) and Stockholm (42.5%). Furthermore, the Lombardy economy has a higher proportion of its workforce employed in manufacturing than Italy as a whole (33.5% versus 27%). This sector is critical because it is under pressure from global competition and yet amenable to strategies that could increase productivity and expand export markets.

The regional economy features a productivity gap as a result of new low-skilled workers entering the labour market and the low levels of educational attainment in sectors where other European regions show high levels of educational attainment. Lombardy ranks at the bottom of the top 25 European high tech regions with respect to the educational credentials of its professional and technical labour force in the high tech sectors. This deficiency is reflective of a national pattern of under-investment in technology, including technologically-advanced human capital.

While higher education participation has improved in Italy and Lombardy, the university system demonstrates inefficiencies in graduate production, such as low retention rates, long duration of studies and late entry to the labour market, partly caused by the under-developed student support system.

In Italy, the entry rate to type A tertiary education programmes is 51%, compared to the OECD average of 56%. Growing enrolments have been a result of a massive increase in the number of youth completing secondary education. Since the 1970s, access to Italian universities has been granted to students that have successfully completed secondary education, including technical and vocational programmes. These trends are replicated in Lombardy, which today caters for about 13% of Italian student population.

Improved entry rates to higher education are undermined by the lack of efficiency in graduate production. Italy has the highest dropout rates among all the OECD countries, with completion rates from type A tertiary education programmes at 45% against an OECD average of 69%. In Lombardy, the dropout rate for universities was 11.2% (between the first and second year), below the national average of 17.6%, but featuring considerable differences between the region's public and private universities (18.5% and 6.5% respectively). In addition, students enter the labour market older than in OECD countries in general.

Increasing efficiency in higher education would require improving financial, social and academic support for students. High dropout rates and long duration of studies are partly a consequence of limited student support, which results in a significant number of students working. As noted by the OECD (*OECD Economic Reviews: Italy, 2011*), Italy needs a system that encourages completion of studies by all students and, at the same time, reduces financial constraints on students from low-income households. A solution could be the introduction of a universal income-contingent-repayment loan system where graduates repay the loan if they find a job and if their earnings exceed a threshold. In addition, means-tested grants schemes should be considered to ensure access of students from low socio-economic backgrounds. While public funding is under increasing pressures in Italy, a higher degree of private financing for higher education needs to be considered.

Lombardy features Italy's most dynamic economy with a traditionally absorptive labour market. However, graduate unemployment in Lombardy is a structural problem, which the economic crisis has aggravated. There is considerable variation how universities facilitate students' entry to labour market and address the skills needs of the region.

Graduate unemployment in Lombardy, the country's most dynamic economy, is a structural problem, which the economic recession has aggravated. Five years ago, 40% of new graduates in Milan found a job with

a long-term contract; today, the figure is only 20%. Out of approximately 50 000 graduates in 2008, only 10 000 received a stable work contract in 2008 and 2009, while another 20% received no work opportunities at all. 60% received very short-term and precarious jobs.

There is considerable variation among the universities in Lombardy in facilitating students' entry to the labour market and in addressing the skills needs of the region. While the Politecnico di Milano, Bocconi University and Carlo Cattaneo University - LIUC are running well-resourced career services and have close linkages with the industry, in general the university career services are weak with limited connections to the labour market. Innovative approaches often remain university- or discipline-based, benefitting only a small proportion of Lombardy students, with a lack of wider dissemination throughout the higher education sector.

Lombardy would benefit from a more demand-driven education provision that is aligned with the needs of the region. This would require reforming the traditional teacher-centred learning models to strengthen the skills and competencies of students, and building stronger links between higher education and the labour market. This could be achieved through a wide range of measures, including more systematic work-based learning for students, for example, through co-op education in collaboration with the local industry and other employers; participation of employers in the curriculum, course design and delivery; and tracking of student progress, achievement and labour market outcomes.

Collaborative action has been taken to improve the match between the labour market supply and demand (VULCANO service), and to provide labour market information (public-private SPECULA project) but so far these mechanisms have operated at a sub-optimal level. The universities themselves need to establish an appropriate method of tracking the student progress and graduate employment outcomes as a way of informing curriculum development and a better understanding how education meets the needs of the society and economy.

Industry associations in Lombardy play a key role in developing mechanisms to align education provision with the regional needs. These include the "Roundtable of Co-ordination" between Assolombarda and the universities in Milan and Pavia, which aims to align curriculum development with the requirements of the business community or specific industry sectors. Assolombarda is also actively involved in promoting master's and PhD programmes to enhance innovation and knowledge transfer from university to industry (*e.g.* executive research doctorate offered by Politecnico di Milano). This type of activities should be more widely disseminated throughout the university sector in the region.

Lombardy has a rapidly ageing population, low labour market participation and one of the most negative elderly dependency rates in Europe. There is a need to strengthen the policy focus on lifelong learning in order to extend the productive lives of the workforce and to make its education and labour market systems more inclusive.

Lombardy's economic model is challenged not only by low human capital development, but also demographic trends linked to poor labour market performance. About 20% of the Lombardy population was over 65 years in 2008, and the proportion is projected to grow to over 26% in the next few years. The rapidly shrinking labour force is typical to Italy, which has the highest elderly dependency ratio in the OECD, second only to Sweden. The elderly tend to retire earlier, further reducing the labour market participation rates. Lombardy's labour markets have also relied on informal and/or low skilled workers, and generally do not encourage women's participation.

There is considerable scope to enhance lifelong learning in Italy and Lombardy. Italy ranks among the weakest OECD countries in lifelong learning. In 2005, the percentage of the Italian adult population that took part in continuing education was 6.2%, compared with the European average of 10.8% and the Lisbon objective of 12.5% (by 2010). In Lombardy, there is a lack of robust regional level data about the access of mature students to higher education and adult education programmes, which suggests a lack of policy focus.

In view of the ageing population and need to extend the productive lives of the workforce through up-skilling and re-skilling, Lombardy universities' response has been fragmented without evidence of collaborative action. Most universities have a centre for continuing learning, but part-time courses for adult learners and employees are rare and lifelong education for those who are trying to re-enter the job market are underdeveloped. While there are targeted efforts to provide management education programmes for large company owners and managers, there is a dearth of educational initiatives aimed at smaller firms and at mid-level technical and professional personnel who may have considerable work experience in an industry and could significantly benefit from process and product innovation oriented degree and certificate programmes.

The Lombardy regional government has taken measures to address the lifelong learning needs by creating a "demand pull" for further training and skills upgrading, and strengthening the vocational tertiary education sector,

but currently there is little evidence of co-ordination between the education providers or monitoring and evaluation in order to ensure returns on investment. In 2005, the regional authorities introduced a voucher system (Lombardy Dote System) with the aim to develop a demand-driven lifelong learning system that would widen the access of traditionally under-represented groups, encourage employees to acquire new skills and competencies and facilitate re-entry to the labour market. In 2006, the regional government supported the creation of 31 professional training institutes, *Poli formativi*, that aim to increase the educational attainment of technical and professional workers currently employed in and entering the region's high tech manufacturing sector and knowledge-intensive services sector. The programme provides funding for advanced training of technical workers and skilled operatives utilising the resources of higher education institutions, and builds links between the different components of the education sector and the labour market So far no comprehensive evaluation has been made of the impacts of these systems.

The Lombardy economy has benefitted from foreign immigration flows, making it the most diverse region in Italy. Integrating immigrants into the education and labour market are important challenges to Lombardy and its higher education institutions. At the same time, greater collaborative efforts are needed to attract and retain talent in Lombardy.

As a result of immigration flows from a diverse set of countries, Lombardy is the most diverse region in Italy, counting 25% of the country's documented immigrant population and 9% of the regional population. The number of foreign students attending primary and secondary schools has quadruplicated since 1998. In 2009, 40.5% of foreigners possessed a secondary school certificate, while 14.2% are higher education graduates.

The Lombardy regional government wishes to inject a greater degree of internationalisation into the regional economy, but has so far not attracted enough talent or launched large scale programmes to train its growing immigrant pool. There is limited evidence of an integrated approach to the issues arising from the demographic transition. Challenges include talent attraction and retention, lifelong learning, mentorships and apprenticeships for younger people to enable them to move into positions of responsibility; and recognition of the need to integrate the immigrant communities socially and culturally, along with their integration into the formal education and labour force.

Integration of immigrants into a regional workforce and education system is complicated by the number and interests of actors. Lombardy could respond to this complexity by, for example, adopting a framework approach to integrating the immigrant workforce, based on the widely recognised Canadian system, which integrates multi-cultural awareness, job training and credentials recognition. In order to avoid waste in human capital investment, Lombardy should also develop mechanism to evaluate and recognise the qualifications and work experience of immigrants. Here, the Swedish experience from the Malmo Validation Centre and the Malmo University could be useful.

The university sector in Lombardy has, so far, played a peripheral role in addressing the challenges and opportunities linked to immigration, but its role is likely to increase in the future. Presently, only a few immigrants are entering the university system in Lombardy. While resident foreign immigrant account for 14% of the 20-28 year-old population, their share of the total student population is below 5.5%. Universities' role will need to grow as the young immigrant population will soon constitute a substantial portion of those age-eligible to participate in post-secondary education programmes. The upcoming generation of higher education students will be culturally diverse and often from families with lower educational attainment. The educational system from primary school onward must adapt to educate a more diverse population of children and to prepare them for higher education. The Lombardy region and its universities could benefit from the example provided by Victoria University in Melbourne (Australia), which has developed a comprehensive approach to widening access and improving success of a diverse student population. This involves long-term collaboration between universities and schools that prepares students for their successful entry and progress to higher education.

The region and its universities should make greater efforts in attracting international talent and retaining graduates of its higher education system. Currently, limited efforts have been made to attract international students and faculty, apart from highly successful artistic and musical institutions (AFAM) and a handful of universities. Lombardy region and its universities could examine the experience of the ICREA programme in Catalonia, which not only attract top researchers (many with Catalan background), but also includes a strand to help retain and motivate top university professors in Catalonia. Thus, a comprehensive internationalisation policy for higher education would require not only the exchange of students and staff, signing of agreements with peer institutions and participation in international organisations, but also participation in the attraction of talent and foreign direct investment to the region, introducing a global, international and

intercultural dimension in the teaching, research and public service activities, and linking local companies with the global networks.

Human capital challenges associated with an SME sector include the ageing of the entrepreneurial workforce and enterprise succession, and increasing the knowledge-intensity and productivity of SME production. Lombardy needs to establish technologically advanced new firms, particularly in traditional sectors, link existing entrepreneurs with students and migrants, and support entrepreneurial skills among its student population.

There is a problem of succession planning in SMEs, which is increased by the inability of the traditional sectors to incorporate a more technologically skilled workforce and demonstrate the capacity to grow and expand into new markets. The demonstration of technological vitality would attract new investors and entrepreneurs to the high quality but currently stagnant sectors of the regional economy. Thus the challenge of finding ways to upgrade human capital skills and increase the vitality and productivity of the traditional sectors, such as those in small-scale manufacturing, is related to the succession issue.

Solutions to the succession issue are likely to be found in the establishment of new firms that are more technologically advanced but within the traditional industries. These advanced technologies and skills should be identified and encouraged via programmes to increase their human capital capacities. There is a need to provide retraining opportunities to existing entrepreneurs and create a formal apprenticeship system that could help transmit tacit knowledge.

Lombardy universities could play a stronger role in enterprise support. While universities in Lombardy have taken steps to boost university spinoffs and graduate entrepreneurship, there is limited evidence of enterprise support being mainstreamed within degree programmes and through supporting infrastructures. Where such support exists, it remains fragmented with limited collaboration between universities. The regional government in Lombardy could consider steering universities to develop entrepreneurship programmes with stronger alignment with the regional needs, to facilitate SME succession as has been done, for example, in Finland.

Entrepreneurship among the immigrant community should also be encouraged through mentorship programmes and innovative financing vehicles, such as revolving loan funds. Immigrant communities could

provide successors to ageing managers and owners of enterprises in small-scale manufacturing and other traditional sectors. The need for this kind of transition effort has been recognised by the regional Chamber of Commerce, whose native Italian enrolment has been shrinking. The Chamber of Commerce identifies and publicised examples of success by immigrant entrepreneurs to provide role models. This kind of initiative could be expanded through mentorship programmes to connect existing enterprise owners with immigrant entrepreneurs.

The following measures would promote human capital development in Lombardy:

Recommendations for the national policy

- *Consider increasing private financing and cost-sharing in higher education.* Address the issues of affordability and retention in higher education by introducing a universal income-contingent-repayment loan system where graduates repay the loan if they find a job and if their earnings meet a threshold. Back up the loan system by a means-tested grants scheme to ensure to students from lower socio-economic backgrounds have access to education.
- *Review* the *achievements of the Bologna process and continue the process of curriculum reform* in universities across Italy in order to develop a workforce with 21st century skills and competencies.
- *Support diversity in tertiary education system by developing the vocational tertiary education sector and enhancing its links with universities.* The tertiary education sector needs to work as a diversified and integrated system in order to address the needs and the demands of the student population and industry.

Recommendations for the regional government

- *Develop a wider portfolio of robust data in the region to support evidence-based decision-making and targeted efforts to foster human capital development.* 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 to come together and students to move into employment. In Lombardy, strategic information gathering

should be directed at the specific human capital issues facing the region and at models to address those issues that are appropriate to the regional situation.

- *Create a Strategy for Human Capital and Skills Development.* Universities and the key private and public sector stakeholders in Lombardy should work together to develop a long-term strategy for regional human capital and skills development to: *i*) define region-wide goals, policies and priorities extending from primary to tertiary education and beyond; *ii*) support more inclusive education and labour market for the ageing segments of the population, immigrants and women; and *iii*) provide lifelong learning activities, including up-skilling and re-skilling for the adult population and those who combine work and study, or are unemployed. Productive working lives of the workforce could be extended through lifelong learning initiatives, programmes that connect retiring business owners with young entrepreneurs and collaborative action for comprehensive training in health sector to address the challenges of an ageing and more diverse population.

- *Develop strategies to increase the supply of knowledge-intensive workers and integrate them in the sectors in which the region has comparative advantages.* This will enhance higher education institutions' participation in revitalising the existing SME sectors, encourage productivity enhancing advances in those sectors, and make connections that would assist in the SME succession problem. In crafting strategies to increase knowledge-based human capital and knowledge-intensive businesses, higher education institutions programmes need to recognise and work with the existing highly-organised industry. Conventional research university technology transfer models, distanced from the local industry, do not address the critical productivity and innovation problems facing Lombardy industries. In some instances, closer connections between the industries in Lombardy and university or vocational education resources may require changes in national or regional regulation governing the activities of staff and faculty of regional universities.

- *Increase diversity within the regional higher education system.* Reinforcing type B tertiary education is particularly important for Lombardy. Taking advantage of the experience gained with the Poli formativi, engage in a concerted effort to determine what aspects of the Poli formativi initiative could be developed and extended. Build strong relationships between the different components of the tertiary education

sector, mainly universities and higher vocational institutions is a key element of effective human capital development of a region.

- *Work together with the universities to strengthen the labour market relevance of university education and alignment with the regional needs in a systematic way.* Universities need to focus on the employability and entrepreneurial skills of graduates, and provide them with the skills and competencies needed in the globalised knowledge economy through new modes of learning, including work- and problem-based learning methods, and programmes that build entrepreneurial and innovative mindset.

- *Balance the need to increase productivity through intensive and technologically sophisticated work, with the need to employ and raise the skills of the sizeable immigrant population with low skills and low educational attainment.* Methods of accrediting and recognition of prior higher education qualifications and work experience from foreign countries must be established and also the framework approach to raise multi-cultural awareness, job training and the employability of migrants should be strengthened. This challenge may also require a "bridging and integrating" strategy to enable immigrant children to access higher education when they become a more significant portion of the population of an age to enter higher education.

- *In collaboration with universities, schools and business sector, develop long-term efforts to increase the access and success of students in higher education including those from lower socio-economic and/or migrant background*. Given that the skills of these students will constitute an important part of the future human capital of the region, this critical issue needs to be addressed. These efforts should build on international best practice models of effective academic, social and financial support services for students and moving away from teacher centred learning models.

Recommendations for higher education institutions

- *Develop a stronger student-centred approach in teaching activities, building on the international best practice and the existing models in Lombardy.* Reduce the number of contact hours. Engage employers in the curriculum development, invite professors from industry and encourage employment after the 1st cycle. Adopt new forms of education that are interactive, and tailored to the individual needs and capacities of students. They involve inter-disciplinary learning, work-based and problem-based learning methods, and programmes to develop

employability, entrepreneurial and transferable skills. Transferable skills should be embedded in degrees programmes across the academic disciplines to boost the productivity base of the region and enhance its internationalisation efforts.

- *Address the need for lifelong learning and more flexible modes of delivery for those who combine work and study.* Steps to make part-time learning more available should be a top priority among the universities. The lifelong learning measures should include transparent pathways to higher education, the ability to attend multiple institutions, obtain short-term education and training that can be recognised towards degrees, and re-skilling and up-skilling courses and programmes designed to the needs of working adults. This involves recognition of prior learning and experience, course and programme articulation agreements, clear and enforceable policies, and collaborative programmes between higher education institutions.

- *Address the needs of a diverse student population and link this with the construction of flexible learning pathways that include type B tertiary education*. Facilitate mobility between a Laurea degree and vocational higher education; ensure credit transfer, and recognition of skills and competencies. Provide information and tutoring to facilitate the process.

- *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.

- *Foster best practices from the international higher education system to boost comprehensive internationalisation policy in collaboration with regional stakeholders.* This would include not only exchange of students and staff, but also global international and intercultural dimension in universities' teaching, research and public services, as well as efforts to help attract talent and foreign direct investment in the region, and link local companies with global networks.

Research, development and innovation in Lombardy

Lombardy has a large concentration of Italy's R&D activity and is home to more than 22% of Italy's research staff. Universities in Lombardy have gradually improved and extended their research activities but many imbalances persist in the innovation system. Although improved, university-industry relations remain mainly fragmented and underdeveloped compared to the leading regions in the EU and major competitors abroad.

Italian R&D activity is concentrated in Lombardy, which boasts 15 universities and around 220 000 students. Almost 9 000 students earn a degree in technical and scientific subjects every year, with a range of more than 60 specialisations. Approximately 30% of private sector researchers and 22.2% of the total number of researchers in Italy are located in Lombardy. The share of business R&D is the highest in Italy after Piedmont. Lombardy universities have made significant progress in knowledge production and publication notably in life sciences (*e.g.* University of Milan and Vita-Salute San Raffaele University) and engineering (*e.g.* Politecnico di Milano) and are now approaching most advanced universities in the OECD area. The volume of higher education research is significant and its quality generally recognised.

The Regional Innovation System has been strengthened in the recent period. Patenting activities have strongly developed and the number of patent registered is by far the highest in the country (the number of European patents conceded by the EPO to the province of Milan has already reached 37% of the Italian total). A number of intermediate organisations have been established to forge links between firms and research organisations. In certain cases, for example, in the life sciences, they have led to the creation of consortium and technology transfer centres. In general, the focus of intermediate organisations seems more on promoting training than supporting collaborative research project.

While the regional innovation system performs relatively well at the R&D stage, knowledge diffusion remains a challenge. Most universities are now endowed with technology transfer offices, but these TTOs remain understaffed and often lack proactive strategies. On the whole, co-operation between higher education institutions and small business remains poorly developed with some notable exceptions.

Lombardy's industrial districts represent a key feature of the production framework but they need to improve their innovation capacities in order to face competition from new emerging economies. This will require a shift from firm-based interactions to broader networks comprising universities, research centres and financial institutions. National policy initiatives support this transformation but in a fragmented manner. While transfer of university research results to the market has improved, the TTOs remain outside of articulated networks with firms and public research centres.

The regional government has taken steps to launch an industrial district policy in collaboration with the national government. Its strategic plan targets knowledge-intensive and conception-intensive activities. However, this approach remains mainly traditional; in the field of design, no attention is devoted to the capacity of universities to sell education services in international markets.

The Regional Development Plan *(Programma Regionalale di Sviluppo)* has a focus towards industries with a high R&D content but a limited emphasis on the non high tech sectors in which Lombardy already has a comparative advantage. In these sectors, universities could be mobilised not only to train more students but also to increase their R&D efforts.

In general, there is a need for a more proactive policy involving greater higher education teaching and R&D efforts by both national and regional governments. This is due to the fact that the region continues to have a low level of educational attainment; for example, in 2008, among 265 European regions Lombardy ranked 221 in terms of the educational attainment of the 25-64 year age group.

Internationalisation of higher education is an important component of national and regional education policies. The continuing loss of a substantial number of graduates and post-graduates constitutes a threat to the long-term competitiveness of the region and the region should make greater efforts in attracting international talent and retaining graduates of its higher education system.

The weak interaction between the higher education sector and the business sector is another issue that needs consideration. In Italy and Lombardy, the absorption capability of the business sector with regard to hiring tertiary education graduates is limited. Per thousand employees the number of business enterprise R&D personnel is lower in Italy than in the most advanced EU countries. The focus on collaborative research remains

insufficient. Supplementary funding from the public authorities would be welcome in particular through joint initiatives of several regions.

In the 2000s, efforts have been made to strengthen the links between universities and science parks and to create technology transfer offices. These new infrastructures have delivered positive results. There is an increasing trend in university patenting. The number of spin-offs linked with university research has grown dramatically albeit from very low levels at the beginning of the decade. While Lombardy ranks first in Italy for the number of venture capital deals, many venture capital funds find it less risky to invest abroad than in the region. Apart from the Politecnico di Milano, universities are also less active in providing services to firms. In that context, co-operation between universities is at early stages of development. There is also a need to integrate the university technology transfer offices in entrepreneurship teaching and development strategies.

The following measures would promote a regional innovation system in Lombardy:

Recommendations for the national policy

- *Incentivise universities to consolidate and professionalise their technology transfer* offices *(TTO).* It is important that TTOs operate within the framework of broadly defined strategies. Their role should not be reduced to a narrow interpretation of technology transfer but they could develop a "forum function" for SMEs and act as brokers or animators of high tech clusters. Ministries of education can help to promote such a strategic shift by sponsoring debates, reviews and reports on these issues.

Recommendations for the regional government

- *Foster a stronger alignment of education and research programmes with the regional needs.* In addition to elevating the technological level of districts and accelerating the transition towards meta-districts for several high tech sectors, focus should also be on the labour-intensive sectors. The Regional Development Plan should prioritise technologies and innovation in the field of the tourism, distribution, transport and green industries. Subsequently, there is a need to increase the grants for R&D programmes developed by universities in these sectors, which so far have received limited attention. The regional sustainability plan should be strengthened and better articulated, and the budget for university R&D clearly earmarked in those segments.

- *Take steps to enhance the contribution of universities and other tertiary education institutions to the full exploitation of the region's comparative*

advantages, such as design. Lombardy design sector's competitiveness is internationally recognised. Public policies need to establish a better regulatory environment for the fashion and design clusters and more generally for the creative industries. There is also a need to promote and sell abroad design training. Ministries and departments of education at different government levels should promote the establishment of a consortium of Lombardy's tertiary education institutions to launch collaborative programmes on the international education market using the extensive knowledge and experiences accumulated in Lombardy.

- *Expand partnerships with neighbouring Italian regions in fields of interest for the higher education sector.* This is an area that has been relatively overlooked by the regional authorities. This co-operation should be furthered in order to: *i*) ensure a co-ordinated development of regional networks for industrial research and of research clusters of excellence; *ii*) promote exchange of methodologies, instruments and strategies for project evaluation; and *iii*) share modalities that enable comparison of initiatives of technology transfer and venture capital programmes. Joint R&D programmes should be initiated. This development could be facilitated by the delegation of powers to the region in the innovation domain. Envisaged budget cuts by the central government for education and research will risk interregional initiatives.

Recommendations for higher education institutions

- *Develop regional knowledge transfer model that is based on an ongoing relationship with industry*: While the university technology transfer models may lead to saleable intellectual property and start-ups, they seldom produce enterprises that grow in the region and contribute to regional economic development. Lombardy's localised supply networks are therefore critical to the process through which innovation is transferred to enterprises, and to create new innovation and transform and upgrade existing industries. The development of a well-functioning regional knowledge transfer model requires an ongoing relationship with industry to determine what innovations have the best opportunities for adoption and commercialisation, and the creation of an industry-university learning environment. It requires support for the human capital development required to adopt and apply process and product innovations, and collaboration with SMEs as well as large corporations. It measures success in terms of the sustainability and transformation of regional industry and employment growth.

- *Engage more actively in the diffusion of best practice in entrepreneurship support and education.* Given the increasingly strong

competition on the international market, universities need to develop a capacity to train a new generation of entrepreneurs with upgraded skills to support the development of industrial districts and high tech firms. Ministries of education at the national and regional levels could initiate programmes to train the trainers, and mobilise university staff and technology transfer offices for the supply of entrepreneurship teaching packages.

Creative industries, environmental and urban development

The creative sector of the Lombardy economy is one of the largest in Europe and in the world. It is a significant regional asset, with particular strengths in visual arts and design. Lombardy's educational and creative arts institutions attract talent from all over the world and should be acknowledged as a major industry.

The Lombardy region is an acknowledged centre of cultural and creative industries (CCI) in Europe, with particular strengths in industrial and fashion design, and architecture. Lombardy is ranked third among the top 25 European regions with important "clusters" of cultural and creative industries. Its art sector is important not only for the production and commercial distribution of art works, but also for its major art schools.

The creative portion of the SME base has been important to the global branding of the Lombardy's regional economy as a creative centre, but remains uncoordinated. Creative workers are a strong asset because of their contribution to continuous innovation improving the quality of life in the region and their internationalising influence through global connections. The Lombardy creative workforce is largely employed in very small enterprises or self-employed (30%). The sector features a lack of co-ordination among the creative enterprises compared to other SME sectors such as manufacturing.

There is a large and prominent non-university higher education sector, with 15 arts and music institutions and major private design schools in Milan. The creative design and arts sectors are less integrated in the network of higher education institutions in Lombardy, in part because professional training takes place in private specialised institutions. These schools are specialised and distinguished by an individual identity and "brand", based on the prominence of their faculty and the type and style of training they provide. They attract international students and should be recognised for their important role as an export "industry".

The creative educational institutions are important exporters in the regional economy. At the same time, studies of the sustainability in creative enterprises indicate that they frequently lack managerial skills required to develop sustainable businesses. Some of Lombardy institutions are taking steps to provide this kind of training but there is scope for substantial expansion given the importance of creative fields in the region.

Milan has lagged other creative industrial capitals in investing in the urban development planning and infrastructure that can both make the city more attractive and more productive logistically. Universities can play a more prominent role in urban regeneration and development, and addressing the logistic challenges of the region. Collaborative efforts are needed to improve the situation.

Milan has lagged behind other creative industrial capitals in investing in the urban development planning and infrastructure that can both make the city more attractive and more productive logistically. Plans, such as that for the exhibition complex at Rho-Pero are central to the transformation of Lombardy from an economy based in heavy industry to one that emphasises knowledge-intensive industries and services. There are also plans to invest in regional transportation infrastructure to link major urban centres in Lombardy – Brescia, Bergamo, and Milan. These investments are critical to improving the access of Lombardy firms to European and global markets. In addition to these regional investments, there is a need for urban redevelopment plans to foster the image of regional cities as creative hubs and centres for knowledge-based industry. The universities in Lombardy can play a more prominent role in this process, as evidenced by the University of Milan-Bicocca, which has transformed an old industrial area to a centre of education. Lombardy could examine the experiences of 22@Barcelona, which has developed into a multi-functional urban area, based on the idea of creativity, social cohesion and economic development. 22@Barcelona also includes an "urban lab" for pilot studies in greening the urban environment.

There are major university research programmes in Lombardy aimed at addressing the logistics and freight transport problems facing the region and its industries. The University of Bergamo has a wide range of initiatives focused on regional development with particular reference to productive systems, transport, internationalisation and exploitation of cultural and historical resources. A research centre with on-going programmes in this arena critical to the regional economy is the Centre for Research on Regional Economics, Transport and Tourism (CERTeT) of the Bocconi

University. Other centres contributing to urban development are the Centre for Research on Territorial Development of the Carlo Cattaneo University – LIUC and the Centre of Research on the Internationalisation of the Local Economies (CRIEL) of the University of Insubria. Co-operation among these programmes would strengthen their ability to influence an urban development agenda that improves the efficiency of the region though better transport planning but also build on the region's brand as an urban development knowledge centre with expertise in creative industries and historic preservation.

Lombardy has a worldwide reputation for its food culture and university expertise in agrifood sector. The forthcoming Expo 2015 will draw from the university expertise and will emphasise the theme of bio-diversity, connecting the food theme with environmental sustainability. The broad university agenda to build a global brand around Lombardy food expertise could be extended to value-added strategies for existing food industry SMEs in order to foster technological innovation.

Lombardy's universities are actively participating in a regional initiative to mount an international exposition – the Expo 2015 – organised around food. Lombardy has a worldwide reputation for its food culture but the Expo 2015 aims to have a strong scientific dimension, building on the region's less well known expertise in food science and the agricultural sciences. The Expo 2015 will particularly emphasise the theme of bio-diversity, thus connecting the food theme to broader concerns for environmental sustainability. The event will market Lombardy's strengths in bio-science, agriculture and food processing, and will reinforce the importance that urban development planning plays in sustaining the region's long-term competitiveness. The experience in joint planning for a flagship event should be capitalised and built on to forge further collaboration between universities and key public and private stakeholders.

Lombardy universities have developed an ambitious agenda to build a global brand around Lombardy food expertise. This agenda, incorporating both science-based initiatives and cultural programmes, takes advantage of the region's broad expertise and international food reputation but also its special experience in co-ordinating international expositions and events. Universities could extend this agenda to incorporate value-added strategies for existing food industry SMEs, in order to foster technological innovation.

The following measures would enhance the creative industries, environmental development and urban development in Lombardy:

Recommendations for the regional government

- *In collaboration with educational institutions, build a global brand for Milan as a centre of design education with the aim to create a strong export industry.* This would involve encouraging collaboration with universities and non-university higher education institutions to develop the knowledge base in the regional economy and attracting young creative workers and students to the region.

- *In collaboration with universities, build a global brand around Lombardy food "expertise".* The plan for Expo 2015 should showcase Lombardy's existing strengths in the broadly defined food industries but also to bring new technologies into the regional SME sector. This should be extended to incorporate value-added strategies for existing food industry SMEs in order to foster technological innovation.

- *In collaboration with the university expertise, resolve congestion and circulation problems in Milan, making urban districts more accessible and visible to visitors.*

Recommendations for higher education institutions

- *Contribute to the social and cultural inclusion of the diverse immigrant population through the university arts and humanities outreach activities, and programmes that include creative immigrant contributions.*

- *Develop interdisciplinary university programmes to provide a better knowledge base in the Lombardy creative economy.* Universities could play an important role by jointly sponsoring an observatory on the creative sector and establish a dialogue between art, architecture and design through joint education programmes.

- *Contribute to the development of the regional creative economy by developing and expanding programmes in entrepreneurship and non-profit management, both in formal degree programmes and through outreach efforts.*

- *Develop university technology transfer programmes to focus on the potential for development of productivity enhancing product and process innovations in creative fields in the region, particularly industrial design.*

- *In collaboration with the regional government, encourage and help plan urban investments that will enhance the region's image as a creative economy.*
- *Undertake both individual and collaborative initiatives to foster university demonstration of green building practices, including retrofitting of old buildings.*

Capacity building for regional development

Institutional autonomy of universities is a necessary pre-condition for stronger accountability. The new university law has the capacity to unleash the potential of universities for local and regional development and industry collaboration. But the right incentives and accountability schemes need to be in place to guarantee greater engagement of universities with industry, labour market and regional development in general.

International experience shows that reforming university governance and funding can contribute to a better performance of the higher education system. If universities are to be held responsible for their results, they must be free to decide how to use their human, financial and physical resources. Making universities both more autonomous and more accountable can enhance their performance. Better management of human resources, including merit-based career progression and improved recruitment processes, are key elements of higher performing institutions.

Italian universities have traditionally featured a lack of autonomy in the key areas of staff and funding decisions, which has limited the development of a more efficient university sector. The 2010 law on university reform enhances institutional autonomy and accountability by improved monitoring of performance and linking rewards to performance. It also promotes the separation of academic and administrative management of the institutions. It will be important that the forthcoming secondary legislation translate these principles into operational rules, and that regulation is then effectively implemented. At the regional level, the Lombardy universities need to take measures to ensure that new university statutes will strike the right balance between autonomy and accountability.

The new university law has the capacity to unleash the potential of universities for local and regional development and industry collaboration, but special incentives need to be in introduced to support this goal. Presently, there is a lack of national, regional and institutional policies, and

incentive structures to support the regional and local engagement of universities, and their faculty and staff. In Lombardy, the recruitment, and promotion of the university staff are nearly exclusively determined by research performance, measured primarily by publications. Management and leadership functions are poorly rewarded and the "third mission" activities have been traditionally absent from the list of factors that have an impact on faculty career development. To make progress in regional development, universities need to introduce their own policies and mechanisms to enhance, recognise and reward faculty contributions to regional engagement. The University Rovira i Virgili in Tarragona, Spain, provides an example how university leadership can provide incentives for regional engagement.

Italy devotes fewer financial resources to tertiary education than other countries. Public funding is under increasing pressures, which calls for a sustainable financial plan with stronger private sector funding and cost sharing. Lombardy could also consider introducing competitive funds to stimulate cross-institutional and interdisciplinary challenge-driven research and educational programmes that are aligned with the region's needs.

Italy devotes fewer financial resources to tertiary education than other OECD countries, whether in terms of annual expenditure per student (37% less than OECD average, including public and private expenditure in 2007), a share of GDP (0.75% versus an OECD average of 1.2%) or a share of public expenditure (1.6% and 3.0%, respectively). At the same time, Italy devotes less private funding to higher education than OECD countries in general. Public funding for higher education is under increasing pressures in Italy, endangering the ability of the universities to improve their performance and to take full advantage of the university reform.

Any attempt to increase efficiency in university education is a substantial challenge unless it is backed by a sustainable financial plan reflecting a long-term commitment on the part of the state. A two-pronged strategy could be articulated and implemented to achieve a sustainable financial plan for higher education: *i)* increase private financing and cost-sharing in higher education to improve performance and efficiency; and *ii)* increase resource diversification in higher education institutions.

Progress on the higher education front requires a long-term commitment to finance it on the basis of clear criteria aligning needs, performance and resources in an objective and transparent manner. Currently, the university state funding has a small, albeit increasing performance-based element.

There is scope to strengthen the performance-based funding to achieve policy objectives, increase efficiency, improve accountability, and encourage a greater degree of institutional innovation and specialisation. Stronger performance-based funding would also encourage greater transparency in how resources are utilised by directly relating inputs to outputs.

At the regional level in Lombardy, introducing competitive funding could fulfil many objectives including the improvement of quality and efficiency of the universities, and stimulating cross-institutional interdisciplinary challenge-driven research and educational programmes that are aligned with the region's needs. On the long-term, performance-based funding of universities would provide the regional government with the means to ensure that the required institutional behaviour is encouraged.

Furthermore, a variety of funding mechanisms can be used to provide incentives for regional engagement of higher education institutions, for example: *i)* Formulae for block grant funding could include higher weights for enrolment from special populations such as students from low socio-economic and/or immigrant backgrounds or for enrolments in academic programmes related to regional labour market needs; *ii)* Policies governing financial aid to students can provide higher amounts for in-region students and special populations; *iii)* Eligibility for special or "categorical" funding could be contingent on evidence of regional engagement and focus; *iv)* Eligibility for funding could include requirements that institutions collaborate. This could provide incentives for higher education institutions to facilitate mobility of students (credit transfer within the region) and share programmes and other resources in efforts to serve the region; and *v)* Provision of matched funding schemes could encourage higher education institutions to engage with regional employers in education and training services.

The development of the quality assurance system is key to helping higher education institutions in Lombardy improve their teaching, research and public service functions in order to become an internationally competitive higher education system.

National level quality assurance has been created to comply with the requirements of the Bologna process and the European Higher Education Area. The national evaluation agency ANVUR has the capacity to develop into an important instrument for degree accreditation as well as working with universities in enhancing their performance and quality.

If Lombardy wishes to strengthen its position in the global market, it could explore the feasibility of establishing a region-wide independent quality assurance organisation or agency in co-ordination with the national agency to which all higher education institutions could be invited to participate on a voluntary basis. An independent agency should place great importance to the learning and employment performance of graduates and could establish accreditation criteria competitive at the international level. It would be important to emphasise the need for flexibility and diversity in the higher education system. By doing this, higher education institutions would benefit from the evaluation of their academic programmes and from collaborating with graduates, employers and the local region.

The experience of other OECD countries suggests that criteria emphasising regional engagement and responsiveness can be included in programme review and approval. In the case of Lombardy, these regional criteria could include: *i*) Data documenting the specific gaps in access and opportunity for the population and important sub-groups (*e.g.* students from low socio-economic background); *ii*) Data documenting relevant regional labour market needs and potential future needs arising from regional development plans; *iii)* Evidence of the engagement of regional stakeholders (employers, community representatives and representatives of under-served population groups) in programme planning and design; and *iv*) Emphasis on regional engagement (*e.g.* internships, community service, student research on regional issues) within the curricula and student experience.

The Regional Government of Lombardy has requested additional competencies from the Italian state in universities, research and innovation. With the new competencies the regional government seeks to transfer resources for university funding to the region and establish a regional university system with greater autonomy concerning regionally relevant R&D and education.

University education in Italy is governed through complex legislative and policy agenda at the national level. The legislative power, remit and responsibilities regarding education are divided between the Italian state and regions. The state has the responsibility for the general provision of education. The Regional Government of Lombardy is currently responsible for the provision of student services and financial support for new degree programmes or university buildings. Furthermore, the region is also responsible for vocational education, in particular in terms of creating an integrated system of education and professional training.

The Regional Government of Lombardy has requested additional competencies from the Italian state in universities, research and innovation. With the new competencies the regional government seeks to establish a regional university system with greater autonomy concerning the provision of degree courses with specific regional focus and to transfer resources for university funding to the region. This would provide an opportunity for the region's universities to become more active players in regional development.

In order to prepare for the new competencies it is necessary to develop a strategic plan and vision for the region, backed up with an implementation plan involving all universities, as well as funding, and develop an embedded accountability system.

Lombardy's Regional Development Plan (*Programma Regionale di Sviluppo*) has a strong focus on knowledge society, sustainability and demographic change, and has engaged universities in the development and implementation phase. A number of collaborative bodies and initiatives have been launched, including the Strategic Agreement for Regional Development; but there is currently no overarching plan that integrates the efforts and assesses the results. In order to ensure return on public investment, there is a need for better co-ordination between the strategic plans and their implementation. System diversity in terms of the types of higher education institutions, study programmes and modes of delivery is necessary to ensure that the higher education system has the capacity to meet the challenges of knowledge society. Greater system diversity and responsiveness to regional needs would require mission diversification of universities and strengthening the vocational tertiary education.

The Lombardy higher education system is principally a university system; there is some diversity of mission, but the overwhelming emphasis is on classical academic provision. Despite the presence of some of the most specialised institutions in the country, the university sector features insufficient differentiation in terms of degree programme offer both regionally and generally, with overlap and repetition among the universities. The focus on the university sector means that it operates at a distance from the rest of the higher education, for example, the vocational higher education institutions and AFAM institutions.

The development of a knowledge-based economy requires a diverse set of skills and competencies. Vocational education has an important role in not only fostering those skills but also for widening access to higher education. Type B tertiary education is therefore important to build capacity at regional level. Lombardy is well placed to address this challenge, as it has fostered the development of centres for higher professional and technical

training/education (*Poli formativi*), which could provide a basis for further development.

The following measures would promote regional capacity building:

Recommendations for the national policy

- *Make regional engagement and its wide agenda for economic, social and cultural development explicit in higher education legislation and policy.* Provide incentives for higher education institutions' regional engagement in the form of strategic incentive-based funding schemes on a competitive basis.
- *Strengthen higher education institutions' accountability to society by developing indicators and monitoring outcomes to assess the impact of the higher education institutions on regional performance.* Include the contribution of higher education institutions to local and regional development in their annual evaluations.
- *Move from an ex ante bureaucratic process of accreditation of degrees into one of a periodical evaluation of institutions and programmes in the framework of the European Standards and Guidelines.* Most important: internationalise the evaluation process. An international evaluation of higher education institutions in Lombardy with the aim of supporting innovative governance and management is recommended.

Recommendations for the regional government

- *Build an integrated vision of the Lombardy higher education system.* The most important goal of the regional government's agenda is the decentralisation of competencies relative to universities, innovation and research. A strategic plan and capacity building is of utmost importance to enable the regional government to strengthen its request to have greater autonomy in higher education and to be in a position to take full advantage of these special powers.
- *Develop a common vision of local and regional development among higher education institutions, by building on existing links and initiatives that align higher education institutions with the regional needs.* Support the vision with a strategy and milestones, and funding in order to ensure that local engagement is part of higher education institutions' activities and reflected in their development plans.

- *Develop and encourage collaboration between regional stakeholders and higher education institutions in order to foster economic and social wellbeing in the region.* Promote collaboration between the organisations, bodies and units already in existence, clarify their tasks and remit, and strengthen their accountability to the public.

- *Invest jointly with higher education institutions in programmes that bring benefit to regional businesses and community*, for example, translational research facilities that are aligned with the needs and opportunities of the region, advisory services for SMEs, professional development programmes, graduate retention and talent attraction programmes. Consider using competitive funding to stimulate cross-institutional, multidisciplinary R&D and education programmes which are aligned with the regional needs. Consider introducing a region-wide independent quality assurance organisation or agency in co-ordination with the national agency and invite all higher education institutions to participate in it on a voluntary basis.

Recommendations for the universities

- *Take full advantage of the new university law and the subsequent governance change.* It is important that the new university statutes strike the right balance between autonomy and accountability and are well formulated to accommodate this complexity.

- *Make promotions based on merit only.* Inverted age pyramid for university teaching staff enables human resource planning. Review staff recruitment, hiring and reward systems so as to include the regional development agenda. Create mechanisms to monitor and evaluate the activities in this area, to share good practice between the institutions and benchmark this experience with other organisations and localities.

- *Prioritise regional and local development by developing the senior management teams to deliver corporate response expected by regional and local stakeholders without disincentivising entrepreneurial academics.* The universities in Lombardy should attach a top priority to the region-wide socio-economic development and engagement by making the rector or pro-rector (who is reporting directly to the head of the institution) responsible for this task. A professional management structure should be put in place to support this task. Along with science and technology transfer, stronger focus should be given to a broad range of regional and local development such as human capital development as well as social, cultural and environmental development. Incentives should be created to encourage university faculty and staff engagement.

- *Collaborate to rationalise the degree programme offer.* The universities in Lombardy should develop ways to rationalise their offer of degree programmes and to develop joint degree programmes at Masters and PhD level.

Chapter 1

Lombardy in context

With a population of nearly 10 million inhabitants and a GDP of over EUR 300 billion, Lombardy is the most prosperous region in Italy. The development of Lombardy has been marked by the growth of the services sector, in particular the financial sector in the city of Milan. At the same time, Lombardy remains the main industrial area of Italy. Despite the resilience in the face of the global recession, the region faces long-term challenges emerging from an ageing population, immigration and slow adaptation of practices and technologies that could enhance productivity.

This chapter presents the profile of Lombardy, with its main socio-economic features. It highlights the key characteristics of the higher education system in Italy, currently in flux due to a new university law, and identifies the main strengths and challenges that Lombardy and its higher education institutions are now facing.

Lombardy: governance and demography

Lombardy is one of the 20 regions in Italy, located in the north of the country. It is bordered by Switzerland to the north, and the Italian regions of Trentino-Alto Adige and Veneto to the east, Emilia Romagna to the south and Piedmont to the west. The region is divided into 12 provinces and 1 546 municipalities (*Comuni*) (see Figure 1.1.).

One of the leading regions in Europe, Lombardy has a larger population and economy than many OECD countries. With 9.8 million inhabitants, the Lombardy population is larger than that of Sweden. With a GDP of EUR 326 billion, it has a larger economy than Belgium.

Milan is the regional capital of Lombardy, with over 1.3 million inhabitants, and a leading city on the national scale. While the Milan province has a population of 3.9 million, representing 40% of the Lombardy population, the Milan metropolitan area extends the province's boundaries and embraces over 7 million people. Almost 65% of the Lombardy population is concentrated in the following eight provinces: Milan, Varese, Como, Lecco, Monza e Brianza, Brescia and Bergamo.

Successive waves of decentralisation in Italy have resulted in a sub-national government framework that comprises 20 regions, 107 provinces and 8 100 municipalities (see Table 1.1.). In this framework, regions are the dominant powers. Despite limited revenue-raising authority, they have the largest budgets and responsibilities, representing 60% of the total sub-national expenditures, with provinces and municipalities accounting for the remaining 40%. The regions' primary responsibilities are health and social services, urban planning, vocational training, culture and tourism, regional public transportation, environment and housing. According to the Italian Constitution (Article 117), regions have legislative competencies in education, scientific and technological research, innovation, and support for productive sectors. In these domains, the state sets out general principles with which regional legislation must comply. The regions may also be attributed further exclusive competencies in certain fields by agreement with the State.

Figure 1.1. Map of Italy and Lombardy

Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Table 1.1. The governance structure of Italy: The region of Lombardy

Italian Government	Government in Italy has national, regional, provincial and municipal levels. The national level consists of a two-chamber Parliament with Chamber of Deputies (630 deputies) and a Senate (315 senators); President of the Republic (elected for 7 years by Parliament); Council of Ministers (proposed by Prime Minister) and President of Council (nominated by President of the Republic).
Sub-national government	The sub-national government consists of 20 regions, 107 provinces and 8 100 municipalities. For historical reasons, 5 Regions (Friuli-Venezia Giulia, Sardinia, Sicily, Trentino Alto Adige - Südtirol and Valle d'Aosta - Vallée d'Aoste) have special forms and conditions of autonomy, pursuant to the special statutes adopted by constitutional law. 15 regions have ordinary status: Abruzzo, Basilicata, Calabria, Campania, Emilia Romagna, Lazio, Liguria, Lombardy, Marche, Molise, Piedmont, Puglia, Tuscany, Umbria, Veneto
The Region of Lombardy	**Executive power** *Presidente* (President): The President is elected directly by the electorate every five years. As head of the Regional Government, the President appoints the members of the executive and is accountable to the Regional Council for the executive's actions. *Giunta regionale* (Regional Executive): The Regional Executive, composed of the President, 16 *Assessori* (Regional Ministers) and four *Sottosegretari* (Under-Secretaries), is the executive body. **Legislative power** *Consiglio regionale* (Regional Council): The Regional Council is the legislative body and is composed of 80 members, elected directly every five years by the electorate. It passes regional laws and adopts the regional budget. **Main functions:** health and social services, urban planning, vocational training, culture and tourism, regional public transportation, environment and housing. These are translated into main expenditure items in the budget. Regions can legislate on all matters that do not fall within the sphere of responsibility of central government. The region of Lombardy is responsible for provision of student services and financial support for new degree programmes.
Provinces (*Province*) (12)	The President is elected by the electorate on a majority basis, and appoints and leads the Provincial Executive Committee. Members of the Provincial Council are elected using a proportional system, Main functions: environmental protection, professional training and cultural heritage.
Municipalities (*Comuni*) (1 546)	**Municipal Council:** Members are elected. Municipal Executive Committee is appointed and led by the Mayor (*sindaco*). **Main functions:** Provision of local public services *e.g.* social housing, local public transportation, municipal roads, local police, and the building and maintenance of primary and pre-elementary schools.

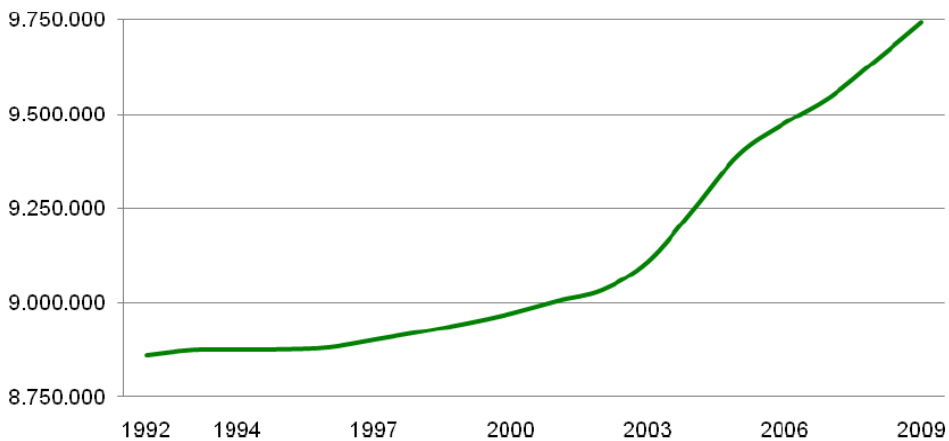
The Regional Government of Lombardy is responsible for the provision of student services and financial support for new degree programmes and university buildings. It is also responsible for vocational education, in particular in terms of creating an integrated system of education and professional training.

The Lombardy region has requested stronger competencies from the State in twelve areas, including universities, research and innovation. This change is expected to unleash the potential of Lombardy's higher education system and to reposition the region to better face the global competition. In the same vein, Lombardy's Regional Development Plan (2010-15) has identified RDI and human capital development as key focus areas along with health and well-being. In order to make tangible progress in these areas and to inject greater degree of internationalisation in the Lombardy economy, joint collaborative action is needed from the region, its higher education sector and private sector stakeholders.

Demography: immigration-driven growth

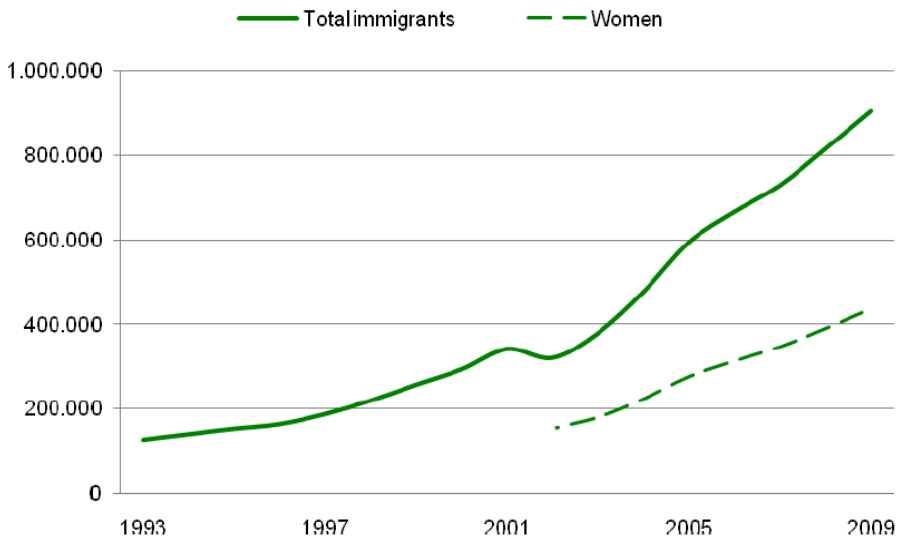
With over 9.8 million inhabitants (ISTAT, 2010), Lombardy is the most populated region in Italy. The growth of the population in recent years has been attributed to foreign immigration, although Lombardy also continues to attract a population moving from southern parts of the country.[1] Recently, due to the economic crisis and the collapse of industrial production in southern Italy internal migration flows have accelerated (*www.svimez.it*). (See Figures 1.2 and 1.3.)

Figure 1.2. Demographic growth



Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment*

Figure 1.3. Trend of immigrant population



Note*:* Data for women only available from 2001 onwards

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment*

With foreign immigration flows, Lombardy is the most diverse region in Italy, counting 25% of the country's documented immigrant population. In 2009, Lombardy had attracted over 0.9 million immigrants, representing almost 9% of the regional population (IReR, 2010). This is a seven-fold increase in the foreign-born population from 1993 to 2009 (909 816). The province of Milan ranks first for the number of immigrant population (41.08% in 2009), while also Bergamo (11.29%) and Brescia (16.55%) have grown their migrant populations (Table 1.2). The top three sending countries for the foreign residents are Romania (13.4% of foreign residents and 3.1% of the total population), Morocco (10.84%) and Albania (9.96%). There has also been a stable increase of the Chinese, Indian and Equadorian communities (Table 1.3). The number of undocumented immigrants was around 152 000 in 2006.

Table 1.2. Population - sub-regional disparities, 2009

	Population	Density	Demographic growth	Income EUR	% Immigrants in the population
Bergamo	1 075 592	395.00	18.11	18 064	11.29
Brescia	1 230 159	257.14	17.72	17 095	16.55
Como	584 762	454.01	11.90	19 094	4.48
Cremona	360 223	203.40	9.82	17 589	3.82
Lecco	335 420	411.05	13.27	20 063	2.63
Lodi	223 630	285.97	21.30	18 184	2.40
Mantua	409 775	175.19	10.02	16 784	5.18
Milan	3 93 035	1 983.02	5.18	23 183	41.08
Pavia	539 238	181.87	9.84	18 238	4.89
Varese	871 448	726.81	9.32	19 127	6.91
Sondrio	182 084	56.69	3.20	15 626	0.77
Total	9 742 676	408.31	9.96	20 172	100.00

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment*

Table 1.3. Foreign residents: countries of origin (%), 2009

Country of origin	Foreign residents (%)
Romania	13.04
Morocco	10.84
Albania	9.96
Egypt	5.83
Philippines	4.53
China	4.14
India	4.09
Ecuador	3.98
Peru	3.68
Ukraine	3.18

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment*.

The high proportion of the young age groups in the immigrant population may partly buffer Lombardy from the effects of ageing and the deteriorating elderly dependency rates. The population over 65 years old has increased from 8.2% in 2001 to around 20% in 2008 and is projected to reach 26.2% within the next few years.[2] Between 2003 and 2007, the

proportion of foreigners who were born in Lombardy rose from 10.1% to 18%. Foreign residents under 18 years old are estimated to be around 25% of the total immigrant population. (IReR, 2010, based on Istat 2009 data). (See Table 1.4, for immigrants among population aged 18-25 years including future projections.)[3]

Table 1.4. Foreigners in Lombardy (%) among population aged 18-25 years old, 2003, 2009, 2020, 2030

Age	2003	2009	2020	2030
18	4.7	10.7	16.7	24.5
19	4.7	12.0	16.6	24.2
20	4.8	13.1	16.6	23.9
21	5.1	14.3	16.8	23.8
22	5.4	14.9	17.4	23.6
23	6.4	14.4	18.2	24.3
24	6.5	15.7	19.7	24.6
25	7.0	16.3	21.0	24.9
Total 18-25	5.7	14.0	17.9	24.2

Source: ISMU Fondazione Iniziative e Studi sulla Multietnicità (Foundation on multi-ethnic studies, research and projects) (2009), XV rapporto sulle migrazioni 2009, FrancoAngeli, Milano

Partly because of the SME-based economy and a large informal sector, Lombardy features a relatively low level of educational attainment, lagging behind the most innovative regions in Europe. In 2010, only about 15.9% of the Lombardy population aged 25-64 years had tertiary education qualifications, which is considerably below the European average (EU27) of 25.9% and other industrialised regions (Ile de France, 39.9% and Stockholm, 42.5%). Nonetheless, the proportion of the Lombardy population with tertiary education has grown about 5 percentage points from 2001 to 2007 similar to growth observed in other European regions.[4] According to a Lisbon Council report, Lombardy ranks 221 out of 265 European regions in terms of the educational attainment of 25-64 years olds (Ederer, Schuller and Wilms, 2011).

Regional economy

Diverse industry base

Lombardy, the most affluent region in Italy, makes a significant contribution to the Italian economy, representing about one-fifth of the total gross domestic product. In terms of GDP per capita (PPP-Adjusted),

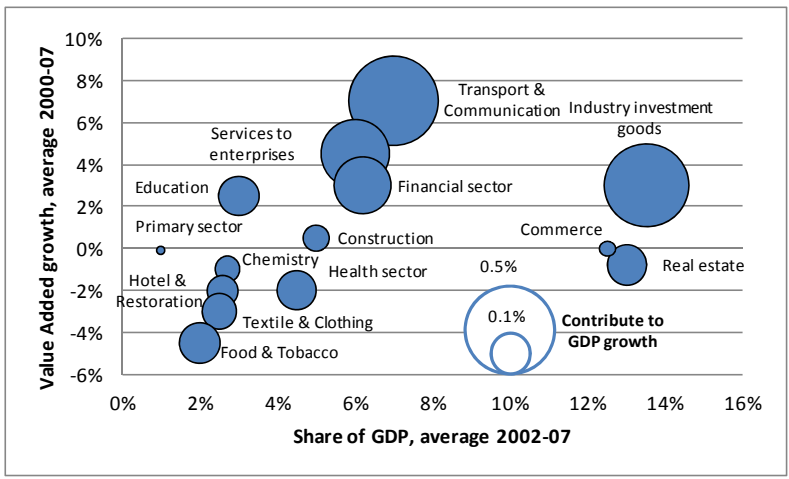
Lombardy is the 26st richest European region (Ederer, Schuller and Wilms, 2011), but there has been considerably fluctuation during the recent economic crisis. In 2008, the per capita GDP in Lombardy decreased to the level of 2000, even though the absolute GDP grew from EUR 246 billion to EUR 326 billion (about 20.7% of the Italian GDP).

Lombardy has a diverse economy, featuring a long-standing industrial and manufacturing tradition and Europe's most productive agricultural sector. Milan has developed into the financial and economic engine of Italy with a presence of multinational companies and an internationally recognised hub of cultural and creative industries, attracting 15 million foreign tourists every year.

The service sector has increased its weight in the value added to the Lombardy GDP (61.7% in 1995 versus 65% in 2008). Service sectors that make the greatest contribution to the GDP growth include ICTs, professional activities, research, planning and the financial sector, while traditional sectors (education, marketing, real estate and restaurants) make only a limited contribution, with the possible exception of education. (See Figure 1.4).

Figure 1.4. Contribution to GDP growth by main economic branches, 2000-07

Real growth *vis-à-vis* 2000 prices, PPP



Source: IReR (2010) "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment* based on BAK 2008 data.

Lombardy is undergoing a profound industrial shift towards services and knowledge-intensive activities, but retains a significant manufacturing sector, which is under pressure from global competition. In 2010, the Lombardy workforce was predominantly employed in the service sector (64%). The manufacturing sector continues to employ a higher proportion of the regional workforce than Italy as a whole (33.5% versus 27%). At the same time, however, the employment rate in high and medium tech manufacturing remains low at 10.9%, compared to 21.2% in the region of Stuttgart and 12% in Piedmont, which is the leading region in Italy. In terms of the share of complex jobs in the workforce in 265 European regions, Lombardy ranked in the 168th position (Ederer, Schuller and Wilms, 2011). Knowledge Intensive Business Services (KIBS) have a limited weight in the Lombardy economy, representing only 3.78% of the total employment, compared to 8.4% in Stockholm and 7.2% in Oslo (IReR, 2010).

Table 1.5. Value added by economic sector

	Lombardy		Italy	
	1995 (%)	2008 (%)	1995 (%)	2008 (%)
Agriculture	1.5	1.5	2.8	2.6
Industry	36.8	33.5	29.4	27.0
Services	61.7	65.0	69.7	70.5

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment*

There is considerable sub-regional diversity in economic activity in Lombardy. The province of Milan is home to multinational and financial companies, educational and health institutions and research centres. Varese, Como, Lecco, Monza e Brianza, Bergamo have a strong manufacturing sector but also a high proportion of service employment. Lodi and Bresca feature both manufacturing and agriculture, while the province of Sondrio as well as the three provinces in the plains (Cremona, Pavia, Mantua) have a strong agricultural sector.

Multinational companies[5] have a strong presence in the region but employ only a small proportion of the workforce (27%), whereas the small and medium-sized enterprises (SMEs) dominate the local and regional economy. In 2009, there were 823 268 companies, *i.e.* 8.45 companies for 100 inhabitants, that employed more than 4.3 million people. One of the main characteristics of the Lombardy economy is the small scale of firms (see Table 1.6.). The resilience of the small business activity has been based

on continuous product improvements and the ability to penetrate the national and international markets.

Table 1.6. Enterprises in terms of the number of employees (%), 1999-2007

	1999	2000	2001	2002	2003	2004	2005	2006	2007
1-9	93.64	93.74	93.81	93.82	93.6	93.67	93.72	93.73	93.69
10 - 49	5.54	5.41	5.32	5.30	5.51	5.45	5.41	5.39	5.43
+ 50	0.82	0.85	0.87	0.87	0.89	0.88	0.87	0.88	0.88

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

The unemployment rate in Lombardy has remained below the national average and that of Europe, but the youth unemployment is on the rise. In 2010, the Lombardy unemployment rate was around 5.6%, compared to the national rate of 7.6%. The unemployment rate for the population under 30 years in Lombardy increased from 8.4% in 2008 to 12.1% in 2009 (OECD, 2010c). Based on 2008 data, Lombardy is ranked 85 out of 242 European regions in terms of the youth unemployment rate, aged 15-24 (Ederer, Schuller and Wilms, 2011).

The regional employment rate remains at a low level due to early retirement, reliance on informal workers and the fact that the Lombardy labour markets do not encourage female participation. The regional employment rate was at 65.1% in 2010, about 74.2% for men and 55.8% for women. Female employment, albeit having increased in recent years, is below the average European levels and is also lower than in the region of Emilia Romagna. The employment rate of highly educated older Italians is nearly three times higher than the rate of the less educated peers.

Higher education in Italy

The Italian higher education system has a large number of institutions, but a limited degree of diversity due to the underdevelopment of the vocational higher education sector. The Italian higher education system consists of 95 universities, 129 academies and conservatories of art, music and dance (*Alta Formazione Artistica e Musicale* - AFAM),[6] and a professional training and education sector[7]. The university system embraces 61 state universities (including 3 technical universities), 28 private universities and 6 higher education centres with a special charter. In 2010, there were 1.8 million university students compared to about 70 000 at the AFAM institutions (66 589 in 2008/09 academic year).

The central government holds responsibility of the overall co-ordination of the higher education system, the European and international representation under a unique voice of the Italian higher education system, and the co-ordination and control of university funding. The Ministry of Education, University and Research (MIUR), supported by a range of advisory agencies,[8] is responsible for the university system as well as the academies and conservatories of art, music and dance, whereas the Ministry of Labour leads employment and vocational training policy, supported by two national agencies: Italia Lavoro for labour market and employment, and ISFOL, the Institute for Workers Vocational Training for VET.

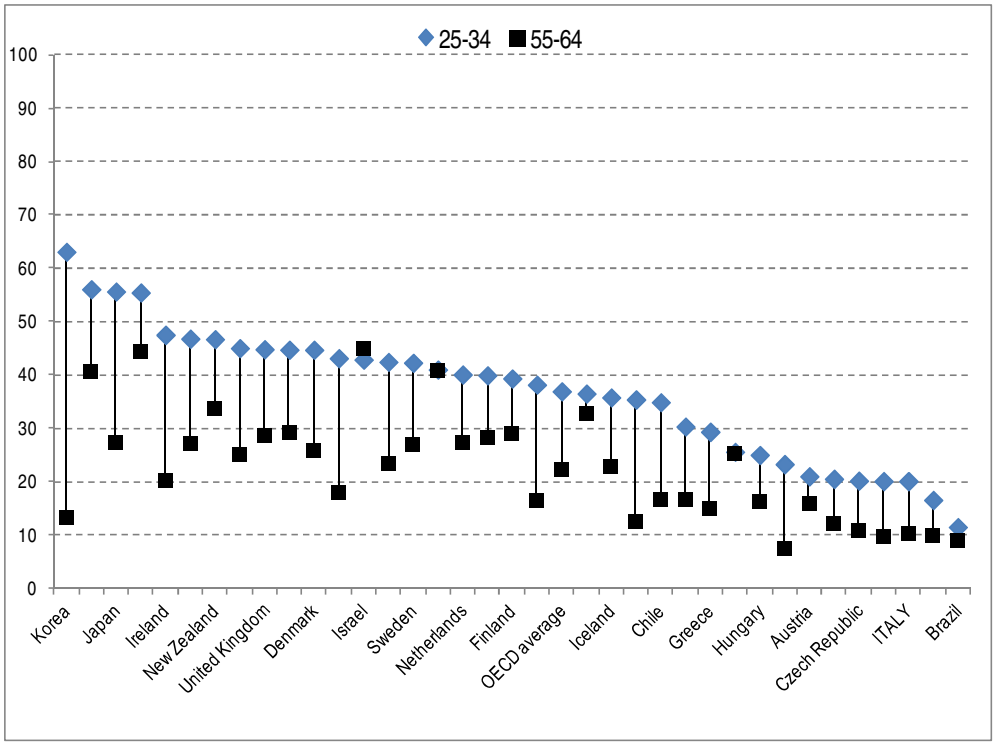
The higher education scene in Italy is dominated by the university sector, which, despite wide institutional variation, is underperforming in three key aspects: graduate production and employability, international competitiveness, and knowledge transfer. The 2010 law on university reform aims to address the challenges by introducing changes to the university governance, funding and staff matters.

Inefficiencies in graduate production

The OECD Data (*Education at Glance, 2011*) show that the population in Italy lags behind the OECD countries in terms of educational attainment, but the gap has been closing in the recent decades. In Italy, about 20% of the 25-34 year olds and around 10% of the 54-64 year olds have completed tertiary education, compared with the OECD average of 35% and 20% respectively. During the period of 1997-2007 there was an annual increase of 5.5% of higher education graduates (OECD, 2010b).

Despite the improved performance and the growth in student enrolment, the share of second-cycle (research) degrees is smaller in Italy than other countries. Similarly, Italy lags behind the number of graduates in scientific fields.[9] These factors reduce the contribution of tertiary education to long term economic growth and have a negative impact on the country's innovation capacity.

Figure 1.5. Population that has attained at least tertiary education, 2009



Note 1: Countries are ranked in descending order of the percentage of 25-34 year-olds who have attained at least tertiary education. The year of reference for the Russian Federation is 2002.

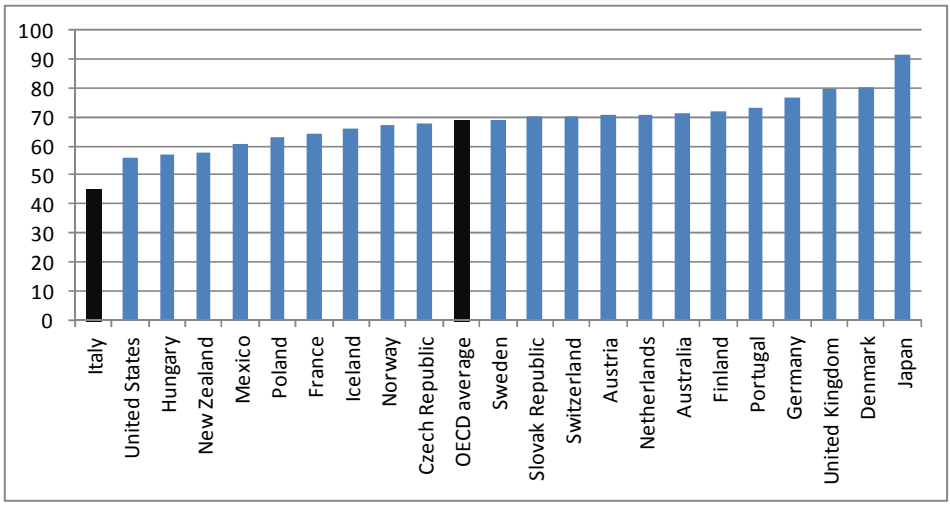
Note 2: For technical reasons, these figures use Israel's official statistics, which include data relating to the Golan Heights, East Jerusalem and Israeli settlements in the West Bank.

Source: OECD (2011a), Education at a Glance 2010, OECD, Paris.

Late graduation, *i.e.* the length of time that university students need to finish their studies, and high dropout rates point to inefficiencies in the higher education system and erode the Italian university system's competitiveness. Italy has the lowest completion rates in the OECD area and its higher education graduates are among the oldest. The average duration of studies in Italy is one year longer than in the OECD area (OECD, 2009a). Four out of ten students are "behind schedule", *i.e.* they are staying longer than the regular duration of studies. About 60% of

students do not gain any credits during the academic year (CNVSU, 2009). More than one out of six students drops out during the first academic year.

Figure 1.6. Completion rates in type A tertiary education programmes

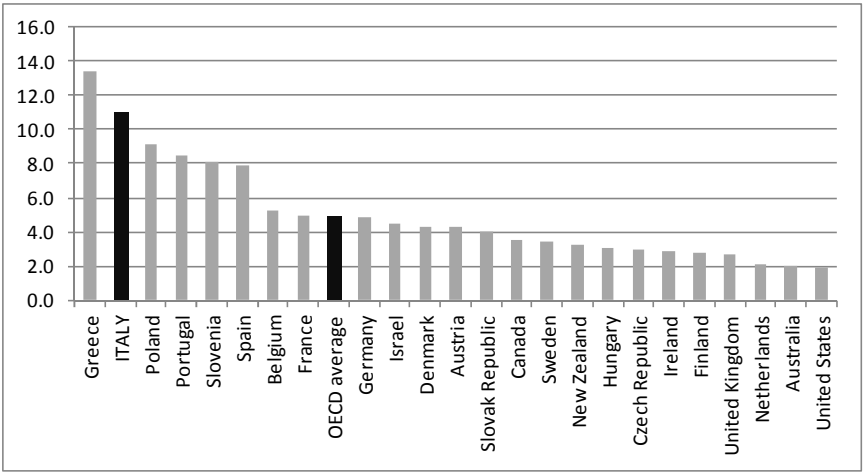


Source: OECD (2010b), Education at a Glance 2010, OECD, Paris.

High drop-out rates are partly caused by the lack of financial, social and academic support, which limits access to and success in higher education. Limited student aid is provided, mostly as family-based mean-tested grants.

The employability of Italian higher education graduates has worsened in the last decade: the number of inactive graduates (neither working nor studying) was about the same as with the population with a lower educational attainment. Graduates face significant difficulties in entering the labour market: in 2006, the unemployment rate of higher education graduates in the age group from 25 to 29 years was 11%, compared with the OECD average of 5% (see Figure 1.7). The situation has deteriorated during the economic crisis.

Figure 1.7. Unemployment rates of higher education graduates in the age group from 25 to 29 years for selected OECD countries, 2006



Source: OECD (2008a), Education at a Glance 2008, OECD, Paris.

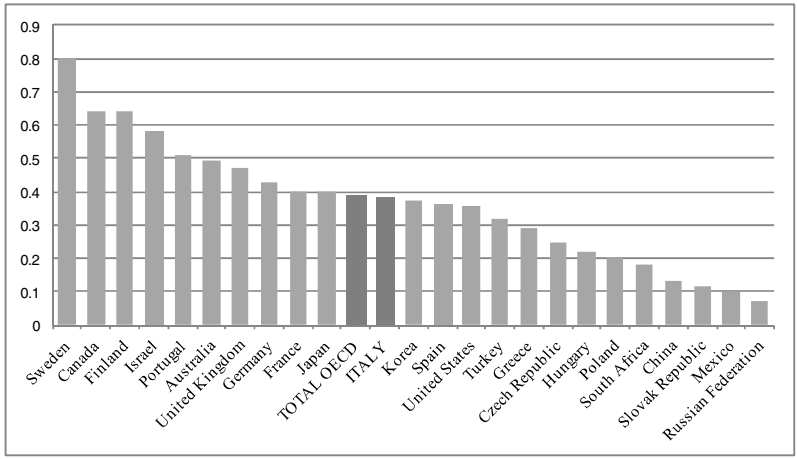
Low international competitiveness

The Italian higher education system is internationally not competitive. In 2008, 2% of the world's students studying outside of their home country came to Italy (as compared with 18.7% to the US, 10% to the UK, 7.3% to both Germany and France) (OECD, 2010b). Net emigration of highly skilled individuals is considerable. The Italian higher education and research system is not attractive to non-Italian researchers, partly due to cumbersome administrative procedures for admission.

Strengths in knowledge generation but limited knowledge transfer

In 2008, Italy's expenditure on higher education R&D (HERD) as a percentage of GDP was comparable to the OECD average (0.38% versus 0.39%).[10] Business and industry funded 1.3% of the Italian university R&D in 2007 compared to the OECD average of 6.5% (see Figures 1.10 and Figure 1.11) In the last twenty years, the share of public R&D has slightly increased in Italy, but overall R&D investment remains significantly behind OECD standards; R&D expenditure was 1.1% of GDP, compared with over 1.7% for the EU and 2.25% for the OECD average.

Figure 1.8. HERD as a percentage of GDP in selected countries, 2008



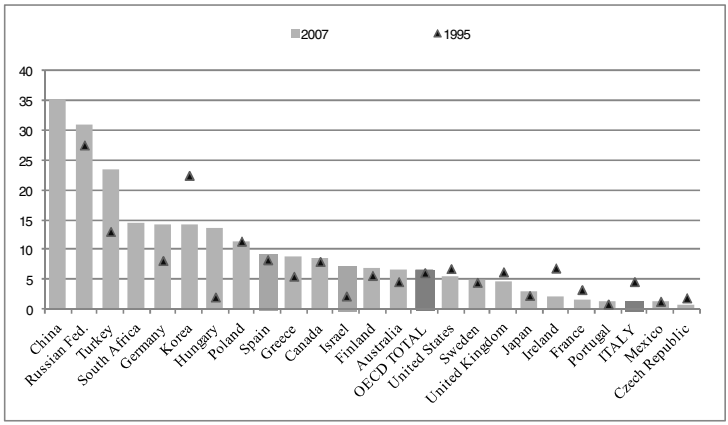
1. Or nearest available year.

2. For technical reasons, these figures use Israel's official statistics, which include data relating to the Golan Heights, East Jerusalem and Israeli Settlements in the West Bank.

Source: OECD (2009b), Main Science and Technology Indicators, OECD, Paris.

Figure 1.9. HERD financed by industry (%)

1995 and 2007, selected countries



1. Or nearest available year.

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

Source: OECD (2009b), Main Science and Technology Indicators, OECD, Paris.

Italian universities have strengths in knowledge generation, but continue to make a relatively modest contribution to innovation. In 1998-2008, Italy was the eighth largest world producer of scientific publications (its share of worldwide publication was 3.6% versus 26% in the US, 7.6% in Japan, 7% in China, around 6% in the UK and Germany). Italian research output is among the top ten in the world (measured by the number of quotes in the two years following the publication), with special strengths in physics and chemistry. At the same time, the number of official university European patents, industry funding of universities and university-industry collaboration in general remain modest (Bonaccorsi and Daraio, 2007; OECD, 2008).[11]

Consequently, the scope and the effectiveness of Italian innovation are among the weakest ones of the OECD area (EIS, 2009; OECD, 2010b). According to the European Innovation Scoreboard, Italy is a moderate innovator and a "slow grower", *i.e.* it is converging to the European average slower than many other countries. Of the seven dimensions used in calculating the innovation performance index, Italy performs particularly poorly in "human resources"[12] and is consistently below the EU average in all the other six dimensions (finance and support, firm investment, linkage and entrepreneurship, throughputs, innovators and economic effects).

New university law strengthens autonomy and accountability

Enhanced autonomy of higher education institutions is a necessary pre-condition for stronger accountability: If universities are to be held responsible for their results, they must be free to decide how to use their human, financial and physical resources. Italian universities have traditionally featured limited autonomy in key areas of staff and funding decisions, which acts as an impediment in the development of a more efficient university sector (Oliveira *et al.*, 2007; see also OECD, 2011b). Public universities' faculty's salaries are determined centrally: yearly updates are set in specific ministerial decrees, in accordance to negotiation results achieved in other wage sectors. Universities also continue to be seriously constrained in their recruitment.

At the same time, Italian universities have been relatively free in their course content and examinations. This has resulted in highly heterogeneous quality of degrees across institutions, despite the legal equivalence of all degrees (*valore legale del titolo*) (Bagues, *et al.*, 2008).

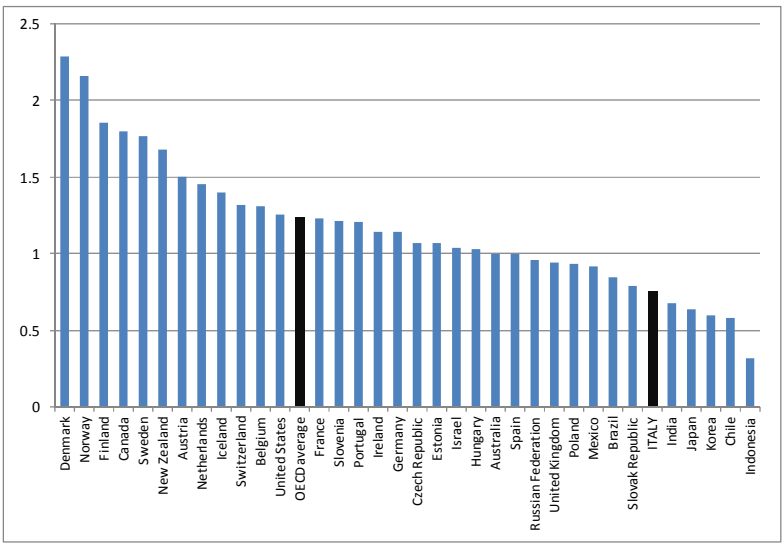
The 2010 law on university reform (law 240/2010) aims to enhance institutional autonomy and accountability by improved monitoring of performance and linking rewards to performance (see Annex 1.A.1). It provides for changes in three key areas of university management:

governing bodies, recruitment, and funding and salaries. There will be a separation of academic and financial management, and automatic salary increases no longer exist.

Public funding is under pressure

Italy devotes fewer financial resources to tertiary education than other countries, whether in terms of annual expenditure per student (37% less than OECD average, including public and private expenditure in 2007), a share of GDP (0.75% versus an OECD average of 1.2%) or a share of public expenditure (1.6% and 3.0%, respectively (OECD, 2010b) (see Figure 1.10). In 2007, expenditure by tertiary education institutions per student in Italy was USD 8 673, compared to the OECD average of USD 12 907 (see Figure 1.11). There is also evidence that the limited resources are spent inefficiently (St. Aubun *et al.*, 2008; Agasisti and Johnes, 2009).

Figure 1.10. Public expenditure on tertiary education as a percentage of GDP, 2007



Note 1. Public expenditure presented in this table includes public subsidies to households for living costs (scholarships and grants to students/households and students loans), which are not spent on educational institutions.

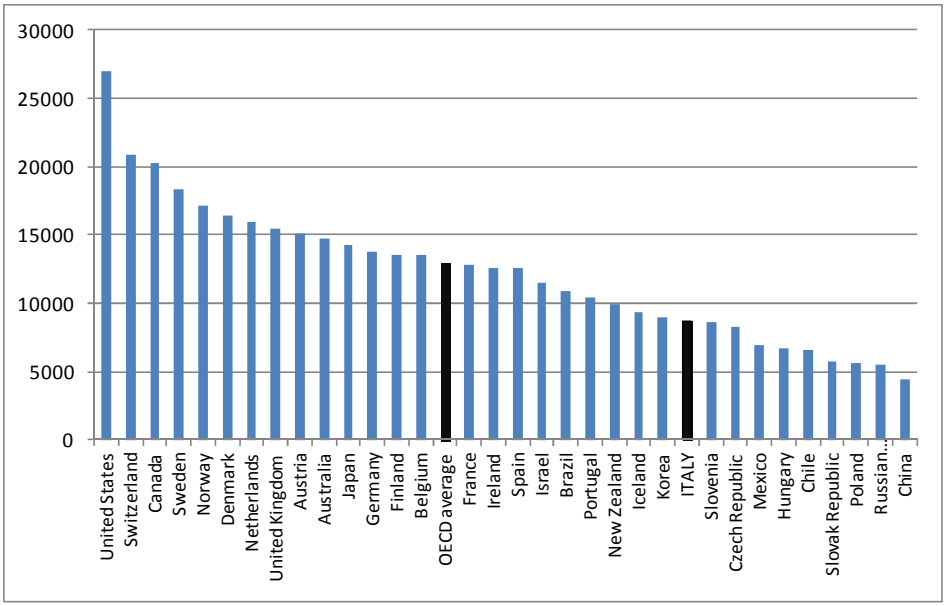
Note 2. Countries are ranked in descending order. The year of reference for Canada is 2006, Chile is 2008 and for India is 2005. Figures for Luxembourg, Poland, Portugal, Switzerland, Brazil and the Russian Federation are direct public expenditure on educational institutions and do not include public subsidies to households.

Note 3: For technical reasons, these figures use Israel's official statistics, which include data relating to the Golan Heights, East Jerusalem and Israeli settlements in the West Bank.

Source: OECD (2010b), Education at a Glance 2010, OECD, Paris.

Figure 1.11. Annual expenditure by educational institutions in tertiary education (including R&D activities) per student for all services, 2007)

In equivalent USD converted using PPPs for GDP



Note 1: Countries are ranked in descending order. The year of reference for Canada is 2006 and Chile is 2008. Figures for Canada, Hungary, Italy, Luxembourg, Poland, Portugal, Switzerland, Brazil and the Russian Federation are for public institutions only.

Note 2: For technical reasons, these figures use Israel's official statistics, which include data relating to the Golan Heights, East Jerusalem and Israeli settlements in the West Bank.

Source: OECD (2010c), OECD Statistics website, OECD, Paris, *http://stats.oecd.org*,

The share of private expenditure in total higher education expenditure (25%) is lower in Italy than the OECD average (33%). Italian public universities are mainly financed by the central government, which, in 2007, provided 64% of the university budget on average.[13] The allocation of state funding depends both on historical spending and other elements (see Box 1.1). In 2008, it was announced that the core fund of universities (the Ordinary Fund for Higher Education, FFO – *Fondo per il Finanziamento Ordinario*) (which, with tuition fees, covers 68% of total funding) would be

cut by 14% for the three years 2009-11, with further cuts to come; some of these cuts were offset with funds granted to cover rewards for performance. As a result, many universities face severe financial difficulties, especially those where student numbers have expanded (since funding is based on historical spending rather than current needs). Overall funding was cut by some 3% between 2008 and 2010 ad cuts of 9% are envisage for the period 2010-12.

In 2010, 10% of state funding (FFO) (increased from 7% in 2009) was allocated to universities on the basis of teaching and research performance (with weights on one-third and two-thirds respectively). Teaching indicators include the number of students enrolled (those that complete 5 credits) and the ratio of the credits actually gained to the number of full-time students "should" have gained in a years. In addition, the indicators take into account the impact of the universities on the productive sector, for example, the percentage of university graduates that find employment three years after graduation and knowledge transfer activities (patents, spinoffs, university-industry collaboration). ANVUR (*Agenzia nazionale di valutazione del sistema universitario e della ricerca*) will decide on future criteria. In the future, the share will be increased progressively towards 30%. Staff costs remain capped at 90% of an institution's funding and tuition fees subject to the limit of 20% of total university funds.

Box 1.1. State funding of universities in Italy

Since 2004, public funding has been distributed to universities according to a baseline share (based on historical spending) and a balancing share (*quota di riequilibrio*). Up to 2009, the balancing share allocated money as a function of standard costs per student (one third of the share), credits and degrees gained by students (one third) and the quality of research activities (one third). As the balancing share was not fixed by law and the cost of personnel has increased substantially in the last ten years, a very small fraction of the core funding has actually been allocated to adjust historical spending trends.

Box 1.1. State funding of universities in Italy (continued)

For the first time in 2009, the balancing share was set equal to 7% of core funding, increased to 10% in 2010 (and the intention is to increase this fraction to 30% in the future). In addition, new criteria were included in the balancing share, which are supposed to take into account progress in the underlying performance structural indicators.*

While the decision to allocate a predictable part of core funding to reward performance and efficiency is commendable, it is important to ensure that the input and output indicators fully supported by robust data (the information dataset is still in progress) and that the indicators are totally understood and agreed by universities. The agency – ANVUR – that is to define the indicators has only recently began its operations. Another element of best-practice funding strategies would be to move to multi-year performance-based funding, which would encourage universities to plan and develop their strategies over the medium term.

* Two-thirds of the balancing share are to be allocated to universities with the most progress in research (annual change in the percentage of academic staff and researchers participating in Research Programmes of National Interest (PRIN), which received a positive assessment; annual change in the percentage of funding obtained by European competition within the EU Cordis projects) while the remaining one third goes to institutions with the best results in didactics (change in the ratio of in-charge academic staff in the academic year 2008-09; change in the ratio of enrolled students in the second year who obtained at least two-thirds of statutory credits; change in the ratio of actual credits of all students to statutory credits; change in the share of all courses for which student valuation is required; change of the percentage of students graduating in 2004 who were employed three years after graduation).

Source: OECD (2011), "Italy", in OECD, *OECD Economic Outlook, Volume 2011 Issue 1*, OECD Publishing.doi: 10.1787/eco_outlook-v2011-1-9-en.

Higher education in Lombardy

Lombardy Universities

The Lombardy university system consists of 15 institutions, with some of the most specialised in Italy. There are 7 public universities (including a technical university), 7 private universities (including two distance universities), and higher education centre with a special charter. The Lombardy university system represents about 16% of the Italian university system and 25% of the CRUI universities (Conference of the Italian University Rectors). (See Annex 1.A.2. for more details.)

With 223 300 university students (2 398 in online universities) in the academic year 2008/09, Lombardy is the leading region in Italy,

representing 13% of the total number of students. Lombardy is also a leading region in internationalisation; the number of foreign students has quadrupled since 1998. In 2008-09, there we 7 950 foreign students enrolled in the universities of Lombardy, 3.5% of the total enrolment, compared with the national average of 2.7%. There is, however, considerable variation in the internationalisation activities of the universities.

The Lombardy universities receive 48% of public national funding. The region's university system has reduced its dependency on public funding by increased knowledge transfer activities and tuition fees, which are among the highest in Italy in both state and private universities (see Table 1.7) The average annual contribution per student is EUR 1 217.81 for public universities and EUR 4 933.46 for private institutions.

Table 1.7. Sources of funding, 1990 and 2007

(Million EUR)

Source of funding	Italy (1990)		Italy (without Lombardy) (2007)		Lombardy (2007)	
Public	7 192.2	91.2%	7 662.7	73.6%	1 064.8	70.8%
Private	609.3	8.7%	2 37.3	26.3%	439.2	29.2%

Source: compiled by IReR from CNVSU, 2009

Three Lombardy universities (the Politecnico di Milano, the University of Bergamo and the University Milan-Bicocca) are in the top ten institutions in Italy in terms of graduate employability and research output. As a result, they (and three other Lombardy universities) have benefitted from the performance-based extra funding allocated by the Ministry of Education, University and Research (MIUR) (see Table 1.8).

Table 1.8. MIUR rankings for re-allocation of 7% of FFO, 2009

National rank	University	Additional funding %
3	Politecnico di Milano	+4.14
4	University of Bergamo	+2.82
6	University of Milan-Bicocca	+2.51
11	University of Milan	+1.69
15	University of Insubria	+1.36
25	University of Pavia	+0.33
28	University of Brescia	-0.39

Source: MIUR (Ministry of Education, University and Research) (2009) *http://statistica.MIUR.it/*.

Academies and conservatories of art, music and dance

Academies and conservatories of art, music and dance in Lombardy, *Alta Formazione Artistica, Musicale e Coreutica,* (AFAM), have strong international reputations and attract students from all over the world. In 2008-09, there were 9 232 AFAM students (13.8% of the national total). Around 30.9% of AFAM students were from abroad, compared to the national average of 5.1%. Consequently, the Lombardy institutions attract 83.6% of foreign students enrolled in Italian AFAMs. (See Annex 1.A.2 for more details.)

Professional education and training institutes – Poli formativi

Among the professional training institutes in Lombardy, a key role is played by 31 *Poli formativi,* centres for higher professional and technical training and education, fostered by the Lombardy region. Each of the *Poli formativi* collaborates with secondary education institutions, professional training centres, university departments, research centres, enterprises, trade unions, regional and local governments, educational organisations and other associations.

Table 1.9. Institutions involved in the *Poli formativi*

Type	No of players
High schools	102
Professional training centres	27
University departments	86
Research institutions	53
Enterprises	14
Trade unions	61
Public institutions	56
Educational organisations	26
Other associations	62
Total	487

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment,* based on Di Maggio and Bandera (2007), "Poli formativi lombardi: un primo bilancio a un anno dall" avvio", in *Rassegna Autonomia Scolastica*, pp. 23-28

Poli formativi are spread throughout the region and focus their work on the relevant sectors of the Lombardy economy. Their aim is to map the economic, productive and local needs, assess the skills needs in the productive sectors and develop professional training required. Training

courses satisfy both up-skilling and re-skilling needs of employees and the unemployed, as well as students and graduates in search of their first jobs.

Table 1.10. Industry sectors of Poli formativi

Sector	No. of *Poli Formativi*
Agriculture	3
Business services	1
Cosmetics	2
Culture and entertainment	2
Financial services	1
Furniture	1
Innovative materials	2
Logistics and transport	1
Mechanics	2
Media	1
Social assistance	1
Technological innovation and robotics	6
Textiles – Fashion – Shoes	3
Tourism	2
Trade fairs	1

Source: Di Maggio and Bandera (2007), "Poli formativi lombardi: un primo bilancio a un anno dall" avvio", in *Rassegna Autonomia Scolastica*, pp. 23-28.

Research and innovation in Lombardy

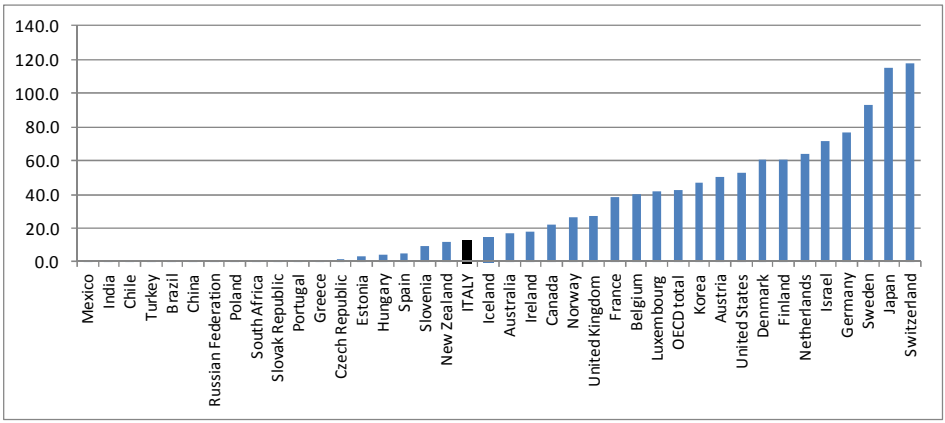
Lombardy ranks number one in Italy in terms of overall amount of R&D expenditure. However, at around EUR 3.9 billion in 2007 (1.22% of the national GDP) it falls short of the Lisbon targets of 3% GDP. Approximately 70-75% of funding comes from private sources, compared to the national average of 50%.

While higher education research is less than 20% of the regional research investment, its absolute value and scope is significant. Lombardy accounts for 12.3% of the Italian R&D expenditure in universities (EUR 630 million in 2006) and receives 16% of the funds of the Research Projects of National Interest (PRIN - *Progetti di Ricerca di Interesse Nazionale*). Lombardy research is dominated by the medical, biological, biotechnological and pharmaceutical fields, which represent 56% of the total research sector (see Annex 1.A.3). The region's universities are home to about 300 research centres.[14] Lombardy accounts for 1.86% of the EU27 publication output and is ranked 5th within the list of the 25th highest performing European regions. The region has increased by 5% its output over the period 2001-07. However, the scientific density (publications per

million inhabitants) is less impressive (ranked 23rd) and the quality index measuring the impact of the scientific production just average (ranked 15th) (OST, 2008).

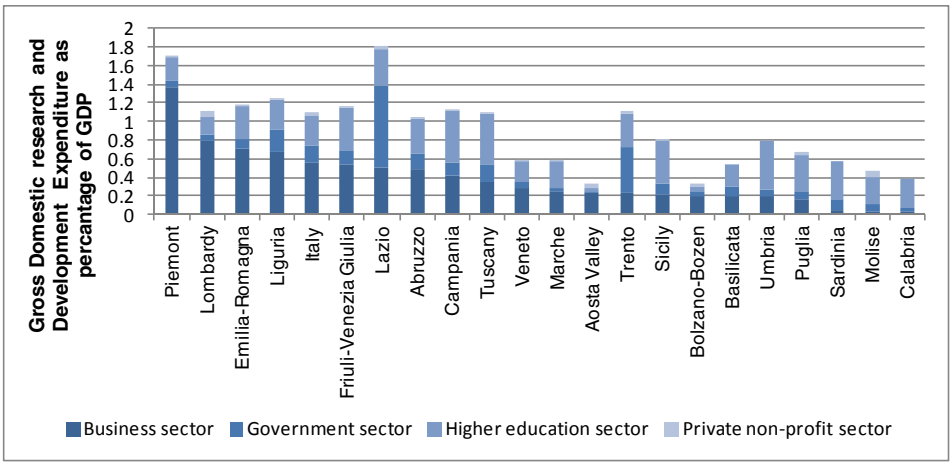
Figure 1.12. Patents registered, 2007

Number per million inhabitants in the European and Japanese Patent Offices, and the United States Patent and Trademark Office



Source: OECD (2010d), *OECD Factbook,* OECD, Paris.

Figure 1.13. R&D intensity in Italy across four sectors



Source: OECD (2010c), OECD Statistics website, OECD, Paris, *http://stats.oecd.org*

Lombardy has been one of the leading regions in building regional innovation systems in Italy and features a strong focus on RDI in its Regional Development Plan. High technology sectors have been the focus of the agreements between Ministry of Education, University and Research (MIUR) and the Lombardy region. The 2004 agreement provided match funding of EUR 90 million (EUR 30 million from the Ministry and EUR 60 million from the region). The 2010 agreement saw an increase in funding with MIUR providing EUR 59 million and the region EUR 61 5 million. The funding has focused on improvement of start-up and spin-off funding instruments, taking into consideration the SME-based economy in Lombardy.

The European Regional Innovation Scoreboard classifies Lombardy as a medium-high innovating region, with high innovation firm activities and outputs (Hollanders, Tarantola and Loschky, 2009). In an innovation indicator measuring public and private R&D as a percentage of overall GDP and patent application per one million inhabitants, Lombardy is ranked 74 out of 263 European regions (Ederer, Schuller and Wilms, 2011). The number of patents relative to population size places Lombardy at the end of the list of top performers in Europe (*i.e.* regions between 100 and 300 and above 300).[15] In 2005, more than 1 400 patents by Lombardy were deposited at the European Patent Office, making Lombardy the leader on the national scene in absolute terms, but lagging behind Piedmont in relative terms (in regional GDP).

The regional innovation indicators for Lombardy for 2004 and 2006 identify innovative SMEs as strengths in the regional innovation system (RIS), whereas there are weaknesses, for example, in broadband access and the universities' knowledge transfer activities (see Annex 1.A.4). In the Italian context, Lombardy's universities are, however, doing well: their patent portfolio is three times richer than in other Italian regions.

Table 1.11. Technology transfer output indicators per 1 000 professors, 2007

	Identified inventions	Priority applications	Patent portfolio	Licences concluded	Returns from licences and/or active options EUR
Average Lombardy	113.2	20.0	301.1	12.9	337 547.4
Average Italy	38.0	16.0	110.8	4.0	81 400.4

Source: Netval (2009), Brevetti e imprese per il sistema paese: il contributo dell'università. Sesto rapporto netval sulla valorizzazione della ricerca nelle università italiane, *www.netval.it/contenuti/file/Rapporto%20Netval%202008.pdf*.

Conclusions

Lombardy is the most prosperous region in Italy. Its recent development has been marked by the growth of the services sector. At the same time, Lombardy remains Italy's main industrial area. Thanks to its economic diversity, the region has demonstrated unusual resilience in the face of the global recession. It is, however, under increasing pressures from global competition.

At the same time, low human capital development and demographic trends linked to poor labour market performance are challenges to Lombardy as it aims to strengthen its positioning in the globalised knowledge economy. The region faces two basic challenges in human capital development: upgrading and adapting the skills of the labour force to the new requirements of the regional economy; and making education and the labour force more inclusive, especially for immigrants, women and the oldest segments of the working population.

While Lombardy's foreign residents have relatively low educational attainment levels, the situation is improving. In 2009, 45% of resident foreigners had a secondary education qualifications and 14.2% higher education qualifications. As Lombardy continues to transform its economy, highly skilled immigrants and knowledge workers will be in demand. However, so far, the region has not attracted enough talent or launched large-scale programmes to train its growing immigrant labour pool. More efforts are also needed to address the consequences of ageing, and the low inclusion of women and older workers aged 55-64 years into the labour market.

The higher education scene in Italy is dominated by the university sector, which, despite wide institutional variation, is underperforming in three key aspects: graduate production and employability, international competitiveness, and knowledge transfer. The 2010 law on university reform aims to address the challenges by introducing changes to the university governance.

Lombardy has a relatively diversified higher education sector with some of the most specialised institutions in Italy. It is the leading region in Italy in terms of number of students and internationalisation of the higher education sector. Its universities have reduced their dependency on public funding and made progress in knowledge transfer. They are generally well placed to take advantage of the strengthened autonomy and accountability that the new university law has brought along. Stronger accountability structures and greater institutional flexibility can unleash the universities'

potential for regional and local development, provided that appropriate incentives structures are developed for institutions and university staff.

Notes

1. Italy, uniquely in Europe, continues to feature strong inward migration: from 1997 to 2008 about 700 000 people left southern regions in order to find employment in the central and northern regions of the country. Internal migration has brought 5 million Italians to Lombardy.
2. During 2002-06, death rates decreased by 7-8%. In 15 years, estimated life expectancy increased by four years for women and six years for men, reaching a level of 84 and 78-79 years respectively.
3. Lombardy hosts a significant number of multinational companies in aeronautics and aerospace factory (Agusta Westland, Alenia Aermacchi, Finmeccanica), pharmaceuticals (Bracco, Dompé, Recordati, Sorin), ICTs (Alcatel, Cisco system, IBM, Pirelli, Saes Getter, Siemens, STMicrolectronics, TXT e-solution), materials (Italcementi, Tenaris), machinery (Gefran), electronic appliances (ABB), household appliances (Candy), engines (MV Agusta, Iveco, Brembo), tyres (Pirelli) and textile (Mantero, Radici, Zucchi).
4. From 1999 to 2008, the percentage of the population with a tertiary education degree increased from 6.6% to 11.4%.
5. About 7% chose to attend a single-cycle degree course belonging to the faculty of pharmacy or medicine and 9% attended law degree courses.
6. Higher education institutions in arts and music (*Alta Formazione Artistica e Musicale* - AFAM) include academies of fine arts, national academies for dance, national academies for the dramatic arts, music conservatories, recognised musical institutes and the Higher Institute for Artistic Industries (Istituto Superiore per le Industrie Artistiche). Schools for interpreters and translators, psychotherapy, archivists, palaeographers, diplomats and military personnel complete the national higher education system.
7. The professional training and education sector includes institutions that were originally established by the regional, provincial or local administrations or private bodies and have a focus on commerce,

communication, marketing and tourism and technical disciplines closely connected to industry.

8. These agencies include: the CUN, National University Council, formed by university professors belonging to different scientific areas and elected by all university professors in Italy; the CNAM, National Council for Artistic and Musical Higher Education and the CNSU, National Council for University Students. The System evaluation is entrusted to the ANVUR, National Agency for the University System and Research Evaluation, which has recently replaced the CIVR (Research Evaluation Committee, active since 1998), and CNVSU (National Committee for the University System Evaluation, founded in 1999).

9. The share of different broad subject areas in Italy has remained virtually unchanged since the 1950s: 30% of degrees are delivered in economics and law, 25% in humanities and 15% in scientific, technological and medical fields. However, some significant changes have taken place in the number of students in the past decade: while economics and engineering have had an increase in the number of students, humanities and especially law (-27%) have registered a reduction. Communication sciences and medicine have shown the strongest increases (+204% and +134%). All other disciplines, with the exception of political sciences, architecture, sociology and statistics, have had some increase.

10. Faculty salaries in Italy may represent a larger share of university R&D expenditure than average.

11. When non-university innovation activities are included, Italy is the fourth largest European country patenting at the European Patent Office (it patents 3% of the whole world's European patents, as compared with Germany who deposits 15.5% of patents). Overall Italy's triadic patent families are among the lowest in the whole OECD area (OECD, 2008b).

12. Human resources include sciences and engineering (S&E) and social sciences and humanities (SSH) graduates per 1000 population aged 20-29 (first stage of tertiary education); S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education); population with tertiary education per 100 population aged 25-64; participation in life-long learning per 100 population aged 25-64 and youth educational attainment level.

13. Since 2001, the proportion of public funding (MIUR's FFO and project-based funding) of the total university funding decreased from 72.9% in 2001 to 64.3% in 2007. There has been an increase of revenues from students' fees (a rate of 5.8%) and external funding from contracts and the sale of services to companies and institutions (nearly 50%). The latter includes also funds from the regions that in 2007 accounted for 6.7% and

were based on contracts, investments in research facilities and equipments and transfers to support the right to study.

14. Lombardy is home to a large number of research centres. These centres are both public and private, and many are located in universities. In 2006, the R&D expenditure in the Lombardy university research centres amounted to almost EUR 630 million (12.3% of domestic university expenditure). Eleven out of 107 institutes of the National Council on Researches (CNR) are in Lombardy. Seventeen out of 42 Hospital Scientific Institutes are in Lombardy. In 2008, the Ministry on Occupation, Health and Social Policies funded programmes on research of Lombardy with EUR 200 million. (AIRI data 2008).

15. Lombardy is lagging behind regions such as Noord Brabant (more than 700 patents per million inhabitants), Oberbayern, Baden-Württemberg, Denmark, Sweden and Ile de France (300).

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Annex 1.A.1. New University Law

The 2010 law on University Reform, law 240/2010 proposes for changes in three key areas of university administration: governing bodies, recruitment, and funding and salaries.

Separation of academic and financial management

The University Board will have up to 11 members, of which 3 (or at least 2 if fewer than 11 members in total) must be external experts with financial/managerial skills and will be chaired by the Rector (elected by university employees) or one of the external members. The Senate, chaired by the Rector, will have up to 35 members; it will make proposals to the Rector and the Board on teaching and research matters, and its approval will be needed for changes in these areas. The Board's approval will be needed for appointments and promotions. Universities and public research institutes will be allowed to share certain facilities and retain any cost savings for their budgets.

Funding

In 2010 10% of funding (increased from 7% in 2009) was allocated to universities on the basis of teaching and research performance (with weights of one third and two thirds respectively). ANVUR (Agenzia nazionale di valutazione del sistema universitario e della ricerca) will decide on future criteria. In the future, the share will be increased progressively towards 30%. Staff costs will remain capped at 90% of an institution's funding and tuition fees remain subject to the limit of 20% of total university funds. Overall funding was cut by some 3% between 2008 and 2010 and cuts of 9% are envisaged for the period 2010-12.

Recruitment and salaries

Researchers will have a tenure track system with fixed term contracts up to a maximum total of 8 years. For tenure, candidates have to be screened by a national panel for eligibility, taking into account the candidates' scientific

production only. Universities are free to make their own final decision about tenure taking into account other factors as well (*e.g*. teaching). Candidates judged negatively by the national panel cannot be tenured locally. Rules for composition of the university panels are to be decided by universities (universities are encouraged to include external and foreign members). Researchers will be able to teach, and in practice are similar to assistant professors in other systems. Automatic salary increments will be abolished. Increments, every 3 years, will be awarded subject to the approval of professors' reports on their activities that can include both teaching and publications. As of 1 January 2011, half of the salary increment is allocated or withheld on the basis of scientific production over the previous two years.

Source: Adapted from OECD (2011), *OECD Economic surveys*: Italy, OECD, Paris.

Annex 1.A.2. Higher education in Lombardy

Table 1.A.2.1 Lombardy's universities, 2009

Name	Year founded	Province	Status	Faculty	Students
University of Milan	1924	Milan	State	9	51 300
Politecnico di Milano	1863	Milan	State	9	35 000
Università Cattolica del Sacro Cuore	1920	Milan	Private	14	33 500
University of Milan-Bicocca	1998	Milan	State	8	27 500
University of Pavia	1361 (825)	Pavia	State	9	18 700
University of Bergamo	1968	Bergamo	State	6	13 300
Bocconi University	1902	Milan	Private	1	12 200
University of Brescia	1982	Brescia	State	4	11 000
University of Insubria	1998	Varese & Como	State	4	8 600
IULM - Institute of Modern Languages	1968	Milan	Private	4	4 450
Carlo Cattaneo University - LIUC	1991	Varese	Private	3	2 500
E-Campus Telematic University	2006	Como	Private	5	2 307
Vita-Salute San Raffaele University	1996	Milan	Private	3	1 900
IUSS - Institute of Higher Studies	1997	Pavia	State	-	350*
UNITEL International Telematic University	2006	Milan	Private	3	91

Note: * only post-graduate

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

Table 1.A.2.2. Academies and conservatories of art, music and dance

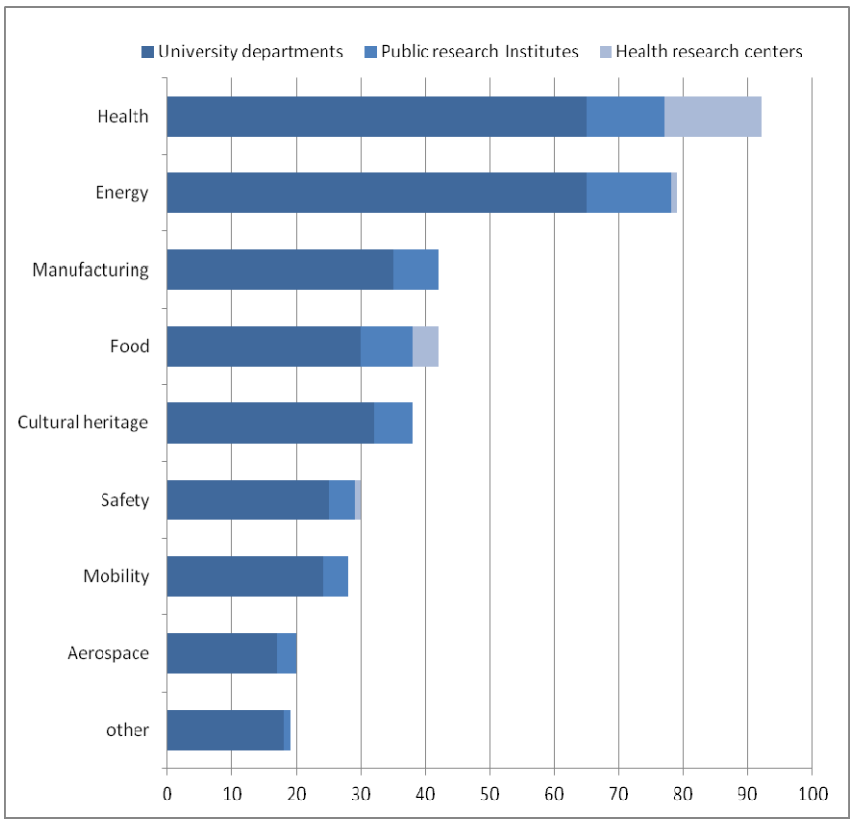
2006/07 academic year

	Name	Year founded	Province	Students
Academy of Fine Arts	Accademia di Brera	1776	Milan	2 803
Recognised Academy of Fine Arts	Nuova Accademia di Belle Arti – Naba	1980	Milan	1 248
	Libera Accademia di Belle Arti - Laba	1999	Brescia	936
	Accademia Santagiulia	1999	Brescia	354
	Accademia A.C.M.E.	1997	Milan	100
	Accademia Carrara	1796	Bergamo	88
	Accademia Aldo Galli	1989	Como	86
Music conservatory	Conservatorio Giuseppe Verdi	1807	Milan	1 474
	Conservatorio Luca Marenzio	1864	Brescia	534
	Conservatorio Giuseppe Verdi	1982	Como	505
	Conservatorio Lucio Campiani	1777	Mantua	301
	Conservatorio Luca Marenzio - Darfo	1978	Brescia	195
Recognised musical institute	Istituto Franco Vittadini	1867	Pavia	318
	Istituto Gaetano Donizetti	1806	Bergamo	224
	Istituto Claudio Monteverdi	1973	Cremona	137
	Istituto Giacomo Puccini	1984	Varese	124

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

Annex 1.A.3. Research in Lombardy

Figure A.1.3. Research structures by sector, 2010



Source: IReR based on QuESTIO data, 2010.

Annex 1.A.4. European regional innovation

Table 1.A.4.1. European regional innovation scoreboard and Lombardy

Lombardy	2004	2006
Tertiary education	0.15	0.16
Life long learning	0.4	0.42
Broadband access	0.3	0.3
Public R&D expenditures	0.4	0.4
Business R&D expenditures	0.55	0.55
Non - R&D innovation expenditures		
SME innovating in-house	0.87	
Innovative SMEs collaborating with others	0.28	
EPO patents	0.59	0.59
Product and/or process innovators	0.65	
Marketing and / organisational innovators	0.6	
Resource efficiency innovators - Labour	0.42	
Resource efficiency innovators - Energy	0.25	
Employment: medium- high & high tech manufacturing	0.61	0.62
Employment: Knowledge intensive services	0.66	0.67

Source: Hollanders, H., S. Tarantola and A. Loschky, (2009), Regional Innovation Scoreboard (RIS) 2009, Pro Inno Europe, Brussels.

Note : The value of each indicator is scaled from a minimum value of 0 to a maximum value of 1.0, based on comparative European regional data.

Chapter 2

Human capital, labour market and skills

This chapter addresses the ways in which universities and other higher education institutions in the Lombardy region contribute to the development of skills and human capital.

The Lombardy region has demonstrated unusual resilience in the face of the global recession, largely because of its economic diversity and a large number of small and medium sized enterprises. At the same time the region faces long-term challenges in human capital emerging from an ageing population, low labour market participation and slow adaptation of practices and technologies that could enhance productivity.

The chapter highlights the challenges and opportunities linked to the human capital development in Lombardy, and highlights good practice in Lombardy and worldwide. The chapter concludes with a series of recommendations to support sustainable regional development and to enhance the role that the Regional Government of Lombardy, together with the higher education institutions and regional stakeholders, can play in improving human capital development and productivity in the region.

Important issues in Lombardy include raising the overall level of educational attainment in the region, making education and labour market systems more inclusive, and aligning the educational programmes with the labour market needs, particularly those of the SMEs. Full advantage should be taken of the university reform in order to improve economic dynamism in the region, and equip graduates and the labour force with 21st century skills.

Introduction

The Lombardy region stands out in the European landscape because of its diverse economy, which includes a financial capital of Europe, Milan, and one of the continent's most productive agricultural sectors. Lombardy, with a population of almost 10 million inhabitants, is arguably the first region in the Italian economy as measured by total production and exports. The region has the highest number of universities and the biggest research budget in the country. It is an affluent area – GDP per capita is about 35% higher than the European average. The regional government now directs key areas of Lombardy's economy.

Economic diversity and continued demand for Lombardy products have made it possible for the region to remain resilient in the face of global recession. Regional unemployment has remained low in comparison to many other Italian regions because of the continued strength of many sectors in the region's economy, including higher education but also because production in many of the region's most important industries is carried out in small and medium-sized enterprises (SME). These enterprises include high-technology companies and business services but also the value-added craft and enterprises in specialised food and fashion for which the region is known all over the world. SMEs are less likely to shed labour during an economic downturn and can respond more flexibly to market fluctuations, for example, by changing product mix and adjusting employee hours. This does not mean that they are not affected by recession but that they are more likely to adjust without producing unemployment.

Furthermore, Lombardy has a significant arts, design fields and craft sector which is a source of constant creativity and entrepreneurialism. This is a strong regional asset for attracting and retaining international talent as well as contributing to the quality of life for the population in Lombardy (Florida, 2002). This sector also has a role in attracting foreign investment and tourists to the region.

Despite its strengths and resiliency, the Lombardy economy faces some critical challenges in maintaining its distinctive global position and regional resilience over the longer term. For example, in part because of its strong SME base, the region has been slow to move to a "knowledge economy" model. This is evidenced by low tertiary educational attainment, limited experiential education, and lack of responsiveness to the demands of the labour market. Universities differ in how they are responding to these challenges but the large public universities appear to have been very slow to

respond effectively. Furthermore, the employment outcomes of the university graduates in Lombardy are deteriorating with the economic crisis.

The labour force in Lombardy, including its entrepreneurial segment, is ageing and considerable attention will need to be paid to how to extend the productive working lives of the existing workforce through skill up-grading and to issues of succession. All of the population growth in the region is attributable to immigrants to the region who have higher birth rates than the native Lombardy population. This means that the upcoming generation of higher education students will be culturally diverse and tend to be from families with low educational attainment.

Universities and other higher education institutions can play a central role in helping the Lombardy Region address these challenges. They can contribute to the human capital development in their regions basically in four different ways by: *i*) widening access to and success in tertiary education of the existing youth and adult population of the region; *ii*) attracting talent to the region, including students and highly qualified faculty and researchers; *iii*) producing graduates with knowledge/skills relevant to the region's economy; and *iv*) contributing to developing an economy that will employ graduates and retain and attract educated population.

Universities' research activity also plays a role in human capital development: it increases the demand for human capital in the region, encourages local firms to emphasise human-capital-intensive activities and attracts inward investment and people with technical and knowledge-intensive skills. Ideally, the research activity leads to the development and expansion of knowledge-intensive activities through business incubators, research parks or faculty ties with local industry. Sometimes this cycle of development is interpreted as emphasising the necessity and benefit of investment in science and technology-based education and R&D, but increasing evidence shows that the arts, humanities and social sciences also make important contributions to economic growth through the development of new business ideas and processes, social innovation and the cultural and community activities that underpins the breadth of civic society (OECD, 2007). This is particularly important in Lombardy because of its strengths as a capital of culture. Finally, higher education institutions can foster a broad regional commitment to human capital development, pointing to and providing research on human capital issues in the region and fostering a "learning region" through satellites, outreach projects and programmes.

Human capital is critical to regional development because individuals with high-level skills and knowledge tend to be highly productive and individual workers are also more productive in regions where their peers have higher levels of human capital. Higher levels of human capital are

associated positively with regional economic growth and indicators of regional wealth.

Critical human capital issues facing the Lombardy region include: *i)* the particular human capital challenges associated with an SME sector – the ageing of the entrepreneurial workforce and enterprise succession and increasing the knowledge-intensity and productivity of SME production; *ii)* the innovation and productivity challenges which are acute in the Italian economy, including in Lombardy; and *iii)* the role of a creative workforce in the regional economy. The creative sector of the Lombardy economy is one of the largest in Europe and in the world and the creative workforce is a significant regional asset. Fostering skills in this sector and recognising its distinctive contributions to the regional economy and society require innovative support tools and policy by the regional government and higher education institutions in the region.

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

- Do the existing higher education providers offer adequate learning and training opportunities to the local population in terms of age, gender, and socio-economic and ethnic backgrounds?
- Are existing higher education institutions and programmes adequately aligned with the skill needs of the local economy and do they support entrepreneurship in the region? Are they taking full advantage of the educational reform to improve learning outcomes and employability?
- What lessons can be learned from international experience?

Lombardy: an SME-based economy

The most prosperous region of Italy, Lombardy has been impacted by general trends in the Italian labour market since the 1990s. The liberalising of Italian labour market regulation since the 1990s has spurred employment growth and decreased the rate of unemployment but also resulted in lower productivity per worker (Lucidi and Kleinknecht, 2010). Although both the employment to population ratio and the labour force participation rate have increased in conjunction with labour market liberalisation, the Italian rates are still below OECD and EU averages (Chaloff, 2005; OECD, 2003). Furthermore, Italian industries, including those in Lombardy, have faced stiffer international competition, which has eroded the competitiveness of the export sector.

One legacy of the highly regulated labour market and SME orientation of the economy is that a significant portion of the Italian workforce, estimated at 16%, is employed in the informal economy (OECD, 2004). Because the sectors where informal workers are most likely to be employed (agriculture, retail, hotels, and restaurants, domestic services and transport) are important in the Lombardy economy, the proportion of informal workers in the Lombardy workforce is likely to be at least equal to the Italian average.

At the same time, and contributing to its economic strengths, the Lombardy economy has a higher proportion of its workforce employed in manufacturing than Italy as a whole (33.5% versus 27%). This sector is critical because, as compared with agriculture and services, it is under serious pressure from global competition and yet amenable to strategies that could increase productivity and expand export markets.

Due to the SME based sectors in Lombardy not requiring a high level of education and the significant informal economy, which might not properly value educational qualifications, the Lombardy workforce exhibits a low level of educational attainment. According to the Lombardy's regional self-evaluation report: "In Lombardy graduate workers only account for 14.8% of the total workforce, the same as the rest of the country, but below the European average (21.5%) and quite far away from other European regions (Ile de France, 40.3%; Stockholm 37.3%)" (IReR, 2010).

However, at the same time the labour market is very absorptive. The percentage of graduates who are working after three years from receiving their degree title is 86% and the percentage of those who are working fully immediately following the award of the degree is 70%, whilst the Italian average is 56% (Istat, 2008).

What these characteristics describe is a labour market in Lombardy with many jobs but with many jobs with low skills and limited opportunities for productivity increases (Lucidi and Kleinknecht, 2010). The challenge for both educators and regional policy makers is to find ways to increase the knowledge intensity of jobs, to foster product and process innovation, and to make higher education relevant to the needs of SMEs.

The productivity and innovation gap

Despite the obvious strengths of its SME-based economy the Lombardy economy also confronts a distinctive set of human capital problems. Some of these problems originate in the way the labour market was deregulated, encouraging the expansion of jobs at the expense of productivity increases.

Value added per Italian worker between 2000 and 2005 increased only 0.15% while labour input increased 4.27% (Lucidi and Kleinknecht, 2010).

The available evidence indicates that the stagnation in productivity in the existing workforce is not simply a consequence of new low-skilled workers entering the labour market. This productivity gap is demonstrated by low levels of educational attainment in sectors where other European regions show high levels of educational attainment. Lombardy has the second highest number of employees in high tech sectors (as a share of 2006 EU high tech employment) with 2.52% of the total. At the same time, of the professionals and technicians employed in these high tech sectors, only a small proportion has higher education qualifications. Lombardy ranks at the bottom of the top 25 European high tech regions in the educational qualifications of its professional and technical labour force in the high tech sectors (Meri, 2007). This deficiency is reflective of a national pattern of under-investment in technology, including in technologically-advanced human capital (OECD, 2008).

There is a need for industry-based educational programmes to increase the educational attainment of technical and professional workers currently employed in and entering the region's high tech manufacturing sector and its knowledge intensive services sector. While these programmes do exist, such as the management engineering programme at Bergamo University, which grew out of the needs of the textile industry, they do not appear to be strategically aligned throughout the region in a coherent strategy to increase productivity in existing industry. In particular, there is a dearth of educational initiatives aimed at smaller firms and at mid-level technical and professional personnel who may have considerable work experience in an industry and could significantly benefit from process and product innovation oriented degree and certificate programmes. Programmes such as that initiated by the municipality of Bergamo to contract with the university to provide industry-driven training are more likely to reach personnel who could benefit for technically oriented programmes that enhance productivity.

On the other side of the spectrum, there are identifiable targeted efforts to provide management programmes for large company owners and managers, such as the executive PhD and masters in business administration programmes (MBAs) at privately financed Bocconi University. Their costs might limit the entry of SME managers and leaders into these programmes.

One step below the professional and technical worker, the skilled operative is also critical to attaining productivity increases and introducing new technologies. An experimental programme, the *Poli formativi*, intended to provide funding for advanced training of technical workers and skilled operatives utilising the resources of higher education institutions. This

programme offers models for advanced training of the existing workforce. Furthermore, connecting *Poli formativi* with worldwide networks and technical associations could provide a model for innovation and growth for SMEs.

The SME sector and ageing business owners: issues of succession

An industry composed of SMEs is stable and adaptive but faces problems in reproducing itself if the children of business owners choose not to go into the family business or if birth rates are low producing fewer potential business successors. Lombardy's SME sectors are facing this critical long-term issue of succession. The problem is increased by the inability of the traditional sectors to incorporate a more technologically skilled workforce and demonstrate the capacity to grow and expand into new markets. The demonstration of technological vitality would attract new investors and entrepreneurs to the high quality but currently stagnant sectors of the regional economy. Thus the challenge of finding ways to upgrade human capital skills and increase the vitality and productivity of the traditional sectors, such as those in small-scale manufacturing, is related to the succession issue. Solutions to the succession issue are likely to be found in the establishment of new firms that are more technologically advanced but within the traditional industries. These advanced technologies and skills should be identified and encouraged via programmes to increase their human capital capacities.

The regional government in Lombardy could also consider steering universities to develop entrepreneurship programmes with stronger alignment with the regional needs, for example to provide retraining opportunities to existing entrepreneurs.

In view of demographic change and the ageing of the company leaders, one programme worth considering is the FINPIN SME succession programme in Finland which improved the succession planning and management of the local small and medium-sized enterprises by matching the university students with the business leaders who are close to retiring but do not have a successor for their companies (see Box 2.1.).

Box 2.1. SME succession planning in Finland

In 2004, FINPIN, the organisation sponsoring entrepreneurship among students of universities of applied sciences in Finland, launched a programme to improve succession planning in small and medium-sized enterprises. It was estimated that 60 000 to 70 000 firms out of the total stock of 240 000 firms in Finland would close their doors within ten years due to uncertainties in succession. Business ownership in Finland is estimated to last an average of 25 years, which is twice the Swedish average (12-14 years) and more than three times the US average (7 years).

The basic idea of the scheme is to match university students with business owners who are close to retirement but lack a successor. Taking over existing small and medium-sized businesses, whose management is about to retire, provides an opportunity to a student to incubate their own ideas in an existing production structure and client network.

Today, all 26 universities of applied sciences participating in FINPIN have business succession support programmes. The programmes have regional specificities but follow an overall structure with three components: *i)* education to business successors (project work, business succession plan as thesis project), *ii*) practical experience (work in enterprises, entry/take-over strategy) and *iii)* assistance with business succession (ownership transfer process, competences transfer process, management transfer process). Graduates are awarded a nationally recognised certificate issued by FINPIN, the respective university and the Finnish Ministry of Employment and Economics (15 ECTS).

Source: OECD (2010a), Universities, innovation and entrepreneurship: Criteria and Examples of Good Practice, OECD, Paris.

Entrepreneurship among the immigrant community should also be encouraged. As an important source of young people in the region, immigrant communities could provide successors to ageing managers and owners of enterprises in small-scale manufacturing and other traditional sectors. This type of initiative would require mentorship programmes and also innovative financing vehicles, such as revolving loan funds, as well as managerial training programmes. The need for this kind of transition effort has been recognised by the regional Chamber of Commerce, whose native Italian enrolment has been shrinking. Examples of success by immigrant entrepreneurs are being identified and publicised to provide role models. This initiative could be expanded through mentorship programmes to connect existing enterprise owners with immigrant entrepreneurs.

Lombardy higher education: performance

Higher education in Lombardy and Italy in general is characterised by low educational attainment, which constitutes a barrier to increasing the knowledge intensity of jobs, up-scaling the activities of the SME sector, and fostering product and process innovations. Furthermore, low retention rates and long duration of studies in higher education result in high costs to the society, late entry to the labour market and a low level of efficiency of the university system. It is in the public interest that the authorities and universities will take steps to ensure that the current university reform will increase efficiency in the higher education system. (See also Chapter 1.)

Higher education attainment, access and retention

Despite progress made in recent decades, higher education attainment levels remain generally low in Italy. Only 20% of people aged 25 to 34 have tertiary education qualifications, compared to the OECD average of 35% (OECD, 2010b; see also Chapter 1 figure 1.5). In Lombardy, the percentage of people aged 25-64 with tertiary education qualifications is 15.9% in 2010, which is substantially below the European Union rate of 25.9% (Eurostat) and best performing regions; Lombardy is ranked 221 among 265 European regions in terms of the overall educational attainment (Ederer, Schuller and Wilms, 2011).

There has been a considerable increase of students entering universities, but presently the number of entrants is decreasing, which is bringing along greater competition between universities in Italy and Lombardy. Since the 1970s, access to Italian universities has been granted to students that have successfully completed secondary education, including technical and vocational programmes.[1] Despite the increase in enrolments, access to higher education remains inequitable in Italy and Lombardy, but less so than in other European countries.[2]

The improved entry rates are undermined by low retention in Italian higher education institutions. Italy has the highest dropout rates among all the OECD countries, with completion rates from type A tertiary programmes at 45% against an average of 69% (OECD 2005).

The Lombardy university system, particularly its public part, is characterised by low retention and long duration of studies. In 2007-08, the dropout rate in the region's universities was 11.2% (between the first and second year), below the national average of 17.6%. However, while in the private universities the dropout rate was 6.5%, it was nearly three times higher in public universities (18.5%). As elsewhere in Italy, students in

Lombardy are also taking a long time to complete their degrees. A significant proportion of university graduates in Lombardy are over the age of 30.

While challenges in higher education retention are often linked to the problems in the pre-university education system, it appears to be less of an issue in Lombardy. The region features good learning outcomes as measured by the Programme for International Student Assessment (PISA), which evaluates 15-year-old student performances in reading, mathematics and science (OECD, 2010a). Lombardy has the highest mean score in PISA tests in reading, mathematics and science out of all the Italian regions, comparable to best performing PISA countries. In comparison to PISA countries, Lombardy has the fourth highest mean score for reading and the eighth in mathematics and science. In all three subject areas, Lombardy exceeds the OECD average in contrast to Italy which is below the OECD average in all fields. (See Annex 2.A.1. for details about Lombardy PISA results.)

Nonetheless, there is a need to build capacity to address the emerging diversity, as well as quality and inequity challenges which can be linked with the growing diversity among student population in Lombardy schools and also the regional government's policy to favour free school choice (see Box 2.4 for Dote system). The primary responsibility lies with school authorities at the national and regional level, who need to address the challenges in school education in a comprehensive way and mobilise appropriate levels of financial resources to support education. In Lombardy, the regional government has taken steps to address the quality issues in secondary education schools through the Regional Scholastic Office which brings together representatives from universities and secondary schools to analyse regional training needs and to identify best practices in teaching. This work should be enhanced to address also the emerging equity issues.

At the same time, universities could more actively reach out to local schools to raise aspirations and academic performance of students, and to improve the quality of teaching. In Lombardy, there was limited evidence of a long-term institution-wide collaboration between schools and universities. A comprehensive approach to widening access to education and improving success is provided by Victoria University in Australia, whose catchment area is one of the fastest growing in Melbourne, (see Annex 2.A.2.)

Improving affordability of and retention in higher education

High dropout rates and long duration of studies are partly a consequence of the fact that, because of limited student support, a significant number of students work while studying. While tuition fees are not high by

international standards, the cost of living is. Italy needs a system to reduce financial constraints on students from low-income households, and at the same time encourages completion of studies by all students. The issue of affordability needs to be considered, so as not to price tertiary education attainment beyond the reach of a large number of students.

While public funding is under increasing pressures in Italy, a greater degree of private financing and cost sharing in higher education needs to be considered, whether through means-tested scholarships, income contingent loans or other funding packages. At the regional level, there is a need to develop mechanisms that complement the scholarships provided by the Italian government.

There are number of reasons for increasing private financing and cost-sharing in higher education: *i)* Private returns to higher education exceed public returns; *ii)* The current public financing is regressive, since higher education is financed through general taxation, but participation in and completion of higher education are correlated with socio-economic background; *iii)* Greater reliance on private financing can increase cost-effectiveness; and *iv)* greater participation by business could strengthen the links between university and the economy.

In addressing higher education dropout, Italy has several policy options to consider (including selection at entry, increased student fees and incentives for timely graduation), but some of these can involve trade-offs with guaranteeing an equitable access to higher education (see Box 2.2.).[3]

As noted by the OECD (*OECD Economic Surveys: Italy*, 2011), a solution could be the introduction of a universal income-contingent-repayment loan system where graduates repay the loan if they find a job and if their earnings exceed a threshold. The loan system should be backed up by a means-tested grants scheme to ensure that students from lower socio-economic backgrounds have access to education.

Box 2.2. How to reduce dropout

In the light of OECD countries' experiences, countries that want to reduce drop-out from universities (OECD, 2008a) can:

- Impose student selection at entry.
- Provide targeted institutional support for individual students.
- Condition financing help to students on their performance (*e.g.* convert public loans into grants if students complete their studies on time, as is the case in Norway.
- Design incentive-compatible funding to higher education institutions.
- Introduce a flexible remuneration system for teachers based on the quality of outcomes (ideally based on value-added indicators).
- Develop vocational tertiary education sector to allow students to join and complete other study programmes; in France, in 2005, almost 15% of enrolled students did not complete the original degree but successfully switched to a vocationally oriented tertiary education.
- Use tuition fees to impact the supply (*e.g.* allowing higher education institutions to respond more strongly to students' specific needs) and the demand of education (*e.g.* giving students more incentives to complete swiftly their studies).

Source: OECD (2011a), "Italy", in OECD, *OECD Economic Outlook, Volume 2011 Issue 1*, OECD Publishing.doi: 10.1787/eco_outlook-v2011-1-9-en.

Relevance of education

Employability of graduates

Youth graduate unemployment in Lombardy, the country's most dynamic economy, is a structural problem, which the current economic crisis has aggravated. Private sector efforts have been made to alleviate the situation. For example, the Milan Chamber of Commerce is considering providing a EUR 6 000 voucher to SMEs that hire a university graduate in order to upgrade the human capital of the local economy's backbone and offer the opportunities for the young.

The Formaper report "Supply and Demand for Graduates in Lombardy" (2009) showed that the labour market in Lombardy is dynamic, and the demand for graduates is higher than the supply. Prior to the economic crisis,

labour market demand was approximately 41 000 graduates in 2007. Three quarters of the demand came from companies, 24.7% from public administration and 2.1% from the non-profit sector (Formaper, 2009). University graduates of science and engineering, pharmaceutical chemistry and economics were faced with good employment prospects, while the situation for graduates of humanities and social sciences was more complex.[4]

The latest edition of Specula *Lombardia* report (2010) analysed job careers during the period 2007-09 of students who graduated in 2006-08, highlighting the impact of the economic crisis on the entry of university graduates to the labour market. The crisis has reduced and delayed the opportunities to enter the labour market, not only for high school graduates, but also for graduates of higher education institutions. In 2008, the unemployment rate for university graduates was 7% and increased to 10.8% in 2009 (IReR, 2010). Furthermore, only 20% of university graduates of 2008 had a long-term contract in 2009; 40% of university graduates had a short-term contract; 20% for less than six months and the remaining 20% were unemployed. The percentage of students that were dependent employees after 12 months of graduation had reduced from 66.7% in 2008 to 63.5% in 2009. Sectors that had reduced recruiting of graduates were industry (especially machinery and mechanics), informatics, finance, R&D and real estate. The unemployment rate for the population under 30 years old increased from 8.4% in 2008 to 12.1% in 2009.

In a time of global financial and economic crisis, the employability of university graduates from 11 universities in Lombardy has deteriorated: out of approximately 50 000 graduates in 2008, only 10 000 (or 20%) received a stable work contract in 2008 and 2009, while another 20% received no work opportunities at all. 60% received very short-term and precarious jobs with salaries between EUR 700 and 1 000, leaving young people dependent upon their families. 10% of graduates have only an internship and are often paid less than EUR 500 per month. According to Italian law, internships cannot exceed 18 months, however, in reality internships may last up to 36 months. In addition, there is limited opportunity for employment after the internship.

Universities in Lombardy offer services to facilitate transfer to the labour market, for example, guidance, internships and placements by: providing information on job opportunities linked to their field of study and internship opportunities in Italy and abroad; offering specialised tutoring in professional guidance in the development of a Curriculum Vitae and in the preparation for job interviews; matching graduates with the main public and private institutions in Lombardy by means of training periods, post-graduate internships and company presentations in universities; and taking charge of

contacts with the companies in order to encourage the supply/demand of work with the service VULCANO. (See Box 2.5.)

There is considerable variation among the Lombardy universities in facilitating students' labour market outcomes. While the Politecnico di Milano, Bocconi University and Carlo Cattaneo University - LIUC are running well functioning career services, the University Cattolica del Sacro Cuore, one of the largest universities in Milan, has only one person in charge of internships, while professors do not appear to play a significant role in helping their graduates find jobs.

Some collaborative measures between Lombardy universities have been taken to facilitate the match between the labour market demand and universities' supply of graduates. The VULCANO service is run with the technical support from the Inter-University Consortium, CILEA (*Consorzio Interuniversitario*), but no information is available on the outcomes of the services *e.g.* how many students or companies have benefitted from the VULCANO services, (see Box 2.3.).

Box 2.3. VULCANO service

The VULCANO service (On-line University Graduate List with Curricula Vitae for Companies), is a web-based platform where university graduates, students and companies can meet. This platform facilitates the match between the supply and demand in the labour market. The process is facilitated by research criteria (and filters) related to the particular job profiles offered/required. VULCANO was set up in 1996 by the Conference of Lombardy's university rectors to facilitate the swift employment of university graduates. Nine universities in Lombardy take part in the service, which is intended for:

- Graduates, school leavers, research doctors and specialists seeking employment by means of advertising their Curricula Vitae.
- Companies in search of qualified personnel.
- Universities which are in search of information on the labour market.

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

Lifelong learning

The growing economic necessity to complete some form of higher education in order to participate in the economic and social life at the national, regional and local levels applies equally to working age adults as it

does to younger students. In Italy and Lombardy this is a challenge due to the ageing workforce and low labour market participation.

Due to rapidly changing skill requirements in working life, lifelong learning, skills upgrading and re-skilling, and flexible ways of learning are becoming increasingly important. The importance of skills upgrading is felt most urgently at the local and regional level. Upgrading the skills of the adult population is likely to have a more direct effect on the region's economic performance and productivity since adult learners are generally less mobile than younger students. For non-traditional learners, who often combine work and study, flexible ways of provision need to be in place through work-based, e-learning and distance education. In addition, there is a need for recognition of non-formal and informal learning (OECD 2007 and 2008).

Italy ranks among the lowest of the OECD countries when measuring participation in lifelong learning (see Table 2.1). The percentage of the Italian adult population (25 to 64 years) which took part in 2005 in activities related to continuing education was 6.2%, compared with the European average of 10.8% and the Lisbon objective of 12.5% by 2010.

Table 2.1. 30+ population participating in lifelong education

Full-time and part-time in public and private learning institutions

Rank	Country	Percentage
1	Finland	14.4
2	Australia	13.5
3	Sweden	12.9
4	Belgium	8.5
5	Denmark	8.1
6	Hungary	5.9
7	United Kingdom	5.7
8	Ireland	5.6
9	USA	5.5
10	Spain	4.0
11	Switzerland	3.8
12	Portugal	3.7
13	Austria	3.5
14	Italy	3.5
15	Netherlands	2.7
16	France	2.6
17	Germany	2.5

Source: Based on OECD (2009a), Education at a Glance 2009, OECD, Paris.

Despite the importance of lifelong learning in Lombardy, universities are more geared to catering for traditional students. Lombardy has an ageing

population and cannot rely on young people as the sole suppliers of new skills. While general enhancement of the qualifications of the existing workforce would improve competencies in an effective way, also more targeted training is needed. To date, universities in Lombardy have had a limited focus on LLL providing services mainly to higher education graduates. Higher education institutions should be encouraged to take a more active role in LLL, recognise prior learning and work experience, and provide better opportunities to combine work and study.

No robust data is available about the Lombardy situation in terms of access of mature students to higher education and adult education programmes. The limitations in the data call for an improvement of the collection of information in order to help the Lombardy higher education institutions address these challenges in a strategic way.

Most universities in Lombardy have a centre for continuing learning aimed at professional training and updating. Universities have also developed various innovative initiatives in this very direction. The centres for continuing education ("centres of permanent training"), supported by the government along with the Ministry of University and Research, the Ministry for Education, the Ministry for Employment and the Ministry for Innovation aim to: *i)* Reduce the length of study time for those people who have significant professional experience and develop personalised university training aligned with prior learning; *ii)* Develop university courses (both degree courses as well as post-graduate courses such as masters, specialisation courses, certified modules) which are more flexible in terms of length, content and methodology, for example, through the use of ICT; and *iii*) Collaborate with public and private organisations that need to increase and develop the competences of their workforce by means of specifically personalised methods (work-based learning, for example). These organisations may become involved in the development of partnerships with universities in order to create training programmes that qualify adult workers and encourage integration between professional activity and university training.

Recognising the challenges of the ageing society, the regional authorities in Lombardy have introduced Vocational Training Vouchers (*Dote formazione*), which aim to improve access to the education and professional training system in Lombardy. Vocational training vouchers are part of a larger voucher system that aims to create a demand-based education and training system. Vocational training vouchers aim to widen the access of traditionally under-represented groups to training and encourage the workers to acquire knowledge and skills to remain competitive in the work market. Vocational training vouchers, the entire

voucher system and their impact deserve a thorough evaluation. (See Box 2.4.)

Box 2.4. The *Dote* system

In 2005, the Lombardy Region embarked on a reform of the regional education, training and labour market system. The main tool is the so-called *Dote*, a mix of financial resources and services assigned to the citizens through a targeted voucher system. The Dote is based on the integration of different funds and legal instruments that converge on one process of registration, resource allocation and monitoring of results. The Lombardy *Dote* system includes:

- School vouchers (*Dote Scuola,* education up to the age of 18) support free choice of the school (public or private). Funds for school vouchers are assigned to students attending public or private schools (1 100) and accredited training institutes (130). In 2008/09, around 3 million vouchers were granted to 170 000 students/pupils. Vouchers were used in 4 784 different entities including book shops, transport services, student canteens, travel agencies and municipalities.

- Vocational training vouchers (*Dote Formazione*) foster employability. The voucher allows for the use of a maximum of EUR 5 000 per person within 12 months. With a budget of EUR 25 million in 2009, vouchers were given to 5 000 beneficiaries for a total of 13 798 courses. The number of training hours was 3 032 000 divided into professional training (57%), basic training (37%), transversal training (5%) and managerial training (1%).

- Labour vouchers (*Dote Lavoro)* support labour market integration, skills upgrading and entrepreneurship. In 2009, EUR 112 million was granted to 27 000 beneficiaries that benefitted from services and financial incentives worth up to EUR 3 000 per person.

No comprehensive assessment has been made of the dote system. Results from prior reforms have shown that the voucher system can respond to the following challenges: *i)* re-integrating people into the labour market; *ii)* improving the matching of training programmes with labour market needs (school-work process)*; iii)* overcoming the skills shortages and sustaining innovation and the growth of the knowledge society; and *iv)* recognising informal learning.

Source: IReR (2010), "The region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

Part of the challenges of the higher education system to meet the lifelong learning needs, is linked to the limited pathways among higher

education institutions, and between the university and the vocational higher education system, as well as the lack of a system of recognition of prior formal and informal learning. The Lombardy regional government has taken steps to address this challenge by sponsoring the establishment of *Poli formativi* that provide tertiary vocational education and link with a wide range of public and private stakeholders, including universities. While good progress has been made in this domain, there is scope for further development to build a coherent tertiary education system in Lombardy (see Chapter 5 for more details). At the same time, Lombardy does not have a well functioning system of recognition of prior learning. There are many examples of how an accreditation and recognition of prior learning system can operate. One relevant model to Lombardy that embraces higher education skills is the National Qualifications Authority in Ireland. (See Box 2.5; see also example of Validation Center in the city of Malmö, Box 2.13.)

Box 2.5. National Qualifications Agency of Ireland

The National Qualifications Agency of Ireland (NQAI) was established in 2001 to:

- Establish and maintain a framework of qualifications for the development, recognition and award of qualifications based on standards of knowledge, skill or competence to be acquired by learners.
- Establish and promote the maintenance and improvement of the standards of awards of the further and higher education and training sector, other than in the existing universities.
- Promote and facilitate access, transfer and progression throughout the span of education and training provision.

As part of this remit, a National Framework of Qualifications was developed to enable comparison of qualifications, and to ensure that they are quality-assured and recognised in Ireland and other countries. A major objective is to recognise all learning achievements, by supporting the development of alternative pathways to qualifications (or awards) and by promoting the recognition of prior learning. Recognition is a process by which prior learning is given a value. The term "prior learning" is learning that has taken place, but not necessarily been assessed or measured, prior to entering a programme or seeking an award. This may have been acquired through formal, non-formal or informal routes.

Source: National Qualifications Agency of Ireland, *www.nqai.ie/index.html*; Anne Murphy (2010), RPL Matters in the DIT. Policy and Practice Guide for DIT Staff, Dublin Institute of Technology.

Aligning skills and competencies development with regional needs

Universities and other higher education institutions that contribute effectively to building the skill base in a regional economy: *i*) participate in efforts to analyse trends, and strengths and weaknesses in the economy; *ii*) implement strategies to foster the development of educational programmes that are aligned with the existing and emerging labour market needs; and *iii*) provide students with labour information that can guide their educational choices. This does not mean designing academic programmes to meet short-term regional labour force needs, but that the universities and other higher education institutions make systematic efforts to obtain and provide knowledge about the regional economy (for example, job and career opportunities), and use this knowledge to help make academic programme investments and provide work-based learning opportunities for students.

Creating knowledge base about labour market trends

With respect to knowledge about trends in the regional economy, most Lombardy universities appear to have limited capacity to assess the relevance of educational programmes based on their own ability to analyse the regional economy. They have, however, engaged in knowledge creation and sharing relationships with organisations that have that kind of analysis as their mandate.

Lombardy has taken steps to create an integrated system for forecasting demand and determining ways to raise labour productivity. In order to provide reliable labour market information, universities and companies in Lombardy launched the SPECULA project. During the last few years, it has gradually developed mechanisms to monitor the evolution in the supply of graduates and the demand of the labour market. SPECULA partners include private sector organisations, such as the Milan Chamber of Commerce, Unioncamere and Formaper that provide information on company's requirements for graduates and the Lombardy universities that have set up a common data bank of graduates and students. Public institutions, including regional authorities, for example, the regional scholastic office and other public and local bodies, provide information about graduates who are employed in the public sector.

Most Lombardy universities also have a limited capacity of tracking student progress and achievement, and labour market outcomes. Based on the existing good examples in the region's higher education sector, the follow-up of graduate employment by each university should be organised on the basis of a homogenous set of indicators at the regional level *e.g.* sector of employment, province and, if applicable, other regions or foreign

countries. This would allow identification of the level of the brain drain from the region and if it affects particularly one or several sectors, allowing for future adjustments in course offerings to focus on areas where there is labour market demand in the region. Salary differentials are another factor to take into consideration so wage levels in different regions should also be analysed.

Aligning education with regional needs

Italy was one of the first movers in implementing the Bologna process, but has not yet taken a full advantage of a thorough curriculum reform. In 2001/02, the new teaching regulations were in place and the university system was articulated around three cycles. However, in terms of the degrees structures and course content, the Bologna reform did not, in most cases, entail deep curricular reforms. The two cycle structure was achieved by slicing the former five year degree programmes into two blocks, while the five year degree programmes (*laurea magistrali a ciclo unico*) experienced minor alterations as a result. Lombardy students do not try, and are not encouraged to seek employment after the first cycle, but continue in what was referred to as "the normal path" to obtain the masters degree. There are also a high number of contact hours and subjects per semester and a lack of an interdisciplinary approach.

The regional government and the universities in Lombardy should look at this challenge as an opportunity for collaborative efforts to transform universities into stronger and innovative institutions that Lombardy needs in order to build its attractiveness and competitive edge in the global knowledge economy. It would be therefore useful to revisit the achievements of the Bologna process and continue the process of curriculum reform in universities in order to ensure the international competitiveness, improve the quality and learning outcomes of students, and the overall efficiency of institutions. Efforts and development programmes are needed for example to assist faculty to learn skills and tools relevant for more learner-centred modes of teaching.

There is considerable variation among the Lombardy universities in making an effective linkage with the skill needs of the region. Some universities are systematically engaged in making connections between the university and the labour market and the dominant clusters; for others, the connection is more tenuous. A number of work-based learning projects are ongoing, but in general only a small proportion of students benefit from them. There appears to be a lack of student mobility between institutions and a degree of duplication of programmes that are not well-aligned with the needs of the region.

There is evidence of a mismatch between competencies required by the labour market and those provided by universities. STELLA, a project that provides statistics about how graduates enter into the labour market in Lombardy, also detected a deeper mismatch between the labour market supply and demand, specifically in professions required (engineering, economics and statistics) and those available (humanities and social science), pointing to the lack of alignment of the secondary and tertiary education system and the labour market.

Due to the variation between individual institutions in terms of the relevance of their learning programmes and efficiency, the capacity of the Lombardy higher education system to provide the skills and competencies required by the modern knowledge-based labour market is limited. The traditional modes of teaching and learning continue to dominate in most Lombardy universities: education is supply-driven, teacher-centred and focused on disciplinary knowledge with a basic theoretical approach. Active learning modes such as project-based learning, research projects and work-based learning through work placements are not widely implemented in universities. Training periods outside the university are uncommon in most study fields taking place only, if at all, during the second cycle. In many universities, the learning process is based in "magisterial" classes, with a high number of students and tutorial classes for smaller groups.

Lombardy's industry associations have been active in developing mechanisms to align educational provision with the regional needs, pushing the universities to become more demand-driven. These include the "Roundtable of Co-ordination" between Assolombarda and the rectors of the universities in Milan and Pavia, which aims to design and/or update academic programmes (undergraduate and postgraduate) according to the requirements of the business community or specific industry sectors (*i.e.* industrial chemistry, mechanical and automotive engineering, healthcare). Furthermore, Assolombarda is involved in promoting masters programmes and, recently, PhD programmes in order to enhance applied research and technology/innovation transfer from university to industry (*e.g.* executive research doctorate offered by Politecnico di Milano). These efforts should be up-scaled and results disseminated throughout the Lombardy university system.

International examples: aligning education with regional needs

There are international examples that the Lombardy universities could take into consideration in designing study programmes that are aligned with the regional needs and leading-edge research, and embedding employability and transferable skills in their core curriculum, for example through experiential and problem-based learning approaches.

The presence of industry specialisations and clusters in Lombardy indicates an opportunity for knowledge-based value contributions to regional industries with comparative advantage in Europe. Value-added in manufacturing goods has risen, reaching 25-30% of total output in some countries by the mid-1990s (OECD, 2007a). Lombardy could achieve productivity increases in specialised business services related to manufacturing, agrifood and tourism. These services may be in sales and marketing, in intellectual property development, in logistics and supply chain management and other consulting services. The growing share of skilled services associated with these industries suggests an opportunity to develop educational programmes aimed at high-skilled services, which are becoming an important aspect of the Lombardy economy, and could drive productivity.

International experience in focusing on key industries in education provision comes from Tarragona, which is specialised in the chemical industry, and provides a strong rationale for encouraging research-based human capital development in that sector. The University of Rovira i Virgili in Tarragona engages in joint R&D and human capital development initiatives in the chemical industry to increase productivity in an industry that demonstrates regional comparative advantage. The extensive integrated R&D and human capital development activities related to industry by this university are a model for effective application of university resources to increase the productivity of a key regional industry, (see Box 2.6.).

Box 2.6. University of Rovira i Virgili

University-industry-region collaboration

The University of Rovira i Virgili has established a long-term collaboration with the chemical industry in Tarragona that incorporates both research and human capital development programmes that are relevant to the industry needs. University faculty are allowed to spend time working in local firms during their leaves and have on-going relationships with the firms. There are strong alumni connections and students participate in internships and co-op programmes within the local firms. Both advanced technical vocational skills and higher degree based skills such as in engineering are designed in co-operation with the local industry representatives. To better serve the SMEs, a public sector intermediary is being developed along the lines of those operating through regional development agencies in the UK. Most important to the success of this integrated initiative is the strong support from the university leadership, including the Rector.

Source: OECD (2010c), Review of Higher Education in Regional and City Development. Catalonia, Spain, OECD, Paris.

Evidence shows that problem-based learning (PBL) can foster social and academic integration between students and teachers, and also between students themselves, which in turn has a positive effect on study progress and completion (Severiens and Schmidt, 2009). Among a wide variety of PBL initiatives in different higher education institutions worldwide, Aalborg University in Denmark stands out because of its long term commitment and institution-wide approach to PBL. In Aalborg, 50% of study programmes are organised around interdisciplinary project work in groups of students who solve real life problems which are often defined by the labour market partners in the private and public sector. At any one time, there are 2 000 to 3 000 ongoing projects to ensure a high degree of collaboration with the local and regional labour market, (see Box 2.7.).

Box 2.7. Problem-based learning at Aalborg University

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

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

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

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

An example of long-term work-based learning collaboration comes for the University of Waterloo in Canada which has the largest co-operative education programme in the world, with over 11 000 students (60% of the

student body) and 3 000 employers involved in the programme each year. Collaboration with industry improves graduate employability and helps keep university's education provision up-to-date, (see Box 2.8.).

Box 2.8. The Co-op Education at the University of Waterloo, Canada

The Waterloo Region in Ontario, located about 100 km west of Toronto, has a rich local labour pool largely as a result of a strategic decision made at the inception of the University of Waterloo. The founding document for this university in the 1950s (the Waterloo Plan), called for a new type of education to be offered on a co-operative basis with industry. The rotation of students to industry and back to the classroom has strengthened the university's relations with local industry.

Co-op programme offerings are available in all faculties and departments in over 100 different programmes. Local and global firms have strong links with the co-op programme. For example, Sybase, an enterprise software company has over 250 employees in its Waterloo campus alone, and15% of its current employees are Waterloo co-op students, and more than half of their Waterloo staff is former co-op students.

The co-op programme benefits to the local economy in many ways: *i)* it acts as a steady source of new hires, because firms know that the students have work experience, and they get an opportunity to evaluate their performance in the work place before hiring them; *ii)* students transfer tacit knowledge and know-how; they also act as a critical source of knowledge circulation within the local high-technology cluster, transferring knowledge between different firms as they undertake different placements over the course of their integrated work-study programme; and *iii)* the relationship between the university and local industry allows the curriculum to keep up-to-date with the industry needs while industry supports the acquisition of technology to enhance classroom learning.

Instead of doing a co-op placement with an established firm, students can also join the Enterprise co-op programme, which enables students to start their own venture and focuses on creating a local network of contacts and mentors.

The key obstacle to the success of the co-op programme is the high cost of finding and maintaining the placement positions for the student body. The university invests its own resources in financing and managing the programme. However, it now benefits from the good reputation of the programme (and the students), which makes it easier to find firms willing to take the students on work placement. Investment of resources in this type of programme can pay dividends to the local economy over a long period of time.

Source: OECD (2010d), *Entrepreneurship, SMEs and Local Development in Andalusia, Spain*, OECD, Paris.

Developing entrepreneurship skills

A core element of university support for innovation and enterprise in most countries is through new business incubation and graduate entrepreneurship (Potter, 2008). These can be supported by entrepreneurship education that contributes to the creation and development of entrepreneurial attitudes and motivations to start-up a firm, and develops the skills needed to successfully run and grow a business venture (OECD, 2010e).

Lombardy universities are increasingly involved in entrepreneurship education. They offer individual courses (Politecnico di Milano, Bergamo), and programmes and degrees for entrepreneurship including specialised masters (*e.g.* Pavia, Bocconi School of Management, LIUC). All universities are involved in Business Plan Competition and Idea to Product Award such as Start Cup. Bocconi University has established a centre for research on entrepreneurship and entrepreneurs.

Experience from other OECD countries shows that the best support for graduate entrepreneurship comes from teaching programmes where students work in teams to form real companies mentored by entrepreneurs. Such programmes can run at undergraduate and graduate levels, and be targeted at students from across the sciences, engineering, business and arts disciplines. In Lombardy, none of the universities highlighted the existence of such programmes. Instead university entrepreneurship courses and incubation programmes seemed to focus on more traditional approaches (accounting and basic management principles), which are useful but do not necessarily encourage entrepreneurs. There is a lack of entrepreneurship education delivered through creative and experimental teaching methods that incorporate work, project and problem-based learning, and involve entrepreneurs as core teachers/coaches rather than just as guest lectures. There is also limited mainstreaming of entrepreneurial experience in curriculum to generate knowledge-oriented enterprises, and little practical experience of new venture formation provided to students. Furthermore, there also seems to be insufficient growth support for new firms outside the "spinoff" and "start-up" categories.

To sum up, despite good progress, there is scope for enhancing entrepreneurship education in Lombardy. This is reflected in the limited breadth of entrepreneurship education activities in most higher education institutions; the relatively small proportion of students benefiting from it; and the lack of the institutional anchoring of entrepreneurship education and co-ordination between the different departments and institutions. Higher education institutions in Lombardy could share good practices among themselves and the key stakeholders in a more systematic manner; build

capacity among entrepreneurship educators in different institutions; and integrate entrepreneurship education into the curricula. They could consider stepping up their entrepreneurship activities. Universities can boost enterprise in many different ways. (Annex 2.A.3. lists some possible approached and identifies the challenges linked to them.)

International experience in enterprise support

In supporting graduate enterprise, the Lombardy higher education institutions would benefit from collaboration and sharing good practices among themselves and the key stakeholders. Examples of collaboration between higher education institutions and the regional development agency can be found for example in Brandenburg, Germany (see Box 2.9.) where a joint resource centre in entrepreneurship and small and medium-sized enterprises (SMEs) has been established in order to pool resources and gain critical mass.

Box 2.9. BIEM - The Brandenburg Institute for Entrepreneurship and SMEs

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

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

Box 2.9. BIEM - The Brandenburg Institute for Entrepreneurship and SMEs (continued)

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

Higher education institutions have established "entrepreneurship location managers/animators" (*Standortmanager*), who act as "one-stop-interlocutors" for would-be entrepreneurs. This structure contributes to building stronger linkages between the university's internal and external support services and to integrating entrepreneurship education and start-up support services.

Other projects include "Entrepreneurship ACs" that evaluate entrepreneurial potentials and learning needs before start-up and match them with adequate mentoring during start-up; examples are "Team Competency Lab" that focuses on team building and coaching at the BTU Cottbus or GO:Incubator at the University of Potsdam.

In 2009, 370 would-be entrepreneurs received initial consultation by BIEM, 203 were referred to external business support structures and 86 business start-ups were supported. The key elements for the institute's success is the multidimensional co-operation between all higher education institutions and their external partners, the involvement of higher education institutions in regional leadership and a phased approach to entrepreneurship.

Source: OECD (2009b), *Universities, innovation and entrepreneurship: Criteria and Examples of Good Practice*, OECD, Paris; BIEM-Brandenburg (2010), Brandenburg Institute for Entrepreneurship and Small and Medium Sized Enterprises website, *www.biem-brandenburg.de.*

In view of the improving knowledge generation capacity of the Lombardy universities and the growing number of patents it would also be useful to consider an example of the University of Illinois in Chicago where graduate students help identify technologies developed by the university that can successfully be put on the market and can lead to new business formation. (See Box 2.10.)

Box 2.10. The Technology Ventures programme at the University of Illinois at Chicago

The Technology Ventures programme at the University of Illinois at Chicago (UIC TVP) makes use of graduate students to launch businesses that commercialise promising technologies. Chicago lacks a vibrant community of technology SMEs looking for new technologies and serial entrepreneurs. Although the Chicago investment community has shown keen interest in high tech spin-offs from the HE system, few have been established. At the same time, investors are often not able to see the potential in raw technologies. UIC TVP was established to provide a mechanism to bring high-potential technologies to the attention of investors. Teams of graduate students (including MBA, MD, pharmacy and engineering) select technologies from amongst the hundreds owned by the university. They conduct market research, draft business plans on how to commercialise those technologies, negotiate with the faculty inventor to join their team and approach investors.

In its first year (2005-06), UIC TVP launched two start-ups. One was a biotechnology firm launched to commercialise a revolutionary cancer treatment. The other firm was seeking to bring to market an orthodontic device that reduced the time required for correcting orthodontic malocclusion (crooked teeth). During its second year, UIC TVP launched four more high-potential, high-tech firms, including a medical device for non-invasive cornea reshaping, an umbilical cord stem cell technology, a vascular imaging technology and a micro-fluidic device. Without UIC TVP, these technologies would have remained "on the shelf", out of sight of potential investors. UIC TVP has received national attention from the media, HEIs and investment groups.

Reasons for the success of UIC TVP include: *i*) hundreds of technologies owned by the university; *ii*) university's expertise, resources and a solid reputation in life sciences; *iii*) university's inventions, links to established biotech firms and recognition by potential investors; *iv*) support from university administration; *v*) student teams, that had an option to license the technology, giving them an incentive to ensure a successful venture; and *vi*) requirement to involve the faculty inventor in return for an equity stake in the business, providing incentives for the inventor to help the company to succeed.

The UIC TVP has faced obstacles such as: *i)* lack of capacity of local investors to evaluate business plans and risk aversion and reluctancy to invest in businesses launched through the UIC; *ii*) lack of perceived legitimacy of student-owned businesses in the media and business/investment communities; *iii)* challenge to convince stakeholders that students were prepared to step aside when professional managers were successfully recruited; and *iv*) heavy work load on students.

Source: OECD (2007b), *Entrepreneurship Environment and Policies: Exploiting the Science and Technology Base in the Region of Halle*, LEED Discussion Paper, OECD, Paris.

The universities in Lombardy could also learn from wide-ranging enterprise support undertaken by the University of Arizona's award winning entrepreneurship education centre, The McGuire Center for Entrepreneurship, which has a 25-year track record in entrepreneurship education. McGuire Center reaches out not only to university students and faculty, but also to schools and businesses. It collaborates with the university's technology transfer office to identify commercially viable faculty inventions, builds entrepreneurial skills among the academic staff of the faculty and helps embed entrepreneurship in curricula. According to "Impact of Entrepreneurship Education", part of a Kauffman Research Series report, and the first study to measure the value of entrepreneurship education, McGuire Center alumni are three times more likely to start new business, become involved in a new venture or become self-employed. They earn 27% more annually, have 62% more assets than non-entrepreneurial peers and express greater work satisfaction, regardless of professional choice. McGuire produces about seven to ten start-up businesses annually from student collaborations. These start-ups have a significant economic impact, particularly in terms of employment, often creating jobs for dozens of employees, whereas a typical spin-off technology firm usually employs only two to three full time equivalent employees. (See Box 2.11.)

Box 2.11. The McGuire Center for Entrepreneurship

The McGuire Center for Entrepreneurship is located within the Eller College of Management at the University of Arizona and is ranked as the fourth best entrepreneurship programme among public universities in the United States, and tenth among all schools, according to US News and World Report. Founded in 1984 with the support of university alumnus and entrepreneur Karl Eller, McGuire was one of the first university-based entrepreneurship centres established in the United States and today one of the few to consistently maintain top-tier ranking status. In 25 years, more than 1 200 graduates have gone on to launch hundreds of ventures, often based on the plan they conceived in the programme.

McGuire teaches entrepreneurship to early-career business people, helps transfer research into the practice by identifying and transferring technology and innovations to the market place and serves on- and off-campus organisations through technical assistance on entrepreneurship activities. McGuire offers a limited-enrolment undergraduate degree stream, and entrepreneurship-focused MBA and a one-year Graduate Associates in Entrepreneurship. The year-long academic programme is available to undergraduate and graduate students from all university disciplines and is completed during the regular course of study. The experience integrates the process of launching a venture into the Idea PathTM curriculum, delivering a hand-on exercise in entrepreneurship.

Box 2.11. The McGuire Center for Entrepreneurship (continued)

McGuire collaborates with the university's office of technology transfer (OTT) in many different ways: it identifies commercially viable research in university and funnels technological innovators to entrepreneurship programmes; it offers workshops for university faculty to provide tools for assessing potential market and social value for their innovations; it hosts workshops for students and faculty to explore the implications of technologies available for commercialisations; it consults with McGuire venture teams on topics such as development, proof of concept and prototype creation via its on-staff technology mentors; and it helps to identify opportunities for collaboration in the university setting and beyond via shared McGuire/OTT knowledge transfer liaison.

McGuire Centre is also well networked outside of the university. As part of Innovation Frontier Arizona's Idea Fair for K-12 schools it is spreading entrepreneurship among school children across the region. McGuire also works with Southern Arizona entrepreneurs on projects including IdeaXchange – a referral network for emerging entrepreneurs – and the IdeaFunding Conference – a day-long workshop for business people, investors and university faculty. In addition to providing resources for new ventures in the region, these activities offer an opportunity for students to network with working entrepreneurs and learn about the issues affecting the entrepreneurial community in an informal setting.

The McGuire Center has championed innovations in embedding entrepreneurship into curricula. It has for instance developed a pioneering Business/Law Exchange™, a mock law firm to address issues such as intellectual property, patent law and contracting. It provides experiential learning opportunities for both students in law and entrepreneurship as it is staffed by law students and has entrepreneurship teams as clients.

Source: OECD (2011, forthcoming), *Higher Education in Regional and City Development, Southern Arizona, United States*, OECD, Paris.

Enhancing a creative workforce in a regional economy

The creative workforce has become a major topic of interest to those concerned with economic development. The creative sector is a key economic driver globally: in several major economies, the value of the cultural industries ranges between 3% and 6% of the total economy (OECD, 2010e). Creative workers are perceived as a strong asset because of their contribution to continuous innovation; their demand for a quality of life that supports their creative work (support for arts and cultural institutions), and their internationalising influence through their global connections.

The creative portion of the SME base has been extremely important to the global branding of the Lombardy region economy as a creative and entrepreneurial centre. Although some creative sectors are organised and their interests represented at the regional scale, in general there appears to be less co-ordination among the creative enterprises than in others sectors, such as manufacturing. This is perhaps due to the more individualistic nature of the production process. All of these aspects are characteristic of the Lombardy creative workforce, which is largely employed in very small enterprises or self-employed (30%).

Despite the absence of detailed information on the creative sectors, Lombardy is an acknowledged centre of creative industries, with particular strengths in design, including textile and industrial design and architecture. In fact, the Lombardy region is recognised as an exceptional centre of creative and cultural industries in Europe.

Lombardy is ranked third among the top 25 European regions with important "clusters" of cultural and creative industries (CCI).[5] This ranking is determined by total CCI employment of 195 848. A location quotient of 1.28 (measuring CCI employment relative to the total employment of the region) demonstrates that Lombardy has a higher CCI employment when compared to other European regions. In general, only the larger global city-regions, such as Ile de France, London, Rome, Stockholm, Amsterdam and Madrid have higher CCI location quotients than Lombardy (Power and Nielsen, 2010) (see Table 2.2.).

Table 2.2. Europe's Top 25 regions for creative and cultural industries: employment

Region	CCI Rank	Employment	LQ
Île de France (Paris), FR	1	301 895	1.53
Inner London, UK	2	235 327	2.19
Lombardy (Milan), IT	**3**	**195 848**	**1.28**
West-Nederland (Amsterdam), NL	4	195 646	1.56
Madrid, ES	5	172 800	1.58
Cataluña (Barcelona), ES	6	153 202	1.30
Danmark, DK	7	124 352	1.28
Lazio (Rome), IT	8	118 047	1.51
Oberbayern (Munch), DE	9	97 050	1.59
Stockholm, SE	10	86 239	2.16
Kozep-Magyarorszag (Budapest), HU	11	82 429	1.73
Outer London, UK	12	80 845	1.28
Berkshire, Buckinghamshire and Oxfordshire, UK	13	80 628	1.82
Attiki (Athens), GR	14	78 920	1.26

Table 2.2. Europe's Top 25 regions for creative and cultural industries: employment (continued)

Oost-Nederland (Nijmegen), NL	15	74 064	1.39
Andalucía (Seville), ES	16	71 843	0.74
Republic of Ireland, IE	17	70 602	1.18
Zuid-Nederland (Maastricht), NL	18	70 543	1.28
Darmstadt (Frankfurt am Main), DE	19	68 238	1.23
Piedmont (Turin), IT	20	66 291	1.04
Cologne, DE	21	65 341	1.28
Etelä-Suomi (Helsinki), FI	22	64 500	1.43
Veneto (Venice), IT	23	63 024	0.89
Stuttgart, DE	24	61 626	1.17
Berlin, DE	25	60 736	1.53

Source: Power, D. and T. Nielsén (2010), Priority Sector Report: Creative and Cultural Industries Europe Innova, European Cluster Observatory, EC. *www.clusterobservatory.eu/upload/CreativeAndCulturalIndustries.pdf*

Among the most important creative and cultural industries in Lombardy are advertising and the artistic performance sectors. These strengths in the regional economy need to be further examined but are likely to be related to the strong presence of the fashion industry (advertising) and musical performance and training (artistic expression), (see Annex 2.A.4.).

Higher education institutions and the creative workforce

The creative design and arts sectors are less integrated in the network of higher education institutions in Lombardy in part because professional training takes place in private specialised institutions (art and design schools, and conservatories). Training methods and evaluation follow different models than those in conventional higher education institutions. For example, creative areas use apprenticeship, studio training, public critiques and exhibitions. Students record their progress and success in different ways, too, through portfolios of their work or recitals or exhibitions. All of these differences create barriers with conventional higher education institutions but offer interesting opportunities for cross-collaboration in teaching and learning methods.

In addition, because networks in creative fields are international, students seek out particular schools and training in a wider international arena. The Milanese designer/ educators interviewed during the OECD review visit indicated that a significant portion of their students come from outside Italy. This compares with a small portion of international students in the public higher education institutions in the region. There may be some

possibilities for collaboration between the state supported higher education institutions and the private specialised institutions. At the very least, it should be noted that the creative educational institutions are important exporters in the regional economy.

Individuals working in the creative industries have a number of entrepreneurial attributes. They have to materialise conceptual ideas and have to develop innovative approaches and outputs to their work. However, studies of the sustainability in creative enterprises indicate that they frequently lack managerial skills required to develop sustainable businesses. Some Lombardy institutions are taking steps to provide this kind of training but there is scope for substantial expansion given the importance of creative fields in the region. Educational, cultural and creative industries could consider collaborating in providing management training in creative industries.

Integrating a more diverse workforce

Research by the ISMU Foundation in Milan indicates that, because of low birth rates, the regional population is ageing. Population increases in the region are attributable to an influx of migrants from a diverse set of countries, (see Chapter 1.).

The regional economy in Lombardy would benefit from the participation of migrant population in higher education. In addition, the children of migrants, currently in primary school, who will constitute a significant portion of the college age population in the next ten years: The number of foreign students attending primary and secondary schools has quadruplicated since 1998; in 2009, 40.5% of foreigners possessed a secondary school certificate. The share of those immigrants with no degree has decreased and is now 7.6%. Data show a slight improvement in immigrants that are graduates, a number reaching 14.2% (MIUR, 2008).

The improving education profile among the immigrant population of the region is a positive development but raises issues about the certification of immigrant's education experience. While a significant portion of this immigrant community has higher education qualifications, there is currently no capacity in the region to identify or evaluate them. Thus, this human capital investment is wasted, and potentially important skills and competencies are not fully utilised in the region.

International experience in integrating migrants into education and labour market

An active involvement of professional associations in Lombardy could help to expedite immigrant integration. As more highly skilled immigrants arrive in the Lombardy region, the accreditation of foreign qualifications and experience will become increasingly important. Many of the regulated professions in the region are controlled by local regulatory bodies, which may have the authority to set entry requirements and standards of practice, to assess applicants' qualifications and credentials, to certify, register or license qualified applicants, and to discipline members of the profession or trade. Toronto, Canada, provides a useful reference for more actively engaged professional associations. For example, Professional Engineers Ontario, a professional association with regulatory authority over the engineering profession, allows prospective immigrants to Canada to take written examinations before their arrival and issues provisional licenses to applicants who have satisfied all the licensing requirements except the minimum 12 months of acceptable engineering experience in Canada. Professional associations also have a role in providing "bridge-to-work" programmes, which help immigrants to obtain work experience in Canada. Most of these programmes are funded by provincial and federal governments and facilitated by professional associations, education institutions and not-for-profit organisations (OECD, 2010f).

Experience in integrating migrants – both highly skilled as well as those with low skills – into education and labour market can also be found in Sweden, where the City of Malmö has made efforts to transform itself into a magnet for talent and investments by drawing on the skills of the immigrant population to support the move towards service, trade and finance-related economy. The strategy is implemented by a partnership that includes the city government, educational institutions, employers and employment services and civil society organisations. As part of this strategy, the City of Malmö has created a validation centre that targets migrants with secondary level foreign education, (see Box 2.12.).

Box 2.12 Validation Centre in Malmö

The City of Malmö in Southern Sweden with more than 270 000 inhabitants (2006) has the highest share of foreign-born individuals in the country, with nationals from around 171 countries. About 36% of the population has a foreign background. The city government has recognised that Malmö's future depends on its ability to attract and retain investments and people. Considerable infrastructural investments were made during 1995-2005 (Oresund Bridge that connects Malmö with Copenhagen, underground system, residential development in the harbour and Malmö University).

The City of Malmö has established the Validation Centre that helps recognition of prior learning based on foreign formal education and work experience, which are validated against an industrial upper secondary curriculum for different occupations (*e.g.* childcare worker, electrician, industrial mechanic, carpenter, builder, chef, assistant nurse and car mechanic). The validation activity is restricted to secondary level education, whereas the validation of higher education and medical professions can be done only by central state institutions.

The portfolio is a structured, comprehensive summary of work experience, education, training and other merits, facilitating the job search and career planning of the immigrant. It is the key document for job applications. The centre evaluates the individual's general education. The results of the validation of general and core subjects in the secondary and upper-secondary school curriculum provides the individual with suggestions of which further education and training offers are most suitable. Local upper-secondary vocational and technical schools in Malmö collaborate in the evaluation of the acquired work competencies and experiences against the Swedish vocational education curricula in the respective profession. Immigrants receive a "competencies portfolio" that makes their skills and competencies transparent and understandable in the Swedish labour market context.

The competencies portfolio concept has spread to the entire Skåne county, and is being carried out annually for at least 3 000 immigrants (2007), of which at least half are in Malmö. The validation exercise is an effective approach to recognition of prior formal and informal learning and provides the immigrant, the training institution or the future employer clarity about acquired and needed skills.

Source: OECD (2009b), *Designing Local Skills Strategy*, OECD, Paris.

Malmö University, working in close collaboration with the regional and local government, has played a key role in facilitating the integration of university educated migrants (see Box 2.13).

Box 2.13. Malmö University

The City of Malmö has systematically invested in increasing the provision and access to higher education. Malmö University has made efforts to attract highly-skilled migrants, who are able to upgrade their competencies and skills. The university's Centre for Widening Participation offers two programmes to support this goal:

- "The Introduction Programme in Swedish with English and Social Sciences" is a one-year intensive programme that targets immigrants who have completed secondary education abroad and have either fully or partly completed university education. It offers language training in Swedish and English, and introductory courses in social sciences that prepare immigrants for a university education in Sweden. Entry exams are language tests in Swedish and English. The programme takes in 60 students a year. Over the period 2000-06, a total of around 400 students participated in the programme.

- "The Aspirant Education Programme" is targeted at foreign-trained academics who have academic degrees and who want to work in their field of training or related fields. The tailored six-month study programme includes company internships, project work and career advice. There are three lines of study. The first is a general option which involves refresher courses and contacts with future employers. The second prepares students to work in the Swedish public administration, and the third prepares students to become teachers and trainers. Applicants need to have a resident permit and a university degree in one of the fields of study taught at Malmö University. Completion of the introduction programme or possession of equivalent levels of language competences in Swedish and English are a requirement. Over the period 2002-06, this programme received a total of 253 applications, of which 154 were accepted.

Source : Adapted from Bevelander P. and P. Broomé (2009), *From Crane to Torso: Local Skill Strategies in the City of Malmö*, in OECD (2009b), Designing Local Skills Strategy, OECD Publishing, Paris, pp. 219-238.

Integration of immigrants into the Lombardy education system and workforce is complicated by the number and interests of actors: employers, occupational regulatory and licensing bodies, labour unions, post-secondary educational institutions, credential assessment providers, nongovernmental organisations representing immigrants, various levels of government and private funding agencies. Lombardy could respond to this complexity by, for example, adopting a framework approach to integrating the immigrant workforce, based on the widely recognised Canadian system, which integrates multi-cultural awareness, job training and credentials recognition (see Box 2.14). In Canada, immigrants have become a vital labour source for the country's growing economy. The labour forces of major Canadian cities have become multicultural as more immigrants settle in the country and look for work. This population change has affected the work culture and employers' approaches to hiring and retaining workers from the immigrant labour force. Because employers lack the experience and skills to deal with immigrant workers, programmes have been developed at the Canadian provincial level and in cities to prepare employers and enhance the possibility that immigrant workers will be hired in positions appropriate with their skill level (Reitz, 2005).

Box 2.14. The Canadian approach to immigrant integration in the workforce

The following features provide a practical guide for effective immigrant integration in the Canadian workforce:

- Improved Internet-based and other information sources for immigrants, both before and after they arrive in Canada.
- More support for providers of credential assessments to improve the labour market effectiveness of their services.
- Bridge-training programmes to top up immigrant skills or to fill gaps across a wider range of occupations.
- Subsidised workplace internship and mentoring programmes for immigrants.
- Upgraded human-resource-management training programmes that include training about ethnic diversity issues.
- Employer recognition of best practices.

Source: Reitz, J. (2005), "Tapping Immigrants' Skills: New Directions for Canadian Immigration Policy in the Knowledge Economy," *IRPP Choices*, 1/1, (February), *www.irpp.org/choices/archive/vol11no1.pdf.*

Conclusions and recommendations

The Lombardy region faces an unusual set of challenges and opportunities in human capital development. Some of these arise from what are also the strengths of the economy, which has a large component of resilient and labour-absorptive industries composed of small and medium-sized enterprises. Key assets include the growing diversity in the region and strengths in creative and cultural industries. At the same time, in comparison to leading regions, Lombardy has an ageing workforce, low labour market participation and educational attainment level. The proportion of the population with higher education in Italy and Lombardy, even for young cohorts, remains significantly below the OECD average.

Low human capital development and demographic trends linked to poor labour market performance are challenges to Lombardy as it aims to strengthen its position in the globalised knowledge economy. The region faces critical issues linked to the ageing of the regional population including low labour market participation, inclusion of migrants and women in the workforce and leadership succession in many SME enterprises.

While the Lombardy labour markets have traditionally been absorptive, the employment outcomes of graduates have been deteriorating with many graduates only acquiring short term precarious employment contracts. Retention rates in many institutions remain relatively low signalling a low level of efficiency in universities' graduate production. Most universities have poor tracking of student progression and achievement, as well as graduate employment outcomes. Despite some notable exceptions, often driven by the active private sector or Lombardy industrial associations, traditionally, the design of study programmes in most Lombardy universities has been based on the supply-side (the desires and capacities of academics), rather than on the demand-side (the needs of the labour market or students). As a result, the educational culture remains "teacher centred" and fails to incorporate experimental, interactive, work and problem-based learning methodology, which currently benefit only a portion of the students. An area where universities can have an impact on the SME-based economy is through support for enterprise within the student and graduate community. There was limited evidence of such support being mainstreamed within degree programmes and through supporting infrastructure. Where such support existed, it remained fragmented with no real collaboration across universities.

Access to lifelong learning remains limited, albeit nascent centres for professional training in Lombardy. There is limited robust data at the regional level about lifelong learning participation. While vocational higher education in Italy is generally underdeveloped and has low enrolment rates,

the Lombardy region has created training institutions which link the educational and economic sectors to meet the training and reskilling needs of the economy.

The OECD review team recommends that the following measures be taken to improve the human capital development outcomes:

Recommendations for the national government

- *Increase private financing and cost-sharing in higher education.*
- *Address the issues of affordability and retention in higher education by introducing a universal income-contingent-repayment loan system where graduates repay the loan if they find a job and if their earnings meet a threshold.* Back up the loan system by a means-tested grants scheme to ensure to students from lower socio-economic backgrounds have access to education.
- *Review the achievements of the Bologna process and continue the process of curriculum reform* in universities across Italy in order to develop a workforce with 21st century skills and competencies.
- *Support diversity in tertiary education system by developing the vocational tertiary education sector and enhancing its links with universities.* The tertiary education sector needs to work as a diversified and integrated system in order to address the needs and the demands of the student population and the business sector. Building strong relationships among the different components of the tertiary education sector, mainly universities and higher vocational institutions is a key element of effective human capital development of a region.

Recommendations for the regional government

- *Develop a wider portfolio of robust data in the region to support evidence-based decision-making and targeted efforts to foster human capital development.* 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 to come together and students to move into employment. In Lombardy, strategic information gathering should be directed at the specific human capital issues facing the region and at models to address those issues that are appropriate to the regional situation.

- *Create a Strategy for Human Capital and Skills Development.* Universities and key stakeholders of the economy and society should work together to develop a long-term strategy for regional human capital and skills development to: *i*) define region-wide goals, policies and priorities extending from primary to tertiary education and beyond; *ii*) develop mechanisms to support more inclusive education and labour market for the ageing population, immigrants and women; and iii) provide lifelong learning activities, including up-skilling and re-skilling for the adult population and those who combine work and study, or are unemployed.

- *Develop strategies to increase the supply of knowledge-intensive workers and integrate them in the sectors in which the region has comparative advantages.* This will enhance higher education institutions' participation in revitalising the existing SME sectors, encourage productivity enhancing advances in those sectors, and make connections that would assist in the SME succession problem. In crafting strategies to increase knowledge-based human capital and knowledge-intensive businesses, higher education institutions programmes need to recognise and work with the existing highly-organised industry. Conventional research university technology transfer models, distanced from the local industry, do not address the critical productivity and innovation problems facing Lombardy industries. In some instances, closer connections between the industries in Lombardy and university or vocational education resources may require changes in national or regional regulation governing the activities of staff and faculty of regional universities.

- *Increase diversity within the regional higher education system.* Reinforcing type B tertiary education is particularly important for Lombardy. Taking advantage of the experience gained with the *Poli formativi,* engage in a concerted effort to determine what aspects of the *Poli formativi* initiative could be developed and extended.

- *Build a strong relationship between the different components of the tertiary education sector*, namely universities and higher vocational institutions.

- *Work together with the universities to strengthen the labour market relevance of university education and alignment with the regional needs in a systematic way.* Universities need to focus on the employability and entrepreneurial skills of graduates, and provide them with the skills and competencies needed in the globalised knowledge economy through new modes of learning, including work- and problem-based learning

methods, and programmes that build entrepreneurial and innovative mindset.

- *Balance the need to increase productivity through intensive and technologically sophisticated work, with the need to employ and raise the skills of the sizeable immigrant population with low skills and low educational attainment.* Methods of accrediting and recognition of prior higher education qualifications and work experience from foreign countries must be established and also the framework approach to raise multi-cultural awareness, job training and the employability of migrants should be strengthened. This challenge may also require a "bridging and integrating" strategy to enable immigrant children to access higher education when they become a more significant portion of the population of an age to enter higher education.

- *In collaboration with universities, schools and business sector, develop long-term efforts to increase the access and success of students in higher education including those from lower socio-economic and/or migrant background.* Given that the skills of these students will constitute an important part of the future human capital of the region, this critical issue needs to be addressed. These efforts should build on international best practice models of effective academic, social and financial support services for students and moving away from teacher centred learning models.

Recommendations for the universities

- *Develop a stronger student-centred approach in teaching activities, building on the international best practice and the existing models in Lombardy.* Reduce the number of contact hours. Engage employers in the curriculum development, invite professors from industry and encourage employment after the 1st cycle. New forms of education are interactive and tailored to the individual needs and capacities of students. They involve inter-disciplinary learning, work-based and problem-based learning methods, and programmes to develop employability, entrepreneurial and transferable skills. Transferable skills should be embedded in degrees programmes across the academic disciplines to boost the productivity base of the region and enhance its internationalisation efforts.

- *Address the need for lifelong learning and more flexible modes of delivery for those who combine work and study.* Steps to make part-time learning more available should be a top priority among the universities. The lifelong learning measures should include transparent pathways to

higher education, the ability to attend multiple institutions, obtain short-term education and training that can be recognised towards degrees, and re-skilling and up-skilling courses and programmes designed to the needs of working adults. This involves recognition of prior learning and experience, course and programme articulation agreements, clear and enforceable policies, and collaborative programmes between higher education institutions.

- *Address the needs of a diverse student population and link this with the construction of flexible learning paths that include type B tertiary education.* Students that enrol in the first year of a Laurea degree, coming from secondary high school, should be able to move into vocational education and have their competences credited. In the same way, students should be able to transfer from vocational education into university education; the process should include the transfer of credits of previously acquired competences. Students should have tutors that would advise in the case of changing their tertiary education courses.

- *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.

Notes

1. The number of students enrolled grew from 300 000 in the early 1960s, to 1 457 000 in the 1990s and 1 814 000 in 2010. The entry rate to type A tertiary education programmes is 51% in Italy, only slightly below the OECD average of 56% (OECD, 2010c).
2. 17% of higher education students' fathers in Italy hold a higher education qualification themselves, while this is only the case for 10% of men in the same age group as students' fathers resulting in a ratio of 1.7.
3. The number of university students increased from 300 000 in 1960/61 to 1 457 000 in the 1990/91 academic year, reaching 1 809 000 in 2010, including 7 300 students enrolled in online universities.
4. Approximately 33 000 out of 46 000 graduates entered directly the labour market. Of these, 23.7% had studied economic or law, 23.8% engineering or science, 20.3% arts and humanities degrees, 7.8% medicine and 7.8% architecture degrees.
5. The data from which these rankings were drawn is employment data and so does not count the substantial population in CCI in all of Europe that is self-employed.

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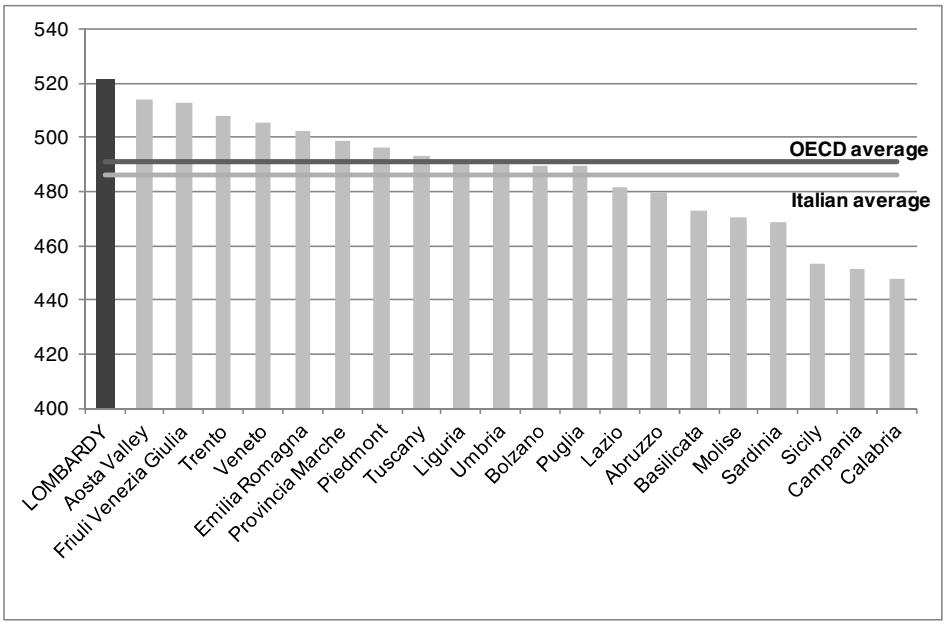
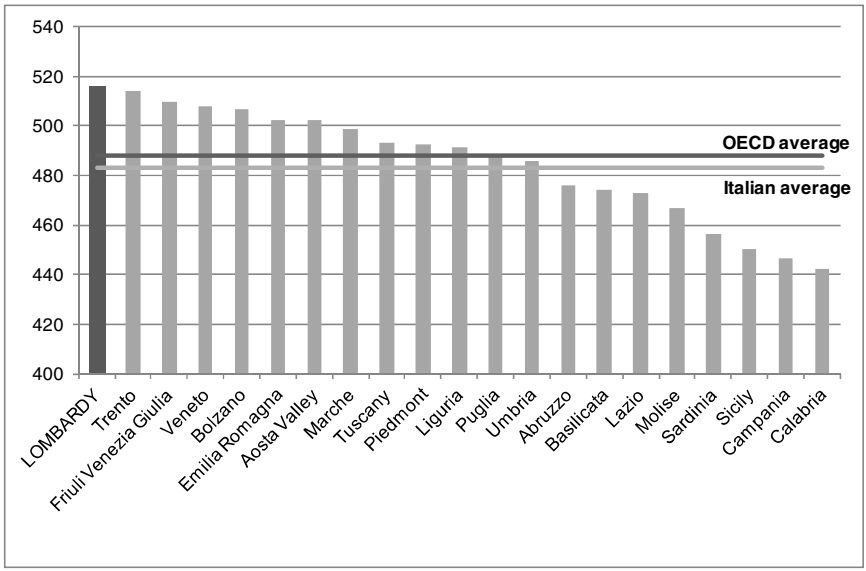
Annex 2.A.1. Lombardy PISA 2009 results

Figure 2.A.1. Average PISA score in the Italian regions, 2009

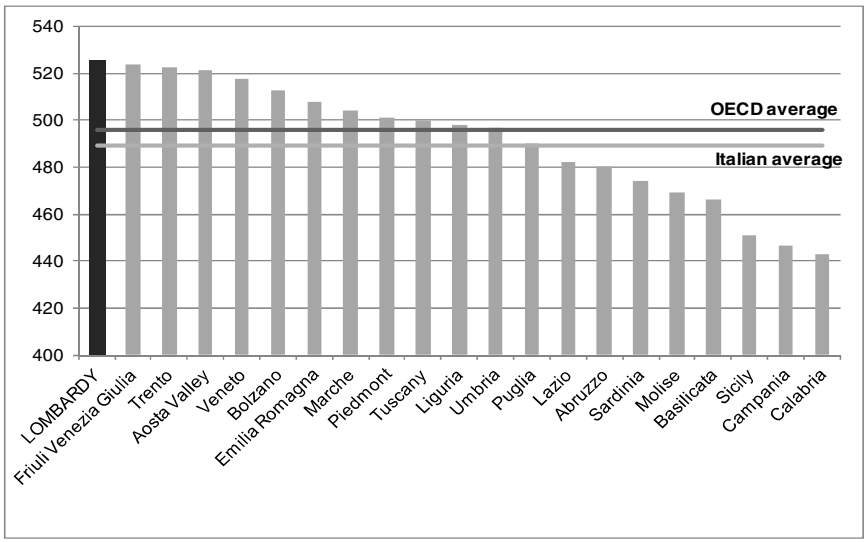
Reading scale



Mathematics scale



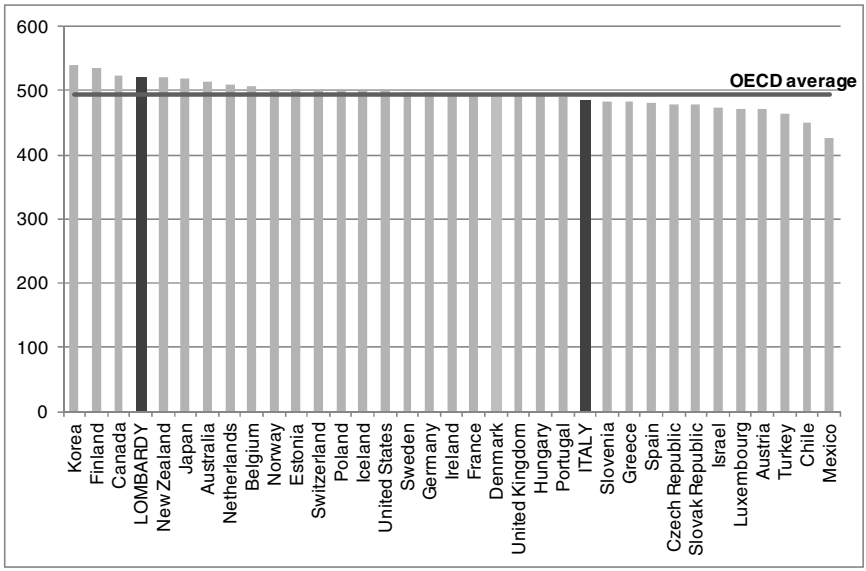
Science scale



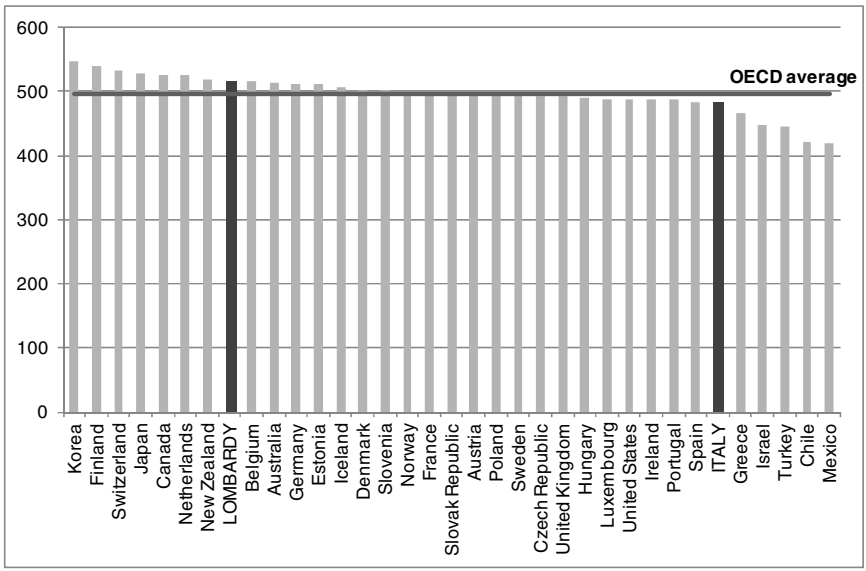
Source: OECD (2010g), *PISA 2009 Assessment Framework: Key Competencies in Reading, Mathematics and Science*, OECD, Paris.

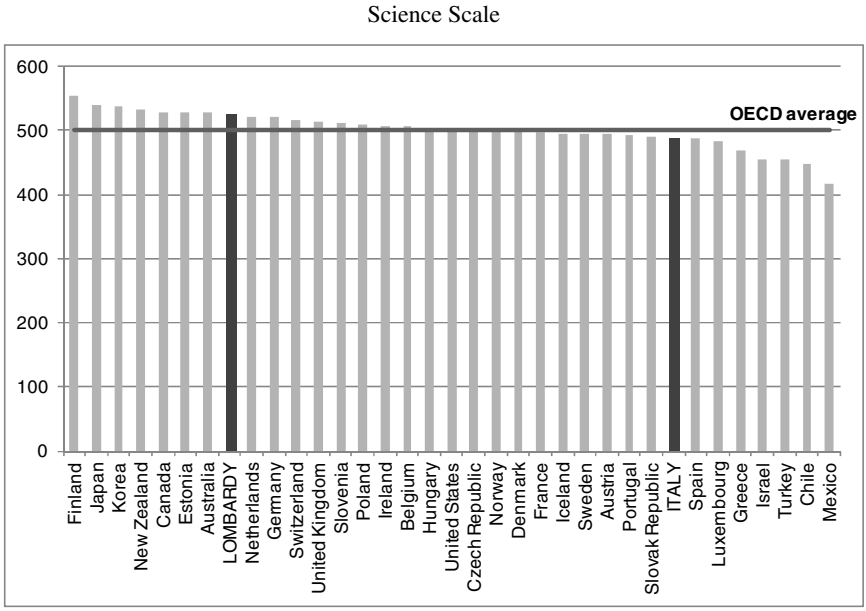
Figure 2.A.2. Average PISA score in the OECD Countries and Lombardy, 2009

Reading scale



Mathematics scale





Source: OECD (2010g), *PISA 2009 Assessment Framework: Key Competencies in Reading, Mathematics and Science*, OECD, Paris.

Annex 2.A.2. Widening access to and improving success in higher education: Victoria University

A comprehensive approach to widening access to education and improving success is provided by Victoria University in Australia, whose catchment area is one of the fastest growing but poorest areas of Melbourne. The university serves a student population with a higher than average representation of students from low socio-economic and non-English speaking backgrounds. Commended by the Australian Universities Quality Agency (AUQA) for its success in building effective relationships with schools, Victoria University's broad equity and diversity strategy comprises a wide range of student equity initiatives, such as: *i)* the investigation of secondary school students' educational aspirations, *ii)* strategies to address student finances and financial literacy; *iii)* provision of access to IT resources for low SES students, *iv)* provision of education for students with a disability, *v)* recognition of the cultural diversity of students, *vi)* provision of programmes designed to increase the participation of students from equity groups through Access and Equity Scholarships and *vii)* a Portfolio Partnership Programme that provides an alternative pathway to university for capable students that do not have a competitive score to enter higher education.

Victoria University's longstanding Access and Success programme demonstrates university's strong commitment to collaboration across sectors. It involves both school and community partners in designing and delivering interventions to increase their relevance to particular contexts. It builds relationships between schools, students and mentors (university students and prominent community figures). It constitutes early, long-term and sustained interventions. Some projects take a cohort-based approach to changing student attitudes and peer culture in relation to education in order to improve achievement and aspirations for future education and employment.

Box 2.A.2. Victoria University's Access and Success programme

Victoria University provides both higher education, and technical and further education. It has over 50 000 local and international students enrolled at campuses across the city-centre and western suburbs of Melbourne which experience below average educational outcomes. The Access and Success programme works with schools in the west of Melbourne to improve access to, and successful participation in post-compulsory education. It has established collaborative teaching and research partnerships with schools and has implemented programmes across more than 70 different sites. It comprises different "arms", which involve university staff and students working in schools (Learning Enrichment), professional development of teachers via participation in post-graduate education (Teacher Leadership), working with senior secondary students to support their aspirations and provide information on pathways to tertiary education and employment (Youth Access), enhancing students' educational engagement through school-based programmes with community partners (Schools Plus) and developing and disseminating research (Access and Success Research).

"Learning Enrichment" involves learning teams of school and university staff and students. Continuous university presence in schools improves student achievement and raises aspirations. Pre-service teachers work with in-service teachers and university researchers to design action research projects that investigate student disengagement and participate as literacy mentors in a whole-school literacy intervention, while also researching the impacts of this intervention on school staff. "Teacher Leadership" aims to engage teachers and principals in professional learning that increases teaching capacity in the schools. This has involved delivering professional development that articulates with the university graduate certificate or masters of education programmes. Research partnerships are based on participatory methodologies, which give teachers and principals control over the research agenda in their schools.

Schools Plus builds school-community connections and increases the engagement of students and families with education and community life. The Kinda Kinder programme (launched in 2005) seeks to address low levels of pre-school participation by engaging with parents and children. Children attend once a week with a parent or a caregiver for one hour free programme in public libraries, other community settings and schools. Pre-service early childhood teachers provide education through storytelling and other play activities, while supporting parents to develop social networks and familiarisation with formal education and community services. In 2009, Kinda Kinder operated in 19 sites.

Box 2.A.2. Victoria University's Access and Success programme (continued)

A new generation of adult learners including parents and grandparents are learning along with the children, the pre-service teachers and university staff in the Kinda Kinder setting. Kinda College has been developed with the vocational higher education part of the university and will offer parents the opportunity to gain further education accreditation for their skills. A range of quantitative and qualitative research methodologies is used to evaluate and inform collaborations with school and community partners and to track the impact of the projects. This investment in research and the emphasis on capacity building through cross-sector and cross-agency partnerships has increased the reach and sustainability of the project.

Source: OECD (2010h), *Higher Education in Regional and City Development, the State of Victoria, Australia*, OECD, Paris.

Annex 2.A.3. Entrepreneurship education

Table 2.A.3.1. Types of entrepreneurship teaching approaches

Type of approach	Main activities	Challenges
Classroom lectures	Lectures on themes such as market analysis, venture creation, new product development, project management, financing, strategy development, etc.	Classroom lectures need to be combined with more experiential approaches to learning. Theory needs to be combined with practice. Lectures must be made relevant to real-world entrepreneurship problems.
Business plans	Preparing business plans individually or in teams. Competitions and prizes for the best business plans.	Business plans must be made realistic. Ways are required to test business plans against market conditions and potential shocks. Teaching must also look at turning business plan ideas into real practice.
Case studies	Presentations and discussions of real company/entrepreneur experiences of business creation, growth, adaptation and failure.	Significant resources are required to develop case studies. Case studies must focus on problems potential entrepreneurs will actually face.
Entrepreneurs as guest speakers	Entrepreneurs invited to present their experiences in lectures and discussions, in the classroom or in their enterprise.	HEIs must find ways of attracting entrepreneurs to teaching programmes. They must also support entrepreneurs in their teaching practice, notably in drawing out the learning from their experiences.
Student business start-ups	Students start real or virtual businesses individually or in teams.	Funds will be required to create start-ups and to develop virtual firm technologies. Rules must be established for sharing rewards from successful starts.
Business games	Computer-simulated or other business games.	The requirements for developing or purchasing the technology should not be underestimated. Efforts are needed to integrate games with other teaching. Teachers need training to provide a framework for learning from the games.
Student entrepreneur clubs and networks	Student societies and networks to discuss entrepreneurship issues, create entrepreneurial teams, obtain mutual support and increase confidence.	Nurturing is required to make networks successful. Activities must be found to animate the networks. Networks should be expanded to include experienced entrepreneurs, investors, consultants, etc.

Table 2.A.3.1. Types of entrepreneurship teaching approaches (continued)

Placements with small firms	Short-term assignments with small firms to assist with business development projects such as market or technology development.	Firms must be found to provide good quality placements. University staff must support the student during the placement.
Feasibility studies	Exploring the feasibility of business ideas with environmental scans, market potential investigations, competitor analysis, etc.	It can be difficult to assess how well feasibility studies have been undertaken compared with real conditions on the ground.
Communication training	Presentation techniques, interpersonal communication.	Communication skills need to be developed under pressured and real-world conditions.
Consulting for SMEs	Student participation in consulting projects for new and small firms with the support of university staff.	It is necessary to find suitable companies and consulting opportunities. Although academics will often be expected to lead, ways must be found of involving students in the projects.
Support for graduate student start-ups following the course	Seed money, mentoring, incubation, consultancy, etc.	Sufficient funds must be generated for the support. Decisions must be made about the right amount and duration of support. Where possible links should be made with existing support providers outside of the HEI.
University-wide entrepreneurship education	Spreading entrepreneurship teaching out to faculties beyond the business school.	The right balance must be found in a trade-off between the benefits of proximity and tailoring to subject specificities through separate courses for each department and the benefits of economies of scale and greater experience through centralised and inter-disciplinary courses.
Specialist entrepreneurship degrees	Undergraduate or post-graduate degrees majoring in entrepreneurship.	It can be difficult to obtain academic rigour from purely entrepreneurship degrees. It can also be difficult to attract students to these degrees. Practical entrepreneurship outcomes are not guaranteed.
Distance education programmes	Use of electronic media including web-based programmes, interactive DVDs and electronic discussion groups.	Student learning rhythm must be maintained and student isolation avoided.
External partnerships	Creation of entrepreneurship centres with financial support from business and public agencies. Advisory boards with external experts.	It is necessary to maintain academic rigour and HEI independence whilst adapting to the concerns of other stakeholders.
Courses for entrepreneurship teachers	Courses for prospective teachers of entrepreneurship to understand the entrepreneur's environment and behaviour and to develop their teaching approaches.	Ways are required to develop insights on the world of the entrepreneur for teachers who have no entrepreneurship experience and to develop teaching abilities in existing or former entrepreneurs.

Source: Potter, J. (ed.) (2008), Entrepreneurship and Tertiary education, OECD, Paris.

Annex 2.A.4. Creative and cultural industries

Table 2.A.4.1. Top 15 regions in the creative and cultural industries

By number of employees and share of European employment in four sectors

	Employment	European share
Radio and television activities		
Inner London	31 231	8.08%
Île de France (Paris)	24 472	6.33%
Madrid	19 105	4.95%
Cataluña (Barcelona)	10 756	2.78%
Köln	10 317	2.67%
Bucuresti – Ilfov	10 122	2.62%
Oberbayern (Munch)	10 037	2.60%
West-Nederland (Amsterdam)	7 647	1.98%
Lazio (Rome)	7 516	1.95%
Outer London	7 515	1.95%
Andalucía (Seville)	7 385	1.91%
Attiki (Athens)	7 100	1.84%
Danmark	6 648	1.72%
Rheinhessen-Pfalz (Mainz)	6 644	1.72%
East Scotland (Edinburgh)	6 351	1.64%
Advertising		
Île de France (Paris)	52 202	7.56%
Lombardia (Milan)	30 020	4.35%
Inner London	24 348	3.53%
West-Nederland (Amsterdam)	19 876	2.88%
Madrid	18 738	2.71%
Denmark	17 343	2.51%
Cataluña (Barcelona)	12 410	1.80%
Düsseldorf	11 653	1.69%
Stockholm	11 230	1.63%
Darmstadt (Frankfurt am Main)	10 053	1.46%
Hamburg	9 664	1.40%
Attiki (Athens)	9 266	1.34%
Lazio (Rome)	9 246	1.34%
Lisbon	9 217	1.33%
Zuid-Nederland (Maastricht)	8 970	1.30%

Table 2.A.4.1. Top 15 regions in the creative and cultural industries (continued)

	Employment	European share
Artistic and literary creation and interpretation		
Île de France (Paris)	20 113	6.80%
Inner London	18 434	6.23%
West-Nederland (Amsterdam)	5 774	1.95%
Outer London	5 357	1.81%
Denmark	5 156	1.74%
Stockholm	4 983	1.68%
Etelä-Suomi (Helsinki)	4 549	1.54%
Lombardia (Milan)	4 448	1.50%
Rhône-Alpes (Lyon)	4 165	1.41%
Slovenija	4 119	1.39%
Lazio (Rome)	4 000	1.35%
Provence-Alpes-Côte d'Azur (Marseille)	3 767	1.27%
Surrey, E and W Sussex (Brighton)	3 714	1.26%
Cataluña (Barcelona)	3 539	1.20%
Kozep-Magyarorszag (Budapest)	3 533	1.19%
Museum activities and preservation of historical sites and buildings		
Île de France (Paris)	10 675	6.24%
Inner London	6 993	4.09%
Denmark	5 162	3.02%
West-Nederland (Amsterdam)	4 525	2.64%
E Scotland (Edinburgh),	3 370	1.97%
Vlaams Gewest (Antwerpen),	2 850	1.66%
Lazio (Rome)	2 720	1.59%
Stockholm	2 648	1.55%
Ireland	2 631	1.54%
Latvija	2 497	1.46%
Madrid	2 240	1.31%
Kozep-Magyarorszag (Budapest)	2 120	1.24%
Cataluña (Barcelona)	2 102	1.23%
Malopolskie (Kraków)	2 040	1.19%
Oost-Nederland (Nijmegen)	2 010	1.17%

Source: Power, D. and T. Nielsén (2010), Priority Sector Report: Creative and Cultural Industries Europe Innova, European Cluster Observatory, EC.
www.clusterobservatory.eu/upload/CreativeAndCulturalIndustries.pdf.

Chapter 3

Research, development and innovation

The regional dimension of innovation is crucial to promote 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 Lombardy and the role of research and knowledge transfer conducted by the universities. It considers the efforts made by the regional government and universities. It examines the current knowledge transfer and exchange mechanisms and highlights good practice from other regions. Finally, the chapter concludes with specific recommendations to improve the regional innovation in Lombardy.

The key message is that the universities need to play a more active role in the regional innovation system, and an effective way of doing this would involve developing a knowledge transfer model that is based on ongoing industry collaboration.

Introduction

The region of Lombardy and the city of Milan are one of the most important economic areas of Italy. This is highlighted by the fact that 42.3% of Lombardy businesses and 6.5% of Italian businesses in profitable operations are in this region. This reflects a high level of wealth in the region with a per capita GDP of over EUR 30 000, accounting for over 20% of the national GDP and annually produces a wealth of more than EUR 300 billion.

Lombardy economy is characterised by high degree of diversity (see Chapter 1.) This has given Milan, the leading city of Lombardy, an advantage over other Italian cities in facing the new competitive challenges, and in competing with the most important European towns and metropolises. The innovative potential of the Milan area rests on a structured university system, a considerable number of public and private research centres, and the resilient SME base which has so far been slow to move to the knowledge economy model. More than 20% of Italian R&D is carried out in the region which is host to 30% of private researchers and 22.2% of the total researchers of the country. Milan is the long standing capital of Italian creativity, with a share of 28% of applications for the registration of inventions, trademarks and industrial designs.

The regional innovation system (RIS) in Lombardy is relatively well structured, diversified and characterised by a dense network of institutions. The main R&D actors include a large number of small firms, provinces and a few large business operators as well as the 15 universities and many public and private research centres. They also include a network of banking foundations (In Italy, these foundations grant more than 25% of their funds to research, education, learning and training) and higher education foundations. A number of employers and business associations are also playing an important role as well as several associations that support economic development through innovation. This is the case of the Agency for Foreign Investment (INVITALIA), the Business Angel Association (IBAN), and the Italian Venture Capital and Private Equity Association (AIFI) that are particularly active in the region.

Lombardy has a strong economic base underpinning its competitiveness, but good framework conditions will not necessarily perpetuate. A number of challenges face the region. First, the Italian district model needs to be modernised to sustain an industrial development that is now being threatened by the competition from emerging economies. Second, Lombardy

has attracted talents and foreign direct investment satisfactorily compared to the rest of Italy, for example, in health and life sciences, but trends are not impressive in absolute terms. R&D spending growth remains moderate. More efforts are required if the region is to keep up with the advanced European regions. Third, education attainment of the population has not considerably changed over the last decade. This limits the capacity of the region to take full advantage of the knowledge economy. Barriers to the upgrading of skills and to the development of lifelong learning should be removed.

Other challenges include the need for universities in Lombardy to rethink their relationships with the surrounding region and to assist in developing and implementing a comprehensive regional development strategy. Universities should not only aim to respond to the needs of the regional labour market, but also embrace their role as economic agents that provide services to firms, undertake R&D, evaluate public R&D and contribute to firm formation and development. The entrepreneurial dimension of universities is on the rise in all universities and technology transfer offices (TTOs) have proliferated. Universities are now transforming TTOs into nodes in the regional innovation networks, gatekeepers in value chains and animators in cluster development, but need to address a number of challenges to improve the long term competencies of the region. Key challenges include: *i)* improving the co-ordination of the actors of the regional innovation system (RIS) through the use of traditional frameworks such as science parks and through new governance systems with full involvement of universities, *ii)* offering more comprehensive TTO services and reinforcing their role as facilitators and brokers for intellectual property (IP) commercialisation and *iii)* strengthening the finance for innovative start-ups from the higher education sector and the equity markets.

In this context, this chapter examines the following three dimensions to assess the effectiveness and coherence of innovation and R&D policies and practices in Lombardy and the role that the universities' play in 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 support the regional innovation system in an optimal way? Are there gaps in delivery where performance could be improved?
- What lessons can be learnt from international experience?

Innovation and higher education potential in the region

Numerous universities

In Lombardy, university system consists of 15 institutions, 7 state universities including a technical university, 7 private universities including 2 online universities and 1 higher education centre with a special charter. Other educational opportunities have been established locally by the regions, especially vocational programmes. Regional post-secondary courses now offer an alternative route which is more centred on specific technical skills required continuously by the changing production system. Some post-secondary vocational programmes benefit from financial contributions allocated by the European social fund.

As in the rest of Italy, the university system in Lombardy has moved from an elitist to a mass university system. Universities in Lombardy account for 16% of the universities in Italy and the region is the first region in Italy for the number of enrolled students (13% of university students in Italy). The higher education enrolment rate (from 19 to 25 years) is 33.2% (40.3% in Italy). Universities in Milan and Lombardy have nearly 223 000 students in 2009 *i.e.* around 2.3% of the population of the region.

The number of students in the total population is a rough indication of the innovation potential of the region as graduates have the skills and the competencies to be an important source of innovation in businesses and other organisations. The proportion of university students in the Lombardy population (2.3%) is higher than the national figure for Italy (1.8%) but is considerably lower than in the US (around 5.5%) or the large European countries (3.3% in UK, 3% in France or 2.6% in Germany). In Lombardy, the percentage of people aged 25-64 with tertiary education qualifications is 15.9% in 2010. This is substantially below the European Union rate of 25.9% (Eurostat) and quite far away from other well developed European regions (Ile de France 39.9%, Stockholm 42.5%) (Eurostat).

Milan has a number of strengths in its universities which contribute to industrial and research innovation. The city contains 8 out of the 15 universities located in Lombardy (see Table 3.1). The Politecnico di Milano produces 5 000 highly-qualified engineers every year on a total population of 24 000 engineering students. The University of Milan is the only Italian member of the LERU (League of European Research Universities), which comprises 20 European research-intensive universities.[1]

Table 3.1. Lombardy universities and research centres

Name	Students	Faculty	Research Centres	Miscellaneous
University of Milan	51 300	9	77	UNIMITT
Politecnico di Milano	35 000	9	13	Only engineering and architecture
Università Cattolica del Sacro Cuore	33 500	14	39	4 Athenaeum Centres
University of Milan-Bicocca	27 500	8	49	4 centres of excellence
University of Pavia	18 700	9	16	15 colleges residences
University of Brescia	14 000	4	36	
University of Bergamo	13 300	6	7	
Bocconi University	12 200	1	19	School of management
University of Insubria	8 600	4	22	3 special re-search centre
IULM - Institute of Modern languages	4 450	4		
Carlo Cattaneo University - LIUC	2 500	3	10	6 Observatories
E-Campus Telematic University	2 307	5		
Vita Salute San Raffaele University	1 900	3	4	Linked with S Raffaele hospital
IUSS - Institute of Higher Studies	350			
UNITEL International Telematic University	91	3		

Source: IReR (2010), The Region of Lombardy, Italy: Self Evaluation Report, OECD Reviews of Higher Education in Regional and City Development, Lombardy, Italy, *www.oecd.org/dataoecd/14/1/45797705.pdf*.

Milan is also home to Bocconi University, the leading specialised private university in Italy with a strong international reputation in business and law.[2] Bocconi represents a significant asset in the region and could play a stronger regional role in talent attraction and retention, programmes, entrepreneurship and SME development, and financial and business innovation.

In the Italian national context, the Lombardy university system is relatively diversified and balanced in terms of disciplines: 23.8% of students are in engineering or natural sciences degrees, 23.7% in economics or law, 20.3% in arts and humanities, 7.8% in medical science, and 7.8% in architecture. It produces every year 46 000 graduates (first-level and second-level degrees). Of this 33 000 enters the labour market (*i.e.* 70% are working immediately compared with a national average of 56%). Graduates tend to

find employment in businesses, 73.2 % of them are employed in companies, 24.7% in public administration and 2.1% in the third sector.

HE research in Lombardy

Lombardy is the powerhouse of Italy for R&D activities. Around one-third of all Italian expenditure on research and development comes from companies in the region, and business expenditures amount to approximately 70% of the total regional expenditure on R&D (see Table 3.2.). Furthermore, with 17.9% of the national total, Lombardy ranks second behind Lazio with regard to the number of R&D employees[3].

Table 3.2. Higher Education and business R&D in Lombardy and selected other Italian regions

	Higher Education S&T spending				Business S&T spending			
	2001	%	2004	%	2001	%	2004	%
Lombardy	555 885	18.4	608 061	19.1	217 201	72.1	2 27 3319	70
Piedmont	266 554	14.7	313 429	16.5	1 461 791	80.8	1 476 232	78
Emilia R.	427 633	34.7	437 134	31.8	680 355	55.3	810 486	59
Tuscany	466 292	52.6	542 407	52.2	301 572	34	322 835	31
Lazio	561 575	22	638 895	23.9	650 960	25.5	646 623	24
ITALY	4 418 275	32.55	5 004 511	32.8	6 660 900	49	7 292 856	48

Source: ERAWATCH (2007), Analysis of the Regional Dimensions of Investment in Research. Case Study Regional report Emilia-Romagna (Italy). Gagliardi D., A. Mina. and P. Conningham, PREST, Manchester Institute of Innovation Research.

While higher education research is less than 20% of the regional research investment, its absolute value is significant and is second only to Lazio (see Table 3.2). Lombardy's universities are host to about 300 research centres (see Table 3.1 above). The Lombardy region has good research infrastructure, including many leading universities and institutes focussing on leading edge of new technologies and creating a fertile environment for innovation. With its eight universities – the Politecnico di Milano, Università Cattolica del Sacro Coure, Bocconi University, University of Milan, University of Milan-Bicocca, IULM, LIUC and Vita Salute San Raffaele University – the city of Milan has one of the highest number of higher education institutions in a city in Italy and Europe. Almost a quarter of the Italian business enterprise research is carried out in the metropolitan area (the figure for Lombardy is 34%). There are also 24 national research centres and several institutes of the National Research Council (CNR), 4 test labs and 2 nuclear physics institutes to sustain an economic system based on the region's advanced industries such as

chemical, pharmaceutical and medical biotechnologies, ICT, the environment and new materials.

Box 3.1. Politecnico di Milano

In recent years, Politecnico has made investments in its 163 laboratories which today rank well among the most advanced and innovative laboratories at a European level and represent the meeting point between the academic and the productive world. Among the most important laboratories is the Lab for Transport System Safety, the Wind Gallery, the Modelling Laboratory and the laboratories of the School of Design (Di. Labb).

Politecnico di Milano is the largest technical university in Italy with about 38 000 students, 9 faculties and 13 research centres. It was established in 1863 by a group of scholars and entrepreneurs belonging to prominent Milanese families. The term "Politecnico" means a state university consisting only of study programmes in engineering and architecture.

Students (2010) are distributed in the following way: architecture (6 501) design (3 254) and engineering (16 197). The number of professors in these disciplines is respectively 317, 197 and 919. The Politecnico is offering 29 bachelor of science programmes of which 2 joint programmes with the Tongji University in China, 35 masters of science programmes, including a joint programme with the University of Genova and three double degree programmes with the Tongji University. Altogether 17 programmes are taught in English for international students who originate from 83 countries. 1 200 international students are enrolled at the BSc level (5%), 1 100 at MSc level (10%) and 150 PhD level (18%).

Politecnico di Milano also offers doctoral programmes which allow researchers to be trained in the architecture, design and engineering sectors. The programmes are promoted by the departments and co-ordinated by the school of doctoral programmes.

The scientific community of Politecnico di Milano includes more than 1 400 professors and research fellows, who are employed in advanced research activities at a national and international level. The university's scientific research seeks to forge a strong relationship with the business and productive world, through technological transfers. Being attuned to the needs of the productive, industrial and public administration sectors helps research to explore new areas and stay at the leading edge.

Box 3.1. Politecnico di Milano (continued)

There are numerous research programmes carried out by the university in collaboration with the international scientific community along with the support of industrial partners, research centers, governing bodies, public administrations and the European Commission. The research area are organised according to 13 strategic (macro)areas: aerospace, environment, cultural heritage, biotech for health, chemistry, materials and nanotechnologies, citizens and governance, construction, ICT, energy, physics, mathematics, industrial process and transport. These areas are further decomposed in 108 research lines which are studied by 264 research groups.

Politecnico has also set up a Technology Transfer Office with the purpose of creating a bridge between those who develop knowledge and those who are able to bring benefits to the final user. The TTO's role is to mediate, enhance and commercialise the research which is born inside of the university. More than 200 inventions have been patented, more than 50% have been transferred and are currently exploited and 18 spin-off companies have been set up. In addition to the technological transfer, Politecnico seeks to facilitate the development of innovative entrepreneurship thanks to the creation of the company incubator (*Acceleratore d'impresa*). There are now four branch offices of the incubator: Milan (Gran Sasso and Bovisa), Como and Lecco. The number of companies which have currently been incubated stands at 26, of which 7 are incubated spin-offs. The companies incubated between 2000 until April 2010 amount to a total number of 53 firms (including the incubated spin-offs).

According to QS World University Rankings among Technical Universities, Politecnico di Milano is: 1st in Italy, 18th in Europe and 63rd in the world. 29% of architects in Italy, 78% of designers, 19% of engineers in Italy have graduated from the Politecnico di Milano. Living alumni account 160 000 people, including Giulio Natta (Nobel Prize 1963), Renzo Piano (Pritzker Prize) and Aldo Rossi (Pritzker Prize).

Source: Politecnico di Milano

The quality of the research undertaken in Lombardy is confirmed by international rankings. For example, according to the Scimago database, the top 40 Italian universities distinguished for the significance and relevance of their research activities include eight universities in Lombardy (see Table 3.3). The leadership of the University of Milan and of the Politecnico di Milano reflects the diversity of skills offered and the focus on engineering (40% of graduates). Research is evaluated particularly highly in the generalist universities (University of Milan), the private ones (Università

Cattolica del Sacro Cuore) and those specialised in medicine and biotechnologies (Università Vita Salute di San Raffaele). However, the level of co-operation with other universities or in the international arena remains disappointing except for the University of Milan-Bicocca that is involved in international research projects and has centres of excellence in plasma research, cognitive sciences, biotech and molecular bio-imaging. The university is also strong in materials, health sciences and complex systems. Also worthY of mention is Bocconi University which specialises exclusively in economics, business and management.[4]

Table 3.3. Lombardy universities in Scimago classification

Institution	World ranking	Italian ranking	Publication output	Quality index Cx	Co-operation intensity	A	B
University of La Sapienza	64	1	18 003	5.79	35.49	1.01	0.06
University of Bologna	94	2	14 942	6.85	35.24	1.00	0.25
University of Milan	97	3	14 668	8.17	36.02	1.05	1.31
University of Firenze	180	7	10 508	5.72	35.09	1.02	1.25
University of Torino	216	8	9 045	7.86	38.78	1.05	1.34
Politecnico di Milano	321	11	6 951	3.63	33.36	0.88	1.18
University of Pavia	338	12	6 481	7.17	36.95	1.03	1.25
Politecnico di Torino	445	18	4 459	3.56	33.15	0.89	1.30
University of Milan-Bicocca	563	23	4 041	7.55	40.81	1.03	1.33
Università del Sacro Cuore	672	30	3 302	8.19	24.95	1.07	1.25
University of Brescia	697	31	3 158	7.7	31.89	1.04	1.39
Università Vita Salute San Raffaele	1 241	37	1 366	13.6	34.92	1.12	2.04
University of Insubria	1 332	39	1 195	7.1	34.81	1.04	1.22

Source: Scimago database, *www.scimagoir.com/pdf/sir_2010_world_report_002.pdf.*

Note: Universities are ranked according to their publication output (Column 3). Cx (column 4) is an indicator showing the average scientific impact of an institution's publication output in terms of citations per document. Column 5 shows the institution's output ratio that has been produced in collaboration with foreign institutions. A shows the journal average importance where an institution output is published. B reveals the ratio between the average scientific impact of an institution and the world average impact of publications of the same time frame and subject area.

The University of Milan's performance in research is an example of the strong efforts in knowledge generation. The university spends more than EUR 280 million annually in R&D. It combines curiosity-driven research

with applied customer-oriented R&D conducted in response to requests by public and private bodies. The university has approximately 5 000 personnel working on research plus an extensive number of doctoral students, research fellows and assistants. Between 2000 and 2006, R&D spending (85% financed by the university) increased by 52%, reflecting a rebalancing between research and teaching in the region's higher education system. The university increasingly relies on government funding (MIUR), EU money (190 contracts signed during the FP6) and external funds (an average of 200 contracts are signed annually with 120 customers). The university's commitment to research in different fields is approximately in line with the distribution of teaching staff among the main disciplinary areas: Life sciences including biotech, bio-molecular science, medicine, neurological sciences and pharmacy (35.4%), mathematics, ICT, physics, organic chemistry and agriculture and food sciences (see Box 3.2.) and veterinary medicine (35.7%) and social sciences (16.5%).

Box 3.2. The Faculty of Agriculture of the University of Milan

With about 2 700 enrolled students and 500 first-year students, Milan Faculty is the biggest agricultural faculty in Italy and is among the world top 100. More than 500 students per year obtain the bachelor's and master's degrees. Courses offer includes a bachelor's degree covering fields such as environment, agro technologies, valorisation of territories, vegetal and food biotechnology, oenology and wine management and, food science and technology and a master's degree in agro-environment science, agricultural science production and protection of plants, food science and nutrition.

Research is executed in several laboratories including the laboratory of Microbiology and molecular biology, the laboratory of biology and genetics, the laboratory of mycology, hydrology, chemistry and advanced computer science. With the Socrates/Erasmus fellowship collaboration is carried out with 11 universities in Europe. Many theses are involving projects in developing countries. While most of the department research money comes from contracts with private companies (It is second after medicine) its R&D budget suffers from a chronic lack of public support. The "know-how" transfer to farms and companies is a challenge due to the fragmentation of these entities. Another important challenge is the mobility of researchers.

The dispersion of universities and research centres poses a challenge to the economies of Milan and Lombardy, and consideration should be given to stronger co-ordination and pooling resources. International evidence shows that in some high tech centres, the presence of powerful academic poles is an important asset for regional development. The low number of Milanese global organisations able to invest significantly in R&D activities and to

innovate (with the exception of life sciences[5]) could be counterbalanced by other R&D organisations such as universities. Although Milan holds one of the largest higher education sectors in Italy and some of the most specialised universities in Italy (*e.g.* the Politecnico di Milano for engineering, Bocconi for management, Vita Salute San Raffaele for medicine and biotechnology, University of Milan for health, agriculture, biomedical and hard sciences), their impact on the regional economy could be enhanced. The underdevelopment of this engagement is mainly because universities perceive that there are very few incentives to collaborate. Better integration of local knowledge institutions, universities and research centres could contribute to enhancing high tech activities in Milan, for example, by creating a strong specialised university pole that would co-ordinate the existing research structures (OECD, 2006a).

Active intermediary organisations but fragmented regional innovation system

Universities can, and should, play a significant role in the regional innovation system (RIS). For this to happen there is a need for widespread collaboration and networking of institutions in research and technology transfer.

To date, the integration of higher education institutions in the RIS in Lombardy remains incomplete. Around 500 centres provide a diverse range of innovation services in Lombardy for companies, of which approximately 200 are geared towards research and technology transfer. However, although the scope and proliferation of the centres constitute a strong base, the development of processes aimed at creating higher-quality structures and progressive specialisation, is still ongoing.

Nonetheless, the current R&D infrastructure in Lombardy is substantial. In the Milan area, there are 4 development agencies, 4 incubators, 8 technology transfer centres and 3 consortia of universities and enterprises. In addition to the universities in Milan, the rest of the Lombardy region can count on seven additional universities, covering some of the most important innovative research field. The sectors of excellence in public research are: electronic engineering and computer sciences, biotechnology and new materials, robotics and mechatronics, economy and management and medicine. There is also a developed system of private research based on company research and on a dense network of private research centres and testing labs. Large Milanese enterprises and universities have been directly involved in the creation of three consortia that operate in the training and research field (MIP and CEFRIEL with the Politecnico di Milano and Milano Ricerche with both the University of Milan and Milan-Bicocca

University). Politecnico di Milano has created its own liaison office Polytechnic Innovation (a consortium on technology transfer and promotion on technology innovation in SME). Industrial associations also play a substantial linking role between research and enterprises, for instance: Assolombarda, Federchimica and UCIMU, have created their own technology transfer centres (ASSOTEC, CIRC). Centres for technology transfer have also been created by the regional government (CESTEC). (See Box 3.3.)

Box 3.3. Centre for the Technological and Productive Development of Crafts and Small Businesses (CESTEC)

CESTEC, founded in 1979 through a regional law, is controlled by the Lombardy region which holds a 51% stake in the centre. Through an annual Regional Budget Law, the regional government defines its priorities and finances 90% of its activities. Cestec has the main objective of encouraging the diffusion of manufacturing progress whilst offering to small and medium-sized enterprises in Lombardy all the organisational, technical and market assistance they require for their development and renewal.

Cestec SpA is a Centre "for the Technological and Productive Development": its core business is to support Lombardy SME enterprises in their capacity to develop their business, particularly stimulating the adoption of new technologies through the exploitation of the outcome of research and development. Cestec is an intermediary agency between the world of research and innovation and the world of small and medium-sized enterprises which facilitates the diffusion of technological knowledge and information, and supports SMEs in applying them to practical cases by means of experimental schemes.

Cestec has experience in:

- Co-ordinating international partnerships within the framework of European Commission programmes.
- Carrying out market research, technological audits and company matching events to find suitable partners/clients for European SME enterprises.
- Promoting transnational technology transfer from Lombardy SMEs stimulating transnational co-operation.
- Organising events (workshops, seminars. to disseminate/promote the results of the studies/research carried out.

Source: CESTEC, Centre for the Technological and Productive Development of Crafts and Small Businesses.

Increasing research results, patents, start-ups and spinoffs

A number of indicators provide evidence of a relatively good performance of the regional innovation system (RIS) in Lombardy. As reflected by input and output indicators, R&D efficiency in Lombardy is greater than innovation efficiency. Despite recent efforts, the transfer of technology from public research has not produced expected results and private research (in Lombardy) is not much above average European standard.

Generation of scientific knowledge in Italy could be qualified as a relative success story. With reference to the years 1998-2008, Italy was ranked 8th in the global classification of scientific publication, with a total number of articles close to 400 000. This number is significantly higher than the Spanish scientific production (below 300 000 publications) and it is not far from Canada (414 000) and France (548 000). Other European countries such as the UK and Germany reach higher levels in the number of publications produced. As expected, the US leads the ranking with over 3 million publications. The citation index (*i.e.* the traditional metrics to address the problem of quality, novelty, and scientific relevance of publications) places also the US in first rank (over 42 million citations), while Italy positions itself in seventh place, after France and Canada.

Lombardy accounts for 1.86% of the EU27 publication output and is ranked 5th within the list of the 25th highest performing European regions. The region has increased by 5% its output over the period 2001-07. The scientific density (publications per million inhabitants) is less impressive (ranked 23rd) and the quality index measuring the impact of the scientific production just average (ranked 15th). The best performances are registered in medical research, biology and mathematics (OST, 2008).

The number of patents can be an interesting indicator of knowledge and innovation, which reflect not only the creativity of a nation, but also its entrepreneurial mindset. Over the period 2001-06 available data suggest that for Italy, the number of triadic patents filed increased by 21% – the data are normalised on 1 million inhabitants. Also, a comparison between the three-year periods, 1992-94 and 2002-04, shows a significant increase of 53% in the number of patents that Italy has filed in collaboration with international partners, highlighting the increasing openness of the country to international collaboration.

In the Italian context, Lombardy is particularly active in patenting, ranking third among all Italian regions. For the number of patents filed at

EPO per million inhabitants in 2006, Emilia Romagna leads with 170 patents, followed by Friuli Venezia Giulia (132.3), Lombardy (132), Veneto (117), Piedmont (102.3) and Tuscany (66). Italian southern regions such as, Molise, Sardinia, Basilicata and Calabria, each filed less than 10 patents per million inhabitants. Patent applications in Lombardy are more important in the field of construction, household goods, industrial processes, machining and transport and chemistry (OST, 2008).

A similar dynamic is at work for the yearly creation of spinoffs. According to the last NETVAL report (NETVAL, 2009), since 2000, Italy continues to display signs of a strong acceleration in the number of new spin-offs. The report highlights that among the 710 spin-offs currently operating in Italy, more than 85% were established in the last eight years and over 80% are located in the northern-central Italian regions, co-localised with the most active Italian universities (Italian Trade Commission, 2009). Leading sectors include ICT (35.8%), life sciences (15.5%), energy and environment (14.6%), electronics (11%) and biomedical (7.4%). In 2007, Lombardy has given birth to 14% of all Italian spinoffs with three-quarters of them shared by universities. About half of these spinoffs have been started at the University of Milan.

Challenges

Industrial districts and clusters of small and medium-sized enterprises are responsible for the country's economic vitality and growth and for regional innovation. As a strong economic force contributing to more than half of GDP, Italian industrial clusters have been referenced as a model of regional development. The growth and rate of innovation in regional clusters is directly affected by customers, suppliers and competitors outside of the clusters, while at the same time the foundations of competitive advantage in this environment are built on strong local factors given that face to face relations, timeliness and trust are of strategic importance in new product development and commercialisation. However, in the changing economic environment, these clusters and districts are challenged to achieve sustainable growth in the areas where they have traditionally operated as well as in new and innovative ones (Busa, 2003).

At the end of the 2000s, Italian industrial districts continue to be a successful phenomenon with about 2 million employees and one third of Italian export (see Box 3.4). There are, nevertheless, signs of decline due to the increased competition from emerging economies, thus casting doubts about the long term sustainability of these industrial districts. Some experts have argued that firms are relocating abroad the activities that are complementary to their business within the clusters but not replacing it

(Locke, 2001), thus building new strategies to maintain or increase their market positions. The combination of the retreat from market segment where competition factors are unfavourable and the engagement in high value added niches and knowledge intensive activities suggests that the companies need to upgrade their capabilities in innovation and creativity and take advantages of their strengths and knowledge assets.

Sustainable cluster-based innovations in Lombardy require a shift from network of SMEs that have traditionally involved firm-based interactions, to a broader network that comprises universities, research centres and financial institutions as well as private and public foundations and the public administration. With the Italian constitution delegating more powers to individual regions in economic policies, there are significant opportunities to enhance co-operation among innovation actors with regional institutions playing an important role as innovation catalysts (Busa, 2003).

Box 3.4. Lombardy's industrial districts

The industrial district model is gaining new interest in the policy agenda due to globalisation and the strong competition in traditional manufacturing sectors from emerging economies, mainly China. Industrial districts are productive systems based on strong relationships between firms (trust and co-operation) and characterised by the geographical agglomeration of a large number of (small) firms that are involved at various stages in the production of the same or similar final product.

The regional government of Lombardy established its own criteria to identify industrial districts and finance development programmes. Two criteria were taken into account for each municipality in Lombardy: the industrialisation rate (with a threshold of 18.5% *i.e.* 30% above the regional average) and the specialisation rate (threshold: 20%). A general principle of geographical proximity was applied. Some municipalities were included even if they were below the threshold *e.g.* Pavia, Lodi and Cremona.

The 16 industrial districts in Lombardy include 302 municipalities belonging to 10 provinces. Among them 7 are specialised textile/clothing, 3 in metal production and processing, 2 in footwear, 1 in furniture, 1 in wood, 1 in electric/electronic equipment and 1 in plastic/rubber.

Source: OECD (2006a), *OECD Territorial Reviews: Milan, Italy*, OECD, Paris.

Regions that innovate successfully are those that align their public policy efforts with the changing needs of the local actors. These clusters are a key element of the vertical and horizontal networks that supports firms'

interactions, resources and knowledge exchange. Regional research and industrial policy is aiming at moving Lombardy up the value-added ladder from traditional industries towards new technologies and R&D intensive niches. The region is not yet sufficiently hooked to international networks and globalised markets given its bias towards small and medium-sized enterprises and very small businesses. Efforts to reduce the brain drain and to internationalise higher education institutions are relatively recent and not sufficiently integrated in the trade and export policy. This will require increased co-operation between higher education and the private sector. To bridge the gap, governments have utilised traditional instruments such as science parks and gradually support higher education institutions attempting to commercialise their research results. Progress has been registered and higher education institutions have created and developed their technology transfer offices and promoted collaborative work with industry. Public R&D commercialisation takes place not only between the three "triple helix" players: the industry, the university and the government (whether national or regional) but it also includes a fourth partner: the financier (venture capitalist, business angels and equity providers).

New cluster strategy and vision

In Lombardy, regional R&D policy is not fully developed. Apart from the regional Undersecretary for University and Research, there is no specialised body leading innovation and R&D related programmes. However, there are agencies that are involved in R&D policies such as the AIS (*Agenzia Innovazione e Sviluppo*) and the ASNM (*Agenzia Sviluppo Nord Milano*). Innovation is, nonetheless, important in a number of policy measures including the Community Strategic Framework 2007-12, the Regional Operation Plan as well as the regional framework agreement between partners (Regional Ministry of Education, Region-Unioncamere framework).

A major national policy initiative that has impacted Lombardy has been the launch in 2003 of the metadistrict policy (see other national innovation policy measures in Box 3.5). A metadistrict is a territory where the concentration of firms belonging to knowledge intensive supply chains is higher than the regional average. In contrast to district policy, contiguity is not the key indicator to identify network. The main aim is to build linkages between the districts and their constituencies and the research centres and notably the universities. The metadistrict policy goes beyond the industrial district policy and the mere spatial agglomeration of firms. It embraces the entire supply chain. Moreover, the idea to finance network linking firms, universities and research centres, rather than individual firms, offers an efficient tool to upgrade the competitiveness of local SMEs.

Box 3.5. National innovation policy lines of action

In Italy, the main component of the Innovation Policy can be summarised as follows: *i)* Modernisation and digitalisation of the public administration, implemented through *e-gov 2012*. This plan is expected to generate important savings around EUR 40 billion in the next four-five years notably by increasing productivity in the public sector; *ii)* Creation of public-private partnerships: *Industria 2015*. The strategy seeks to take advantage of the opportunities arising from the growth of private demand of highly innovative goods; to improve the capacity of the productive system to effectively fit the new needs characterising an advanced society; to improve the competitiveness of traditional sectors by developing new synergies between technology producers and consumer goods producers*; *iii)* Creation of clusters in order to reach critical mass, specially at regional level, taking advantage of the existing regional competences and excellences (*e.g.* technological districts, high technology poles, centres of competence); and *iv)* Re-launching of R&D investments in the energy sector through a Research Plan in the energy sector (2009-11). The plan launched by the Ministry of Economic Development in March 2009 foresees the allocation of EUR 210 million to boost research and innovation in the energy sector.

Ministry of Economy data show that the amount allocated annually to innovation during the 2003-08 tripled to reach EUR 3.32 billion in 2008. The most important support measures adopted included the creation of a Research Incentive fund (FAC) managed by MIUR, an instrument set up for funding basic research (FIRB), a fund for supporting scientific and technological research created in 2007 (EUR 900 million allocated), a technological Innovation fund (with a call for tender of EUR 55 million in 2009), a programme for financing research projects submitted by firms, science parks and consortia (FAR) and a programme to fund projects of national interest (PRIN).

The most recent initiatives aimed at reducing the shortage of finance to innovation (*e.g.* venture capital), the shortage of talents (*e.g.* struggling against brain drain) and the improvement of technology transfer. A national fund for innovation has been established (endowed with EUR 60 million) to act as an instrument to reduce investment risk for bank and financial intermediaries. A programme has been launched to support brain return (*i.e.* financial incentives to attract Italian researchers living abroad). A fund for supporting innovation projects in startups in the high technology sector is also now operational.

The main actions planned include the *Industrial Innovation Projects* (IIPs), which aim to stimulate and promote the development of innovative products and services in five strategic areas, namely energy efficiency, sustainable mobility, life sciences and biotechnology**,** new technologies for SME development, and innovative technologies for the enhancement of cultural heritage. The proposal must be the result of co-operation between a research organisation and business.

Source: Italian Trade Commission (2009), *Research in Italy, Land of Hidden Gems: How and Where to Invest in Italian Scientific Excellence*, Consulate General of Italy, New York.

In line with the metadistrict policy, the Lombardy region is increasingly targeting the supply chains within selected knowledge intensive and conception intensive activities *i.e.* biotechnologies, nanotechnologies, new materials, fashion and industrial design. The main priorities for Lombardy are health and life sciences (linked with demographic problems and family policy), economy of knowledge and sustainable development.

Box 3.6. The Lombardy biotech cluster

Lombardy has the largest Italian cluster of biotech organisations. This bio-cluster located in the area around Milan is characterised by a significant share of pharmacy companies from which various industrial spin offs have been created. Biotechnology companies in Milan (about 39% of the Italian total) are growing fast with higher shares of R&D investments.

The Milan Bio-cluster shows a strong research and teaching base with 5 000 researchers working in the sector and 30 000 students enrolled in four universities. The University of Milan graduates 2 000 students each year in biotech, pharmacy and medicine and employs 1 200 researchers. The University of Milan-Bicocca, Politecnico di Milano and Vita Salute San Raffaele University run biotech related degrees and carry out related R&D. There are also seven hospitals, research centres and science parks in the area with a particular expertise and specialisation in biotech for health (oncology, neurodegenerative diseases, cardiovascular, inflammation and immunity, pharmacogenomics, molecular biology diagnostic systems) while other areas of specialisation include agrofood and bio processes. The Lombardy region counts 126 organisations in the field of biotechnology: companies (62%), research institutes (16%), law firms (9%), associations and foundations (6%), investors (5%) and scientific parks (2%).

Local institutions and players have recently created, under the direction of the Province of Milan, the BioMilano network aimed at promoting and co-ordinating initiatives that strengthen the innovation process in the biotech sector. The agreement for the creation of BioMilano, signed in 2006, promotes collaborative activities among the Province of Milan, a key supporter of the initiative, as well as companies, universities and scientific societies in the Milan area. To maintain its excellence in the biotech sector, BioMilano aims to enhance the networking and joint activities in the fields of nanotechnology, neurosciences, cancer research, proteomics, biochip, immunology, chemistry, and agrofood.

Box 3.6 The Lombardy biotech cluster (continued)

Several associations have been established to support the biotech activity in the region and to link research with the business sector. Biopolo, a private non-profit biotechnology transfer company was established in 1995. The company has focused its expertise on the creation of start-up and spin-off companies, business plans, feasibility studies and support to researchers through the management of grants funded by the European Union framework programme. Biopolo is also the Italian Biotechnology Directory. Assobiotech created in 1986 is the national association for the development of biotechnology, representing more than 75 companies involved in biotech-related fields. They include emerging biotech companies and small to medium-sized enterprises, as well as the biotech divisions of large organisations. Assobiotec is a co-founding member of EuropaBio, the European Association for Bioindustries. Another organisation, Assotec, is playing an important role in fostering innovation in enterprises, a well established technology transfer methodology and a step-by-step operative procedure enabling companies to develop and implement innovation projects. Assotech is a know-how brokerage company that supplies assistance to SMEs in the field of innovation.

Furthermore, the Regional Government of Lombardy, the Province of Milan and Milan Chamber of Commerce are jointly promoting grant programmes intended to supports biotech start-up companies and specifically academic and industrial spinoffs. They are also supporting the existing biotech companies to obtain European and international patents.

The Lombardy region has launched a specific funding programme (Metadistrict programmes) directed to biotech companies. The main goal is to support R&D activities and to strengthen the companies' co-operation for innovative joint projects.

The Lombardy region has also requested from the central government more competencies in a number of areas including research and innovation and universities. In the same vein, Lombardy has been able to come to an agreement with the central government for matched funding in R&D. The second agreement with MIUR, concluded in December 2010, guarantees EUR 59 million from the ministry, whereas the region has allocated EUR 61.5 million to R&D projects in 2011.

Universities are also mobilised to reinforce links and connect for example, in ICT where Lombardy has progress to make. While metadistricts are taking shape, their governance model is not well-structured and maintains an excessive focus on "traditional" high tech. Green energy and food are new sectors that are beginning to be supported by the region.

Tourism remains underdeveloped within universities and the regional government could consider incentives to mobilise universities for the development of this industry which is important for the local and regional economy.

The region has identified fields of activities – aeronautic, agriculture – for international co-operation and to target some countries (Canada, Vietnam, and Russia) for this purpose. Grants are available to researchers that can present projects (six so far) in these two fields.

The region lacks a strategy in a creative and cultural sector that include materials culture (fashion, design, textiles), production of contents, and historic and artistic heritage related activities. These industries not only account for a dominant share of the regional output but many of them have a strong brand which enjoy high international visibility. Higher education institutions play an important role to nurture these industries with new talents. For example, Lombardy has the majority of Italian graduates in design (63% of them from 1991 to 2005) thanks to a number of specialised schools and institutes (Santagata, 2009). The higher education sector could increase their participation in the development of these industries especially in terms of R&D. The regional government initiatives and programmes to stimulate the production of cultural goods remain *ad hoc* in nature and the contribution of the higher education sector is neither clearly identified nor supported. (Read more in Chapter 4.)

Loss of talent and difficulty to internationalise higher education

In Italy, the intensity of scientists and engineers (expressed as percentage of labour force) in 2005 was 3.1% (4.8 for the EU27 average). In the same year the percentage of graduates in science and engineering was 23%, (of the total number of graduates) at a significant distance from other large European countries such as France, Germany and UK.

In Lombardy, the percentage of the population employed in R&D is less than 0.6% of total employed population and on this measure, Lombardy ranks well below Ile de France, several regions in Germany, most of Sweden and Finland (all above 1.8% of the workforce). The low number of graduates with respect to the population size has a number of consequences for the regional innovation capacity. First, it limits both the possibilities of contacts between graduates and researchers as well as an active knowledge transfer between the public and the private sector. Second, university faculty are more focussed on their research role than on their mentoring role, thus creating a cycle where there is no continuity of relationships between mentors and graduates (Busa, 2003). Third, there are few high tech start-ups with highly technical and specialised teams. Several studies have found that

one of the most important indicators of firm survival rate is the presence of teams and entrepreneurs with advanced degrees (Colombo, Delmato and Grilli, 2002).

These detrimental effects mainly originate from the fact that universities in Lombardy and Italy are under-performing in innovation and are not sufficiently open to innovation. There are two features of the Italian higher education sector which might contribute to this: First, the average age of university professors in Italy is about ten years higher than in European countries which perform well in innovation. Second, the proportion of foreign students in the total number of students was around 2% in 2003 compared to over 10% in France, Germany and UK.

In Lombardy, the international attractiveness of universities is uneven. Some perform relatively well (Bocconi or Politecnico) but others are lagging behind. Only the AFAM (artistic and musical institutions) sector succeeds in enrolling significant numbers of foreign students (30.9% of them for the 2008-09 academic year), given the reputation of Italy and Lombardy in these fields. For other fields of knowledge, the success in attracting non Italian students can be attributed to a small number of institutions (see Table 3.4).

Table 3.4. English language provision in Italian and Lombardy universities

	Italian HEIs offering this degree	Degree courses or single units	Lombardy's universities providing these courses	Faculties
Laurea (1st cycle)	16*	12	Bergamo (6) Brescia (2) Bocconi (1) Cattolica (5)	Economics, Interfaculty
Laurea specialistica (2nd cycle)	21**	38	Bocconi (6) Cattolica (11) Politecnico (11)	Economics, Interfaculty Engineering, Architecture
Dottorato di Ricerca	24	189	U of Milan (4), Bocconi (4) Cattolica (5), Politecnico (31) Bicocca (1)	Political science, Economics, Sociology, Interfaculty, Engineering, Architecture
Master Universitario	34	106	Bocconi (10) Cattolica (2) Politecnico (3) Bicocca (1)	Economics Engineering

Source: ENDEAVOUR, "Entrepreneurial Development as a Vehicle to Promote European Higher Education", Erasmus Mundus programme on European Higher education on Entrepreneurship, EU, Brussels. Updated based on 2010/11 data.

At the same time, only a few immigrants are entering the university system in Lombardy. While resident foreign immigrants account for 14% of the 20-28 year-old population, their share of the total student population is considerably below 5.5%. The low number of immigrants in universities in Lombardy could reflect barriers to accessing higher education as immigrants and population with an immigrant background usually do not present the necessary secondary education qualifications that would ensure entry into the higher education system. In addition, the attrition rates for people with immigrant backgrounds may also be higher as they are often less prepared for higher education, because of insufficient mastering of the Italian language and difficulties stemming from their socio-economic condition. There is also a tendency within the migrant population for children to choose education tracks that will not bring them into university.

Research suggests that cultural diversity, such as that in Lombardy, can positively contribute to innovation. Highly skilled immigrants have also been found to have a positive correlation with patents generated in urban areas. For example, in the US, a one percentage point rise in the share of immigrant scientists and engineers in the workforce is associated with an increase in patenting by at least 41% (Hunt, 2008). In Canada, a positive and significant correlation has been found between ethnic diversity and innovative strength, though human capital and creativity indicators offers more robust explanations for innovative performance (Gertler *et al.*, 2002).

Finally, while Lombardy is characterised by a low skilled population compared to its major competitors internationally, it also suffers from brain drain. International mobility is a critical part of research career but Lombardy should make greater efforts to attract and retain talent. The cultural and creative industries in the region could be utilised to attract and retain international talent to Lombardy. There is a need not only to attract Italian top researchers from abroad but also to headhunt in a broader sense. The Fondazione Cariplo in Lombardy has taken the lead in talent attraction through its recruitment project (see Box 3.7), which aims to make the Lombardy research system more attractive at the international level.

Box 3.7. The recruitment project of the Fondazione Cariplo

The Recruitment Project, promoted and financed by the Fondazione Cariplo, is dedicated to the recruitment of foreign researchers operating in the sector of technological innovation with resources available amounting to approximately EUR 2.5 million annually. This initiative facilitates the creation of leading-edge scientific projects led by top international researchers who have access to high quality equipment and human resources.

By the second quarter of 2010, the initiative had invested approximately EUR 5 million and attracted around 20 foreign scientists who have been supported by 60 young researchers in a variety of regional research laboratories. The project aims to encourage internationalisation and exchange between laboratories, and increase and develop human resources, especially for younger people working in research. The projects, selected by public competition, are related to the sectors of bio-technologies and reparative medicine.

Many advanced European regions have embarked on active recruitment policies of highly profiled researchers and teachers in the international arena. One of the leading examples is ICREA (Catalan Institution for Research and Advanced Studies), which aims not only to attract, but also retain talent in Catalonia, (see Box 3.8.).

Box 3.8. The ICREA programme in Catalonia

ICREA (Catalan Institution for Research and Advanced Studies) is a foundation supported by the Catalan Government and guided by a Board of Trustees. ICREA is now part of Talència, an agency recently set up by the Catalan Ministry of Innovation, Universities, and Enterprise (DIUE), to bring together the various partners involved in supporting research. ICREA maintains its independent status within this agency. The purpose of ICREA is to promote scientific excellence by recruiting and retaining top researchers for the Catalan R&D system. It provides a new hiring formula that competes with other national research systems. ICREA is an institution without walls. Agreements have been signed with Catalan universities and research centres based in Catalonia.

ICREA calls are addressed to the international research community. Up to 20 permanent senior research positions are filled each year. Incorporating senior researchers capable of leading new research groups and setting new lines of research on the right track. Scientific excellence, international standards and leadership are required from ICREA researchers.

Box 3.8. The ICREA programme in Catalonia (continued)

The selection committees have appointed 255 researchers since 2001 from 2 525 applications (*i.e*. experts from outside the Catalan R&D systems).

In 2009, half of the researchers were working in Catalan universities: experimental sciences and mathematics (29%), humanities (10%), life sciences (30%), social sciences (9%) and technology (10%). ICREA researchers came from Spain (40%), USA (16%), Germany (10%), UK (10%), Italy and Netherlands (5%). Funds for ICREA related R&D projects amounted to EUR 33 million. These funds were obtained competitively from different Spanish agencies. EUR 20.8 million were channelled to those projects for which ICREA researchers were the manager or the leading researcher. ICREA activities resulted in 2009 in 1 098 publications, in 594 invited conferences and 87 doctoral theses. ICREA researchers also filed applications for 42 patents.

The ICREA Academia Programme aims at retaining and motivating top university professors by recognising excellence in research and leadership within the Catalan Public University System. It is addressed to university professors who conduct their research exclusively at a public Catalan university and who are active and expanding their research activity. Successful candidates gain a financial award based on criteria of scientific excellence. Funds are used to reduce teaching load or to support research. Some funds are available for the universities and they also receive a fee for their role in administering the programme. The funding period lasts five years.

Source: OECD (2010a), OECD Reviews of Higher Education in Regional and City Development: The Autonomous Region of Catalonia, Spain, OECD, Paris. *www.oecd.org/dataoecd/28/36/46826969.pdf.*

Underdeveloped university-industry relationships and SMEs

In Lombardy, the weakness of R&D (R&D investment accounts for only 1.14% of the regional GDP) can also be attributed to the limited capability of the private sector in absorbing university graduates. Italian and Lombardy's industrial associations have highlighted the need to enhance the production of highly-qualified human resources in S&T fields, but at the same time it is important to acknowledge the limited number of graduates hired by firms. In 2005, business enterprise R&D personnel per thousand employees in industry was 3.9 in Italy, 7.1 in the UK, 11.2 in Germany and 5.4 in Spain (Poti and Reale, 2009).

To enhance the employability of researchers in Italy and Lombardy, it is crucial to bridge the gap between public research and industrial agents. Scientific specialisation in Lombardy universities (expressed by publication in SCI journals) is compatible with the structure of government funding, but does not fit into business expenditure in R&D (BERD) and industrial specialisation in the region.

In Italy and Lombardy, the dialogue between higher education institutions and industry is unsatisfactory partly because of the large number of SMEs and their limited absorptive capacity of university knowledge. European Innovation Scoreboard (EIS) indicators show the poor performance of Italy in international comparison: the level of research co-operation between firms or between firms and research centres is estimated to be half the EU average, showing a persisting difficulty in Italian SMEs' activating the virtuous exchange processes for acquiring research results and "external" knowledge.

Because of asymmetry of information, variance in objectives and financial obstacles, co-operation between universities and local (small) business is often fairly sporadic and poorly developed. This is not only dependent on the absorption capacities of these firms but also on their inability to formulate their demand. SMEs have difficulties in predicting their long-term needs and may have insufficient resources to join research projects implemented by universities. They may also have inadequate information about the knowledge and expertise in universities. Moreover, while small firms are often in a greater need of co-operation, the degree of their interactions with universities is significantly lower than for large firms[6]. Small firms often find it easier to work with technological universities. However, the Politecnico di Milano does not seem to be considerably stronger in making its expertise visible than traditional research universities. Creating a demand-pull in small and medium-sized enterprises could help increase university-industry collaboration.

The Regional Government of Lombardy has experimented with innovation vouchers to create a demand pull for RDI in the Lombardy SME sector. While there has not been a thorough evaluation of this initiative, so far the impacts on university-industry collaboration remain limited. (See Box 3.9.)

Box 3.9. Innovation voucher

In 2004, the Lombardy region introduced innovation vouchers in order to: *i)* support SMEs to strengthen their innovative capacity, *ii)* promote university-business interaction by matching supply and demand of innovation and *iii)* streamline the administrative procedures for financing innovation in SMEs.

Type	Company		Individuals		No.	KEUR
	No.	Public Co-financing (%)	No.	Public Co-financing (%)		
International patenting	7 000	100			53	363
National patenting	3 000	100			44	132
Business evaluation	7 500	75	10 000	100	6	45
Technology Due Diligence	3 750	75	5 000	100	244	1 129
Technical-scientific research	9 500	50			19	181
TOTAL					**366**	**1 850**

Technology Due Diligence vouchers have had the greatest demand (244); beneficiaries have also been interested in patenting vouchers (97), while there have been fewer applications for technical-scientific research and business evaluation vouchers (19 and 6, respectively), possibly due to the requirements for a large scale projects and a high share of co-financing.

Technology Due Diligence and technical-scientific research vouchers were designed to enhance effective collaboration, while the other kinds of vouchers were subsidies. Financial contribution was limited and in many cases had a substitution effect on private resources. Vouchers have helped to understand technological opportunities available in technological partners, thus strengthening local dynamics between the actors of the regional innovation system.

Positive impacts of the vouchers include the increased likelihood of firms to co-operate with the knowledge partners. Vouchers increased private spending in innovation: in 50% of the cases, follow-up projects or new projects were commissioned using private resources. At the same time, however, SMEs were more willing to strengthen existing collaborations than to explore new service providers. Furthermore, vouchers were more often used to collaborate with Knowledge Intensive Business Services (KIBS), than universities or public research organizations.

Source: IReR (2010), The Lombardy region, Italy: Self Evaluation Report, OECD Reviews of Higher Education in Regional and City Development, Lombardy, Italy. *www.oecd.org/dataoecd/14/1/45797705.pdf.*

The Lombardy innovation vouchers are similar to the Dutch Knowledge Vouchers to SMEs (see Box 3.10), which deserve attention due to their strong emphasis on knowledge transfer from higher education institutions. According to a study (Cornet, 2006) eight out of ten projects would not have been conducted without the voucher. Furthermore, the voucher stimulated new links between firms and research institutions.

Box 3.10. Knowledge Voucher Programme in the Netherlands

The aim of the Knowledge Voucher Programme is to encourage knowledge transfer from knowledge institutes, such as universities and universities of applied sciences, to small and medium-sized enterprises (SMEs) and to help SMEs to access and use the knowledge produced by knowledge institutes for the development of new products, processes and services. SMEs can use innovation vouchers to commission knowledge institutes to address appropriate research issues.

Vouchers are available in two sizes: small and large. A small voucher is worth EUR 2 500 and a large voucher is worth up to EUR 7 500. To use a large voucher, an SME must make a contribution of at least one third of the total project cost; the government will then contribute up to EUR 5 000.

Vouchers are available for two types of projects: knowledge transfer projects and patent applications. Large knowledge transfer vouchers may be bundled: up to ten enterprises may collectively use vouchers which have been awarded to them individually to cover the cost of a major knowledge transfer project.

Vouchers may be used for projects involving the transfer of knowledge from public knowledge institutes and various private knowledge institutes. A knowledge transfer project involves the transfer of new knowledge to the receiving SME to modernise a product, production process or service. All projects must benefit the Dutch economy. No individual enterprise is entitled to receive more than one small voucher for a knowledge transfer project at any time and more than one large voucher per year. The bundling of patent application vouchers is not permitted.

A study of the innovation voucher showed that eight out of ten projects would not have been conducted without the voucher, and that the voucher had stimulated new links between firms and research institutions (Cornet, 2006).

Source: Agentschap NL, Ministry of the Dutch Ministry of the Economy.

Some intermediary organisations in Lombardy, such as Assolombarda have taken steps to better connect firms and public research. Assolombarda is the largest industry association with 6 100 member firms in the region. It promotes quality of education, training and university/industry partnerships. It influences the design of and updating of academic programmes through contact teams, develop experimentation (contract of high-skilled apprenticeship for MA and PhD students), collaborates with university placement offices and is involved in boosting the appeal of hard sciences through the "Scientific Degrees" project. A number of intermediary organisations have also made considerable efforts to bridge the gap between firms and research in the field of biotechnology. (See Box 3.6.)

Despite some important achievements in university-industry collaboration, stronger efforts are needed to improve the employability of graduates, increase the percentage of knowledge workers and enhance the international appeal of Milan and Lombardy as locations of higher education and research. Developing university-industry partnerships in applied research through joint (higher education/private sector) projects is also an issue. Finally, a better monitoring of student internships is required in order to increase the awareness of their usefulness among firms and to ensure a quality experience for students.

Science and technology parks and the university/industry interface

Lombardy has established a number of science and technology parks to address the shortcomings of the regional innovation system. The parks bring together companies, venture capitalists, universities, laboratories and research centres, with the aim of fostering the culture of innovation, increasing the competitiveness of private companies and creating a fertile and collaborative working environment. In the 1990s, a national programme extended the creation of technology parks to the whole nation, favouring the less developed areas. According to RIDITT, 44 science and technology parks are currently in operation in Italy, 6 of them are located in Lombardy (see Table 3.5).

In Lombardy, the parks have different functions and characteristics. The parks in Bergamo aims at modernising the local industries and struggling against lock in processes. They are relatively diversified and host a number of intermediary organisations. The two parks – Servitech and Kilometro Rosso – help build bridges and appear as vehicles for co-operative projects. Connections have been notably established with the University of Bergamo's centre of management of innovation and technology transfer (GITT). The size of the two parks is relatively modest, even if 500 engineers are employed at Kilometro Rosso. Initiatives of co-operation with Bergamo

university have also remained limited and SMEs engagement modest (*e.g.* an investment of EUR 1.5 million in R&D within the framework of INTELLIMECH: a consortium on mechatronics research).

While research literature has not demonstrated that the networking opportunities offered by science parks significantly promote innovation in SMEs,[7] for Biotech, the involvement has been more important. Science and Technology Parks traditionally play an important role in supporting biotech companies in Italy and they account for 30% of the company locations. In Lombardy, the San Raffaele Biomedical Science Park is one of the largest Biomedical and Biotechnology parks in Europe. The park hosts the University Vita-Salute as well as pharmaceutical, diagnostic and biotech companies and start-ups. These companies have the possibility to co-operate with the scientists and utilise the high tech facilities of the San Raffaele Scientific Institute (500 researchers) also located in the park. The Polo Dulbecco is another research hub – named after the Nobel prize-winner Renato Dulbecco – that operates in pharmacogenomics and stem cells research. It hosts the biomolecular centre of excellence of the University of Milan (CISI), research units of the Multimedia institute, a private industrial group, three institutes of the national research Council and an incubator. It provides advanced technological platforms for biotech companies.

Table 3.5. Science parks in Lombardy

	Number of firms and organisations	Research themes
Como Next, Como (2007)	Como Chamber of Commerce, Politecnico di Milano Foundation	Construction, environment, energy technology transfer
Kilometro Rosso, Bergamo (2003)	20 firms, University of Bergamo	Aerospace, agrofood, biotech, design, microelectronics, energy, pharmaceuticals, ICT, nanotech transport, telecom
Parco Technologico Padano, Lodi (1999)	12 firms, University of Milan	Agrofood, environment, biotech, pharmaceuticasl; diagnostics, R&S, life-sciences, services, technology transfer
Science Park RAF Milano (1992)	Research centres +2, start-ups, San Raffaele University	Biotech, Biomedical, Technology Transfer
Polo technologico Milano-Bicocca	University of Milan-Bicocca	Technology Transfer
Servitec Bergamo (1996)	23 firms and 4 organisations (Province of Bergamo, Bergamo Chamber of Commerce, Municipality of Damine University of Bergamo)	Agrofood, biotech, manufacturing, electronics, ICT, energy, metallurgy, nanotech, materials

Source: Adapted from IReR (2010), The Region of Lombardy, Italy: Self Evaluation Report, OECD Reviews of Higher Education in Regional and City Development, Lombardy, Italy.

The Parco Tecnologico Padano (PTP) plays a pivotal role in the agro-food sector. The park is closely linked to the University of Milan and is an incubator for start-ups and spin-offs, offering know-how, facilities and services and links with Assobiotech. Regional cattle breeder association and some agro-food business organisations are located in PTP. The park is also home to an agri-food research centre (*Centro Ricerche e Studi Agroalimentari*, Cersa).

Despite the progress made, there is a need to support interaction between industry and universities through science parks that can have a crucial role to play in that context, particularly as in recent years, some publicly financed technology transfer intermediary organisations (*e.g.* Polo Scientifico Technologico Lombardo) have closed down. In Lombardy, science parks' co-ordinating function needs also to be enhanced. This can usually be achieved optimally through a coherent institutional approach (see an example in Box 3.12).

A useful example here is the case of Barcelona's Science Park which has become the basis for a network of science parks across Catalonia. The situation in this region is similar to Lombardy. Although there is a strong internationalised backbone to the region's manufacturing economy, there are many underperforming and non-innovative small and medium-sized enterprises. Spain has undergone a long-term process of devolution and since the 1990s, Catalonia has sought to make the best use of its new powers around science, technology and innovation to improve its innovation performance. While this has led to the proliferation of the innovation players, the regional government has recently engaged in the rationalisation of the system. The central issue for Catalonia has been using the universities effectively to stimulate innovation, negotiating between the higher education sector and the resistant SME sector and investing versus pump priming, (see Box 3.11.).

Box 3.11. Network of Science and technology parks in Catalonia (Spain)

Co-ordinating and spreading best practices in XPCAT (*Xarxa de Parcs Científics Ii technològics de Catalunya*),

The origins of the Barcelona Science Park (Parc Científic de Barcelona, PCB) lie in a collaboration agreement in 1999 between the University of Barcelona and a bioincubator sponsored by a Catalan government agency, the Centre for Business Development and Innovation (CIDEM). The idea for collaboration was to stimulate the University of Barcelona's third mission to create an "extended development periphery" outside the university, which would also orient individual university researchers and teachers more closely to the needs of universities. In doing this the Catalan government sought to assert its technological superiority in the Spanish innovation system and position Catalonia to compete more effectively for a larger share of European funding.

PCB is underpinned by four pillars which in turn provide the institutional space within which innovation and knowledge commercialisation take place. These four pillars are:

- Anchor tenants: a number of public and private research laboratories ensure that the project has financial sustainability. They also increase the attractiveness of the parks to other clients.
- Collaboration. Although the park was the private initiative of the university, its realisation was delivered through close collaboration between anchor tenants, the regional government, an investment bank and a regional foundation. The PCB Foundation has been set up to ensure that the wishes of the private sector remain important within the governance process of the PCB.
- Providing innovation services for business to bring them into the science domain (both research services but also incubation). This has been important to create the physical spaces where collaboration around innovation takes place and prevents the physical development from losing its innovation character, becoming a high technology business park rather than a place where innovative ideas are exploited commercially.
- Linkages with the Catalan "Research and Innovation Plan 2005-2008" and 2009-13. Although the idea originally aimed to accelerate the University of Barcelona's technology transfer beyond the outputs achievable by a technology transfer office, the idea was picked up eagerly by regional actors. The University allowed others to share in its good ideas and consequently the PCB model has been extended as a way of articulating how the region's universities will contribute to raising the region's innovative performances.

Source: OECD (2009), *Review of Regional Innovation: Piedmont*, OECD, Paris; OECD (2010), *OECD Reviews of Higher Education in Regional and City Development: The Autonomous Region of Catalonia, Spain*, OECD, Paris, *www.oecd.org/dataoecd/28/36/46826969.pdf*

TTOs and commercialisation of research results

The conversion of Italian universities to entrepreneurship has been gradual over the end of the 1990s[8] and the 2000s and has accelerated in the recent period. Most Italian and Lombardy universities have Technology Transfer Offices (TTO) and have developed efforts to valorise their R&D potential. The TTO functions include: intellectual property rights management (83% of TTOs), spin off creation (80.9%) and by the management of collaborations with industry (57.4%).

TTOs are sometimes linked with incubators and can be responsible for their management. In that case they have a role to play in linking students in entrepreneurship courses with business applications. This emphasis varies depending on the universities concerned. This linkage seems relatively weak in a number of TTOS in Lombardy and could be further developed. The Catalonia example deserves attention in this respect if TTOs rates of return are to be enhanced, (see Box 3.12.).

Box 3.12. INNOVA programme in Catalonia

An example of good practice can be found in the Polytechnic University of Catalonia INNOVA programme which is open to all students, staff and alumni within the university. This entrepreneurial programme offers the above potential entrepreneurs more amenities than a standard entrepreneurial incubator.

INNOVA programme is designed and run through a support centre, aimed at enhancing the development and creation of entrepreneurial technology based firms. The programme takes the entrepreneurs through a number of various stages of the entrepreneurial process, for example, starting with initial workshops, seminars and lectures to providing them with fully furnished office space, right through to giving support and advice on financing, licensing and so forth. The INNOVA programme offers a wide range of services to develop and define evaluation policies for technology and innovation, to identify technological opportunities, to assess intellectual property rights and research in general, to support the creation and expansion of enterprises and to prove training in research management, technology transfer and the creation and expansion of enterprises.

Box 3.12. INNOVA programme in Catalonia (continued)

Between 2006 and 2008, the INNOVA programme assessed over 430 projects and created 66 technological enterprises that are successfully trading today (www.pinnova.upc.es and European Commission, 2008). Since 1999, over 1 700 new jobs were created, from which 96% required high qualifications: 80% of entrepreneurs hold a university degree, 10% hold a doctoral degree and 6% are university professors.

Source: ENDEAVOUR, "Entrepreneurial Development as a Vehicle to Promote European Higher Education", Erasmus Mundus programme on European Higher education on Entrepreneurship, EU, Brussels; OECD (2010), OECD *Review of Higher Education in Regional and City Development The Autonomous Region of Catalonia, Spain*, OECD, Paris, *www.oecd.org/dataoecd/28/36/46826969.pdf.*

In Lombardy, the management of the patents portfolio remains a priority task for TTO. The university portfolios have increased at a steady average pace of 26% per year in Italy with the number of patenting universities doubling between 2002 and 2007[9]. The leading five universities in Italy account for nearly half of the total portfolio (46%). Lombardy takes the lion's share of Italian patents, nearly a quarter with Politecnico di Milano in the lead (about 17% of the country total in 2007).

Lombardy has taken steps to improve the commercialisation and transfer of university R&D results; however, there is still much scope for improvement. The number of patents relative to population size places Lombardy at the end of the list of top performers in Europe (*i.e*. regions between 100 and 300 and above 300)[10]. Hence, while the research contribution to the regional innovation capacity is good, there is much scope for knowledge exchange and diffusion. The low number of licenses on public patents is also a challenge although they have grown at a fast rate in the recent period but from very low base.

Spinoff is a second route for higher education knowledge dissemination. The number of spinoffs in Italy in 2007 was 364 with 192 shared by universities. In Lombardy, the number for the same year was 51 with 38 of them shared with universities (19.8% of Italy).Therefore, in Lombardy, the ratio of spin off creation for a thousand professors is lower than the national average (3 against 5.8) (Netval, 2009). Furthermore, few of these spin offs have a business plan, implement R&D and create jobs in significant numbers (IReR, 2010). For example, only 54 people were employed in the 17 spinoffs generated by the research of Politecnico di Milano and revenue from these companies did not exceed EUR 7 million at the end of 2007.

Improving the spinoff performance is an important challenge for the incubation framework system and for the TTOs management.

Research agreements between university and industry provide other opportunities for the exploitation of public research. They are also a strong tool for fostering innovation. These agreements are not easy to establish because university and industry operate in different work cultures, use different terminology and pursue different objectives. On the one hand, universities want to establish a prestigious reputation for their research activities, acquire financial awards to reward researchers and possibilities to continue the research in the same field after the contract expires. They also expect free of charge use of results, possibilities to publish and have a preference for long term relationships instead of sporadic collaborations. On the other hand, firms want complete ownership of the process and production knowledge, unlimited freedom of operation, co-ownership of IPR and the right to pursuit the legal defence in case of patent infringement. Confidentiality of trade secrets and delay in public disclosure of scientific results to allow patent filing are also crucial for business. For example, two-thirds of patents in the Politecnico di Milano are patents with secrecy agreements and option rights negotiated with firms (Valentini, 2010).

With the exception of the Politecnico di Milano, most university TTOs in Lombardy are not very active in providing services for firms (352 consulting case in 2009). Politecnico is also in the lead for technology transfer agreements (31 signed in 2009)[11].

University collaboration

Collaborative efforts between the universities to reach out to industry remain limited in Lombardy. The UNIVERSITAS (*Università e Impresa per Valorizzare Esperienze e Risultat i scientifici per Innovare e Transfere Attivita e Saperi*) is a project that brings together four universities: the Politecnico di Milano, the University of Milan, Bocconi University and the University of Calabria. This co-operation aims at sharing knowledge and training, developing joint projects, identifying new models of organisation for TTOs and supporting local and national capacities for innovation. Despite good intentions, UNIVERSITAS has so far remained a relatively weak framework for co-operation and its governance could be improved.

The U4NE collaboration in UK (see Box 3.13.) is an example that Lombardy could examine in forging stronger university collaboration. (In 2011, as a result of the economic crisis and a government change, regional development agencies were dismantled of their responsibilities and resources. This also meant the end of the regional higher education associations, such as the U4NE.).

Box 3.13. U4NE in the North East of England

One example of where a project has developed into a collective regional voice for universities participating in debates around the contribution to systemic regional innovation can be seen in the case of the North East of England. 25 years ago, a minor ERDF funded project was set up providing consultant with the resources to help firms' access university knowledge, at a time when such move was considered potentially controversial. This office was known as Higher Education Support for Industry in the North (HESIN). The project won funding from the Research Council to develop a post experience manufacturing Masters degree jointly awarded between the region's five universities (none of which at that time offered an MBA programme).

In 1995, a further development occurred when the regional prefecture encouraged that the five universities to draft a common bid for European funding. HESIN provided a means to co-ordinate between the regional institutions and a senior manager from each institution was appointed to the executive committee. In 1996, one of the ERDF-funded project involved further collective action between the universities. Knowledge House was established as a brokerage and single contact point where SMEs could bring technical questions and, subject to them passing a suitability test, Knowledge House would guarantee a response from the university.

In 1999, regional development agencies were established in the English regions. In discussions mediated through HESIN, the universities in the North East of England decided they needed a common voice for the universities. HESIN was reconstituted as "Universities the North East (U4NE)", with its executive Committee formed from the Vice Chancellors of the five regional universities. The involvement of senior managers has allowed U4NE to conclude agreements with third parties. This has cemented U4NE's position within the North Eastern RIS.

U4NE involved itself in the drafting of the first Regional Economic Strategy, writing the chapter which became B4, "Putting universities at the heart of the North East economy". From that point, U4NE established itself as a key strategic actor, participating in consultations and strategic reviews, representing the views of its institutions and allowing actors to work strategically with higher education. U4NE operated through a series of committees which draw together the managers in the five universities responsible for particular areas. There was a mix of mission based committees (research, teaching, engagement) and thematic committees (culture, widening participation in higher education).

Source: OECD (2009), Reviews of regional innovation: Piedmont, OECD Paris; OECD (2010b), OECD Review of Higher Education in Regional and City Development, The State of Victoria, Australia, OECD, Paris. *www.oecd.org/dataoecd/54/14/46643288.pdf.*

One of the successful initiatives of the U4NE was the Knowledge House which was based on close collaboration between five universities in the North East of England and addresses the needs of industry, particularly local SMEs (see Box 3.14.).

Box 3.14. Knowledge House: a collaborative network to support SMEs

Established in mid-1990s, Knowledge House is a joint effort of the five universities in the North East of England (Durham, Newcastle, Northumbria, Sunderland and Teesside) along with the Open University in the North through universities' regional association, i.e. the Universities for the North East (Unis4NE). It helps companies access university skills, expertise and specialist resources. It offers expert solutions for developing ideas and solving problems through collaboration, consultancy, training and research. Knowledge House has a central headquarters and staff are placed at partner sites of different universities. The network and its operations are supported by a web-based enquiry handling/project management and client relationship management system.

The idea behind the Knowledge House was that small and medium-sized enterprises (SMEs) face a range of barriers in accessing the knowledge resources of the universities which discouraged regional university/SME collaboration. Knowledge House was created specifically to overcome these barriers and to increase the amount of technology transfer taking place between local firms and universities. The purpose of the scheme was to create a structure which suited SMEs looking for help with a particular technical problem. The first barrier an SME faces in contacting a university in search of help is the lack of knowledge of whom to contact. Therefore, Knowledge House offered the benefits of a single point of contact for all universities in the region.

Knowledge House can be accessed via a central node, based at a Regional Technology Centre, or any of the five university nodes. The initial enquiry would then be sent out to contact people at each of the five regional universities, inviting them to suggest academics that could address the identified need. Each university has a co-ordinator responsible for ensuring that the leads are disseminated to the correct contacts. Ideally Knowledge House will be able to offer the SME a choice of academic consultants and will facilitate a meeting for the firm's managers to meet with and select the most appropriate person for their needs.

Box 3.14. Knowledge House: a collaborative network to support SMEs (continued)

Knowledge House generated an income in excess of GBP 13 million for its universities from over 1 300 projects since 1996, with GBP 7.6 million of this coming in the last four years. Knowledge House's profile has risen significantly over time, with more than half (60%) of all enquiries generated since 2003. In 2007, Knowledge House generated GBP 4.7 million for the participating universities by delivering 364 completed projects from over 800 business enquiries. Business growth averaged 25% since 2000. Knowledge House operations were dispersed to individual universities in 2011 as a result of dismantling of the RDAs in the UK.

In contrast to networks that provide only signposting services, Knowledge House offered a comprehensive service, stretching from the receipt and circulation of enquiries through project management and delivery to post-completion evaluation. It also played its part in the integration and consolidation of the business support services in the North East through formal agreements and joint appointments with other non-university business support agencies such as the Business Links Service and the Regional Development Agency. Knowledge House helped facilitate a cultural change within the academia, since an increasing number of higher education staff across the region's universities were becoming engaged with Knowledge House activities.

Source: OECD (2007), Higher Education and Regions: Globally Competitive, Locally Engaged, OECD, Paris; Potts, G. (1998), "The HESIN Knowledge House: A Front Door to North East Universities" Local Economy, Vol. 13, No.3, Routledge, London, pp.267-271.

Designing technology transfer for an SME-based economy

The typical model for innovation and technology transfer is linear. University Technology Transfer Office (TTO) initiates science-based innovations, which are then developed into start-ups and sold as intellectual property. The emphasis in this model is on an individual start-up company rather than an industry. In addition, particular types of innovations are favoured (particular bio-tech) because of the speed with which they can be brought to the intellectual property market and the substantial profit for investors. The favoured areas of innovation are frequently not connected to any regional industry and hence, do not contribute to increasing the knowledge intensity or innovation capacity in the regional industrial base.

The linear TTO model of innovation can be compared with a very different model oriented toward increasing the productivity and competitiveness of industries already located in a region. This industry-centred model is exemplified in the relationship between the local chemical industry and the University Rovira i Virgili (URV) in the region of Catalonia, Spain (see Box 3.15). This model has a strong emphasis on increasing the productivity and innovative capacity of local industry firms, both large and small. It also emphasises the development of human capital resources that can bring new ideas and business practices to local firms. The human capital resources are developed at every level, from the technical operative workforce to executive management.

Box 3.15.URV: a model of university industry–region collaboration

The University of Rovira i Virgili established a long-term co-operative relationship with the chemical industry in Catalonia that incorporates both research and human capital development programmes that are relevant to the industry needs. Faculty are allowed to spend time working in local firms during their leaves and have on-going relationships with the firms. There are strong alumni connections and students participate in internships and co-operative programmes within the local firms. Both advanced technical vocational skills and higher degree based skills such as in engineering are designed in cooperation with the local industry representatives. To better serve the SMEs, a public sector intermediary is being developed along the lines of those operating through regional development agencies in the UK. Most important to the success of this integrated initiative is the strong support from the university leadership, including the Rector.

Source: OECD (2010), *Higher Education in Regional and City Development: Catalonia, Spain*, OECD, Paris, *www.oecd.org/dataoecd/28/36/46826969.pdf*

This Rovira i Virgili model, built around increasing productivity and building new markets for existing industry agglomerations would seem to be particularly suited to Lombardy.[12] Some of this programmatic orientation is already present in TTO programmes, particularly in the Politecnico di Milano.

The limited success of the linear TTO efforts to promote knowledge-based industries in the regions in which they are located suggests that Lombardy universities should take a different, more regionally-focused approach, building on the comparative advantage of the region's strong industrial institutions. Higher education institutions could develop ways to introduce new technologies that could be generalised across companies in an industry, through the mechanism of trade associations. This alternative

industrial approach is already demonstrated in programmes with agricultural producers and in a project being initiated in the Politecnico di Milano in industrial design. Those higher education institutions with pre-existing industry connections, such as the University of Milan-Biccoca and the University of Bergamo have some initial advantages in developing innovation programmes oriented toward increasing productivity in the regional industry base.

A valuable model is being developed by the University of Bergamo to work directly with regional SMEs to improve their innovative potential and the productivity of their human resources. The SME relationship with the university provides not only a client for educational and training services but also a continuing connection to potential high tech firms in science-intensive fields such as materials science.

International experience shows that while university technology transfer models may lead to saleable intellectual property and start-ups, they seldom produce enterprises that grow in the region and contribute to regional economic development. The creation of localised supply networks is therefore critical to the process through which innovation is transferred to enterprises enabling the creation of new innovation that transforms and upgrades existing industries. A well functioning regional knowledge transfer model is based on an ongoing relationship between the university and industry to determine what innovations have the best opportunities for adoption and commercialisation, creating an industry-university learning environment. It supports the human capital development required to adopt and apply process and product innovations and works with SMEs as well as large corporations. It measures success in terms of the sustainability and transformation of regional industry and employment growth. University entrepreneurship programmes should therefore also support the existing industries and SMEs.

Finance for innovation and venture capital

Successful innovation processes require a good availability of venture capital and a start-up friendly environment. In Italy, the picture is not so favourable but improving. At 0.2% of the GDP, early stage venture capital is nearly ten times less than the average EU 15 level. It is, nevertheless, constantly growing. According to AIFI, the Italian Private Equity and Venture Capital Association, during the first six months of 2009, early stage investments grew by 7% in terms of volumes invested to a total of EUR 56 million and 46 deals closed (+15%).

In Lombardy, Finlombarda, a financial company provides assistance to the regional administration by developing public-private partnership

investment models and using innovating financing tools such as project financing and private equity. Finlombarda Gestioni SGR promotes venture capital and private equity funds and manages the NEXT fund. This fund is a closed-ended fund of funds, a collective investment scheme with a limited number of shares, subscribed by institutional investors. NEXT can invest directly in companies, in partnerships with other investors, and also indirectly by investing in other closed-ended venture capital funds. The direct investments of NEXT focus on start-up or early stage SMEs in Lombardy in innovative and technological sectors. Next has invested in 43 companies. To support early stage business development, the Lombardy region also created a seed fund in 2008.[13]

Another important point of entry for investors in Lombardy is represented by the numerous associations and agencies that work to support economic development through innovation. In particular, the Business Angels Association (IBAN) as well as AIFI are very active bodies.

Despite the progress made, financial instruments appropriate for research and innovation activities, such as venture capital, are still not fully utilised Lombardy compared to the leading innovative regions. While, AIFI data and reports on venture capital show that Lombardy ranked first in the number of venture capital in the north west of Italy (see Table 3.6), the level of seed funding is still low. Only EUR 2 million has been invested in 15 projects by the NEXT fund. Indirect investments are more substantial (EUR 18 million) but a large share of them is going to other venture capital funds that finance innovative projects outside the region or even outside the country. In fact, Lombardy and Italian venture capital in general find it less risky to invest abroad where labour markets are more flexible.

Table 3.6. Number of venture capital deals

Lombardy and neighbouring regions

Years	1998	1999	2000	2001	2002	2003	2004	2005	2006 1st	Total
Lombardy	54	66	157	79	74	76	55	83	35	679
Emilia-R	34	31	47	36	41	48	15	37	16	305
Piedmont	13	23	24	16	14	22	27	11	9	159
Tuscany	12	18	16	20	11	9	11	18	20	124
Italy	269	390	648	489	301	286	206	234	112	2 933

Source: ERAWATCH (2007), *Analysis of the Regional Dimensions of Investment in Research. Case Study Regional report Emilia-Romagna (Italy)*. Gagliardi D., A. Mina. and P. Conningham, PREST, Manchester Institute of Innovation Research.

Conclusions and recommendations

Lombardy's position as the leading region in Italy for innovation and the knowledge economy is so far not challenged. The region continues to be one of the largest and most successful in Italy, representing over one fifth of the whole national economy. Italian R&D activity remains concentrated in Lombardy with 16% of the universities of the country, 15% of its students and 22.2% of its researchers. Employment in high tech manufacturing is significantly higher than in the rest of country and the region has a leading position also in terms of innovation expenditures per employed and for labour productivity.

Despite the success in the national context, there is considerable scope for improvement in Lombardy's international positioning. The population of science and engineering graduates is lower than in the neighbouring regions in relative terms, R&D has grown moderately since the early 2000s and the region has not yet completed its transformation from a traditional district based economy into a high tech oriented manufacturing and service economy. The World Knowledge Competitiveness Index ranks Lombardy 96th in 2008 among 145 most advanced regions in the world, 14 places down from 2005 (WKCI, 2008)[14].

In this context, Lombardy needs more than ever to maintain and build on its comparative advantages. The Milan region has built a series of strong positions based on dynamic exchanges with European partners such as France and Germany. It contains 40% of FDI inflows coming to Italy (although this should not be overemphasised given that Italy receives much weaker amount of FDI than its main European competitors). Milan can

capitalise on its industrial district heritage in different ways, *i)* it can promote the synergies in the value, *e.g.* in the Brianza furniture district, between furniture, textile and mechanical industries; *ii)* it can focus on high value-added products while outsourcing low-value added ones to emerging economies *e.g.* in the metal industry district; and *iii)* it can locally embed large companies in districts *e.g.* in electric, electronic and medical equipment districts that are distributed across the provinces of Bergamo, Lecco, Lodi and Milan. Lombardy is also particularly strong in concept-oriented activities and should be in a position to expand the turnover and a number of small firms specialised in advanced functions and high level services such as design.

The role of higher education is crucial in exploiting the regional innovation capacities and to facilitate new technology intake by firms. First, higher education institutions can offer courses adjusted to industry needs and customised skills on the labour market in Lombardy. Second, universities need to better tailor their engineering and business courses for regional needs. Inspiration could be taken from a number of experiments that are ongoing in Europe such as ARTEM in Nancy (France) and in Aalto University in Helsinki (Finland) with a view to institutionalise interdisciplinary thinking for innovation in the knowledge economy. Third, participation rate in higher education need to be improved and the dropout rates reduced. The Lombardy economy needs a diverse and supplementary influx of skills. The employment rate is still low after the crisis and brain drain could be mitigated to assist the globalisation of the regional economy. Fourth, entrepreneurial sector in Milan and Lombardy is in the state of change. In the future, entrepreneurs will be faced with increasingly complex problems, innovation management issues and precarious careers. Higher education institutions need to play a more active role in upgrading the skills of entrepreneurs and preparing new entrepreneurs for the market.

The OECD review team recommends that the following measures are taken to promote regional innovation Lombardy.

Recommendations for the national government

- *Incentivise universities to consolidate and professionalise their technology transfer offices (TTO).* It is important that TTOs operate within the framework of broadly defined strategies. Their role should not be reduced to a narrow interpretation of technology transfer but they could develop a "forum function" for SMEs and act as brokers or animators of high tech clusters. Ministries of education can help to promote such a strategic shift by sponsoring debates, reviews and reports on these issues.

Recommendations for the regional government

- *Foster a stronger alignment of education programmes with the regional needs.* In addition to elevating the technological level of districts and accelerating the transition towards meta-districts for several high tech sectors, focus should also be on the labour-intensive sectors. The Regional Development Plan should prioritise technologies and innovation in the field of the tourism, distribution, transport and green industries. Subsequently, there is a need to increase the grants for R&D programmes developed by universities in these sectors, which so far have received limited attention. The regional sustainability plan should be strengthened and better articulated, and the budget for university R&D clearly earmarked in those segments.

- *Take steps to enhance the contribution of universities and other tertiary education institutions to the full exploitation of the region's comparative advantages, such as design.* Lombardy design sector's competitiveness is internationally recognised. Public policies need to establish a better regulatory environment for the fashion and design clusters and more generally for the creative industries. There is also a need to promote and sell abroad design training. Ministries and departments of education at different government levels should promote the establishment of a consortium of Lombardy's tertiary education institutions to launch collaborative programmes on the international education market using the extensive knowledge and experiences accumulated in Lombardy.

- *Expand partnerships with neighbouring Italian regions in fields of interest for the higher education sector.* This is an area that has been relatively overlooked by the regional authorities. This co-operation should be furthered in order to *i*) ensure a co-ordinated development of regional networks for industrial research and of research clusters of excellence; *ii*) promote exchange of methodologies, instruments and strategies for project evaluation; and *iii*) share modalities which enable to compare initiatives of technology transfer and venture capital programmes. Joint R&D programmes should be initiated. This development could be facilitated by the delegation of powers to the region in the innovation domain. Envisaged budget cuts by the central government for education and research will risk interregional initiatives.

Recommendations for higher education institutions

- *Develop regional knowledge transfer model that is based on an ongoing relationship with industry*: while the university technology transfer models may lead to saleable intellectual property and start-ups, they seldom produce enterprises that grow in the region and contribute to regional economic

development. Lombardy's localised supply networks are therefore critical to the process through which innovation is transferred to enterprises, and to create new innovation and transform and upgrade existing industries. The development of a well-functioning regional knowledge transfer model requires ongoing relationship with industry to determine what innovations have the best opportunities for adoption and commercialisation, and the creation of an industry-university learning environment. It requires support for the human capital development required to adopt and apply process and product innovations, and collaboration with SMEs as well as large corporations. It measures success in terms of the sustainability and transformation of regional industry and employment growth.

- *Engage more actively in the diffusion of best practice in entrepreneurship support and education.* Given the increasingly strong competition on the international market, universities need to develop a capacity to train a new generation of entrepreneurs with upgraded skills to support the development of industrial districts and high tech firms. Ministries of education at the national and regional levels could initiate programmes to train the trainers, and mobilise university staff and technology transfer offices for the supply of entrepreneurship teaching packages.

- *Foster best practices from the international higher education system to boost comprehensive internationalisation policy in collaboration with regional stakeholders.* This would include not only exchange of students and staff, but also global international and intercultural dimension in universities' teaching, research and public services, as well as efforts to help attract talent and foreign direct investment in the region, and link local companies with global networks.

Notes

1. The list includes: the University of Amsterdam, University of Cambridge, University of Edinburgh, Albert Ludwig University of Freiburg, the University of Geneva, Ruprecht Karls University of Heidelberg, the University of Helsinki, Leiden, the Catholic University of Leuven, University College London, Lunds University, Ludwigs Maximilian University of Munich, Oxford, Université Pierre et Marie Curie (Paris 6) and Université Paris-Sud 11, Karolinska Institut (Stockholm), Louis Pasteur (Strasbourg) and Utrecht and Zürich universities.

2. Bocconi university's graduate business school, the SDA Bocconi School of Management, is ranked 17th by the Financial Times 2010 European Business school rankings. Bocconi University's research infrastructure consists of 19 research centres. According to RePEc (Research Papers in Economics), which ranks economists and institutions according to scientific productivity and impact factor, the research centre at Bocconi, IGIER (Innocenzo Gasparini Institute for Economic Research) was ranked top Italian research department in economics since 2008 and the only Italian institution listed in the top 100.

3. The high number of R&D employers in Lazio is due to a large number of national research institutions.

4. Bocconi has a considerable publication record (581 outputs in 2010, of which 242 in the "A" and "A+" level (established using the average of the ISI Impact Factors (IF) of the last three years. 65 of these articles have been published in leading international journals). 7 Grants have been awarded to Bocconi professors by the European Research Council (the European Agency funding frontier research projects submitted by top researchers of any nationality). To date, the ERC funds only 319 projects worldwide in the Social Sciences and Humanities: Italy hosts 30 ERC Grants, of which 7 in Bocconi and 3 others in Lombardy. The SDA Bocconi School of Management has constantly improved its position in the Financial Times MBA Ranking, occupying the 10th position in Europe and the 28th worldwide in 2011.

5. About 59% of the big pharmacy companies operating in Italy are located in Lombardy (61 companies). These include Sanofi-Aventis, Roche, Novartis, Astrazeneca, Bayer, Jansen or Schering-Plough. These companies had a cumulative turnover of nearly EUR 4 billion and employed about 10 000 people in 2009.

6. The probability of innovative success for small firms appears to be more dependent on co-operation than for larger firms, and medium-sized firms are found to be more affected by a lack of financing and by the availability of information. An increase in the proportion of firms citing government and/or universities as a highly important source of information for innovation has a significant positive association with the share of new products in turnover, but has no significant impact on the aggregate fraction of successful innovators The estimated coefficient implies that a 1 percentage point increase in the fraction of firms using information from the non-business sector raises the share of new products in turnover by 3 percentage points. This effect appears to stem from the impact on the turnover shares of true innovators, rather than from the turnover shares of imitators and from industry rather than services. See evidence from Community Innovation Survey December 2005.

7. There is growing evidence that innovation policy should not focus exclusively on science parks, given that research has not conclusively demonstrated that the networking opportunities they offer SMEs significantly promote innovation. Van Geenhuizen and Soetanto (2008) confirm that evaluation studies of science parks are either inconclusive or positive only to a limited extent. A wide range of evidence appears to support the finding that science parks have no significant effect in supporting entrepreneurship, innovation, employment growth in high-tech sectors, research productivity and technological spillovers (Shearmur and Doloreux, 2000; Siegel *et al.*, 2003; Tamasy, 2007).

8. The first technology transfer office was created in 1997.

9. For patents granted by EPO, USPTO and in Italy.

10. In terms of patents inhabitants, Lombardy is lagging behind regions such as Noord Brabant (more than 700 patents per million), Oberbayern, Baden-Württemberg, Denmark, Sweden and Ile de France (300).

11. Cumulative data show that the Politecnico di Milano filed applications for 391 patents. 132 patents have been granted to the Politecnico since the 1990s. It has signed about 140 technology transfer agreements (67 of which are license agreements) that generated more than EUR 3 million revenues. Politecnico's research produced 18 spinoffs and it holds between 5 and 10% of the shares of these new companies.

12. Assolombarda, for example, is a territorial association with a mission to represent enterprises' interests in dealing with local authorities, trade unions, and the overall political and social world. It is part of Confindustria, the leader organisation founded in 1910 to represent the manufacturing, construction, energy, transportation, ITC, tourism and service industries in Italy. Approximately 6 000 firms in Lombardy (mostly SMEs) are associated with Assolombarda.

13. This fund is dedicated to companies less than six months old, to university spinoff less than two years old and individuals committed to create a company within three months after receiving seed funding.

14. WKCI is an integrated and overall benchmark of the knowledge capacity, capability and sustainability of each region and the extent to which it is translated into economic value and transferred into the wealth of each region. It integrates 19 knowledge economy indicators. It is compiled by the UWIC Institute of Cardiff Metropolitan University. The 2008 edition placed Santa Clara region (Silicon Valley) first, Stockholm 6th, West Netherlands 19th, Pohjois-Suomi (North Finland) 20th; Ile de France 29th, Brussels 47th and Baden-Württemberg 55th. Lombardy is 37th in Europe (34th in 2005).

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Chapter 4

Social, cultural and environmental development

Social, cultural and environmental development supports economic growth, improves health and welfare, and social cohesion, and contributes to clean, healthy and sustainable environment. It also provides an opportunity to transform the existing challenges into assets for the benefit of the local and regional economy.

This chapter focuses on how universities and other higher education institutions in Lombardy can contribute to four areas of critical importance to the region: the demographic transition, creative economy, environmental sustainability and urban development.

Introduction

Universities and other higher education institutions in Lombardy have the advantage of operating in a rich social and cultural environment, in which creativity and innovation are manifested throughout the region, both in the private sector and in civic society. Higher education institutions in Lombardy have the ability to address (through teaching, research and community outreach) issues that have long-term implications for the region and require institutional capacity. These issues, encompassing cultural, social and environmental development, are inter-twined in many respects. They address the need to protect and conserve a rich cultural heritage and productive environment while at the same time adapting to new conditions fostered by expanded global markets and a globally mobile population.

This chapter examines the major challenges facing the region that the higher education institutions are positioned to address. First, the demographic challenges linked to ageing and immigration, for example, of health care provision. There is also a need to adapt to the reality that the generation of students that will be age eligible to enter Lombardy higher education institutions in the next ten years will be largely composed of the children of immigrants and, in many cases, will be the first in their families to aspire to higher education. These students face significant problems in reaching for higher education because of their families' economic situation.

Second, Lombardy higher education institutions can address and contribute to the critical role that creative and cultural industries play in Lombardy's economy and society. Lombardy has a diverse creative economy and non-university higher education institutions play a critical role in developing skills and capabilities in the creative and cultural sector. This sector attracts more international students than the university-based higher education sector.

Third, the regional higher education institutions in Lombardy can respond to sustainability and environmental challenges, by providing food and agricultural expertise and by contributing to urban development strategies and transportation planning that would enhance regional productivity.

In the context of these challenges and opportunities, this chapter examines:

- What is the contribution of the universities and other higher education institutions to Lombardy's cultural, social and environmental

development, in terms of health and social cohesion, cultural and creative industries, and environmental sustainability?

- Are the higher education activities appropriately targeted to address the key challenges in Lombardy? Are there gaps in delivery and are resources and incentives aligned with the objectives?
- What lessons can be learnt from international experience?

Demographic transition

In the early 2000s, the Lombardy population growth was due primarily to foreign immigration (see also Chapters 1 and 2). While the Italian reproduction rate is 1.1, in Milan, the birth rate for established foreign-born residents is 1.8, both below the 2.0 rate needed for population replacement. These patterns have implications for the future of the region, its entrepreneurial culture and social and cultural identity. At a practical level, the educational system from primary school onward must adapt to educate a more diverse population of children and to prepare them for higher education.

There are also immediate issues related to the aging of the native-born population and low birth rate. Most prominently, there is an on-going demand for foreign immigrant workers to fill the existing labour force gap. This is reflected in employer association requests to increase the quotas for immigration. At the same time, there are challenges in integrating the immigrant workforce and in providing them with adequate housing. Although national law requires employers to indicate how foreign workers will be housed after they arrive to work in the country, access to housing remains a problem especially for those workers who are employed seasonally, for example, in the services sector. Policy tensions of dealing with the immigration question are demonstrated by the fact that while there is a high demand for immigrant workers to fill the labour needs in small and medium-sized enterprises, regional and local governments have called for immigration quotas because of the inability to integrate immigrants in local communities and because of the lack of affordable housing (OECD, 2004; OECD, 2006).

In Lombardy, immigrant integration initiatives are undertaken by a wide variety of organisations including unions, trade associations, NGOs and inter-cultural and research institutes specialising in migrant issues, most notably *Fondazione Iniziative e Studi Sulla Multietnicita* (ISMU). At the

same time, community-based organisations do not appear as important in representing immigrant concerns (OECD, 2004).

The university sector in Lombardy has, so far, played a peripheral role in addressing the issues linked to immigration but its role will potentially increase as the young immigrant population will soon constitute a substantial portion of those age-eligible to participate in post-secondary education programmes. This issue will be particularly important for the publicly-funded universities, which currently draw the majority of their students from the region. The existing problems of the long duration of university studies and poor completion rates are likely to be exacerbated within a student population with a higher portion of immigrants from low-income families. While there are a number of initiatives directed toward immigrant communities including language instruction, vocational training and professional specialisation courses, these initiatives are primarily implemented outside the educational system and largely financed by the European Social Fund.

One arena in which the Lombardy university sector could take a leading role is in devising new standards, and procedures to recognise and accredit the previous educational attainment of non-EU immigrants. The absence of procedures for evaluating educational achievements or bi-lateral and/or multi-lateral agreements to address accreditation of educational attainment is reflected in data that show a gap between declared and recognised levels of education (OECD, 2004).

While the economic integration of the immigrant population has important implications for the future of human capital in Lombardy, their social inclusion has important implications for regional governance, and social and cultural patterns. There is evidence of barriers to that inclusion. For example, the migrant communities in the region are more likely to be located in smaller "peripheral" cities, such as Mantua, rather than in Milan. This is attributable to the availability of affordable housing in the periphery and the absence of such housing in Milan. Furthermore, neighbourhoods that receive immigrant families tend to become predominantly immigrant because the Italian residents leave the neighbourhood. OECD/LEED analysis of the housing issue finds that:

> *The housing problem is a prevalent obstacle for all immigrants, whether legal or illegal, indifferent if they have been for some time in Italy or arrived only recently. The response to this demand by NGOs, however, has always been almost completely insufficient. Apart from Catholic NGOs, which have only a limited number of beds in special hostels, too few actions have been implemented so*

far to support immigrants in their search for housing and to overcome the discrimination existing in this issue (OECD, 2004).

There is limited evidence of the regional government of Lombardy having an integrated approach to the issues arising from the demographic transition in the regions. Issues include lifelong learning, mentorships and apprenticeships for younger people to enable them to move into positions of responsibility or recognition of the need to integrate the immigrant communities socially and culturally along with their integration into the labour force.

Some new thinking has been initiated to link plans for modernisation of the Milan urban environment to programmes for a better integration of the immigrant communities. Such initiatives were discussed at a round table on "The Inter-Ethnic City: Management and Policies for a Better Integration of Migrants", co-organised by the UNAoC, the International Organization for Migration (IOM) and the Permanent Missions of Italy and of Canada to the United Nations in September 2009. This meeting focused on the challenges faced by municipalities in integrating migrants into their societies.

One major sources of ideas for integration of immigrants in urban settings is "Cities of migration", sponsored by the Maytree Foundation in Canada (see Box 4.1.). This programme searches out the best ideas in integration practice regardless of which global city they come from. Examples of creative approaches documented by the programme include: *i)* active efforts to include qualified members of immigrant communities on provincial and city commissions and boards; *ii)* efforts to train immigrant women living in Copenhagen to ride bicycles, which are a dominant form of transport in the City; and *iii)* an effort in Cardiff (UK) to use police as language teachers in immigrant communities (*http://citiesofmigration.ca/*). Although higher education institutions are only one of a number of participants in these efforts, they could expand the resources available to these efforts by fostering student involvement through internships and community "antenna" programmes.

Box 4.1. The Canadian model for cities of migration: recognising and integrating immigrant communities in Canada

Canadian city regions and their education institutions are active participants in national strategies and programmes to foster dialog with and integrate the diverse immigrant communities that are an important part of the contemporary Canadian population.

Immigrant access begins with creating a learning environment in primary and secondary school that demonstrates a commitment to results for the children of immigrant families. In 2008, the Toronto District School Board (TDSB) was awarded the Carl Bertelsmann Prize to recognise exemplary practice in promoting social integration and providing equal learning opportunities. The TDSB has successfully closed the average achievement gap between second-generation students of immigrant origin and their Canadian peers.

Another key actor fostering immigrant integration and access is the Toronto Region Immigrant Employment Council (TRIEC). TRIEC's path-breaking work to increase immigrant access to employment through mentoring, employer training, internships and public awareness has been extended to 18 city regions throughout Canada and resulted in foundation support for a new programme – ALLIES, Assisting Local Leaders with Immigrant Employment Strategies. Among the key aspects of this comprehensive programme are technical training programmes to promote labour market attachment and bridge skill gaps.

The holistic Canadian approach to immigrant integration also has a cultural dimension. In Toronto, universities faculty participate in and act as mentors for young writers in "Diaspora Dialogues: Writing the New City".

Source: Cities of Migration, *http://citiesofmigration.ca/*

Universities and the regional health system

Despite rapid changes in life expectancy, health remains an important policy concern in OECD countries. There have been significant changes in the nature of health problems, with a growth in conditions related to chronic conditions such as diabetes, depression and the deterioration of health-related behaviour in the areas of diet, exercise and drinking. Increasing life expectancy has led to a growing share of the population at risk of "old-age conditions". There are also concerns related to health inequalities while certain demographic and socio-economic groups face significantly poorer health circumstances (OECD, 2010a; WHO, 2008).

In Lombardy, challenges of ageing population, and large numbers of immigrants will place considerable pressures on the regional health system in the future.

Universities contribute significantly to the Lombardy health system, through their six faculties of medicine and surgery. This contribution is carried out according to the regional law that regulates the co-ordinated activities between the Lombardy Region and universities in assistance, teaching and research in the social and health sector. To achieve this goal, universities and hospitals have become part of the regional health network and the Steering and Co-ordination Committee (*Comitato di Indirizzo e Coordinamento*) has been established to facilitate regional planning. As members of this committee, universities take part in the development of programmes and innovative organisational models. Organisational regulations related to the presence of universities in health organisations are laid down in agreements between universities and hospitals. The planning of the reciprocal activities is defined by the Organ of Combined Planning (*Organo di programmazione congiunta*).

Ensuring that the regional health care system has competent personnel is a challenge in Lombardy, and the regional government and the Lombardy universities could compare the experiences in the health sector with those of the Autonomous Region of Andalusia in Spain. One of the major successes in collaboration between the Regional Government of Andalusia and the university sector has been the development and implementation of the Strategic Plan for Comprehensive Training in the Andalusian Health Care System. The plan provides for compulsory clinical practice for health professionals as well as specialist training and professional development. The joint investments and collaboration in training have helped improve the health outcomes in Andalusia and the quality of healthcare delivery (see Box 4.2.).

Box 4.2. The Andalusian Public Health System Training

Launched by the Regional Ministry of Health in Andalusia, the Strategic Plan for Comprehensive Training in the Andalusian Public Health System is responsible for developing professional competencies during the compulsory education of healthcare professionals, including clinical practice, specialist training and continuing professional development. Training is based on an in-depth needs assessment and encourages collaboration and sharing of knowledge and experience among the health professionals by allowing for temporary transfers among departments and self-learning opportunities.

Box 4.2. The Andalusian Public Health System Training (continued)

The Andalusian Public Health System is the largest provider of health professionals in Spain. It also accounts for the largest number of training activities and the largest budget for continuing professional development in this domain. Every year, the Andalusian Public Health System provides clinical practice for around 850 undergraduate students, who obtain their medical degrees and who over a period of several years, spend varying periods of time in the public health centres. The beneficiaries of this programme are over 3 000 nursing, physiotherapy and speech therapy graduates and around 10 000 students enrolled in various degree programmes and diploma level vocational training courses in healthcare. Around 18 000 students from universities and vocational training institutions move through this network. The main potential employer of the new healthcare professionals is the Andalusian Public Health System.

The Andalusian Public Health System also employs over 1 300 university lecturers and a large number of vocational training tutors. It has an exclusive responsibility over specialist training as it is in charge of training 3 360 specialty residents, of which around 950 finish their specialist training each year. Hospital departments, healthcare management departments and primary care districts have teaching units, accredited by the ministry of health, provide over 1 000 (1 276 in 2008) places for specialist training.

There are around 900 tutors distributed among the various specialties who oversee the training process of specialty residents. The Andalusian Public Health System is responsible for the continuing professional development of over 450 managerial staff, 3 600 middle management staff, over 13 000 doctors, 20 000 nurses, 1 500 professionals and technicians from other disciplines.

The Andalusian University System provides funding for the compulsory training in health professions. The university system pays the portion of a professionals' salary (which corresponds the university salary levels) and also the salaries of part-time clinical associate teachers who work within the health system. Health centres cover other costs that are not funded by universities. Funding for postgraduate training is provided by the regional ministry of health, which receives an earmarked budget for this purpose and transfers the funds to the health centres. This budget covered the residency costs of junior doctors that are based on training contracts. A total of 3 360 health science specialists were trained in 2006 on the basis of at residency contracts. The costs of the specific training activities to the Andalusia Public Health Care System amounted to almost EUR 114 million 2006.

Source: OECD (2010b), Higher Education in Regional and City Development, The Autonomous Region of Andalusia, Spain, OECD, Paris.
*www.oecd.org/dataoecd/45/3/46528648.*pdf.

Lombardy higher education institutions and the creative economy

Lombardy is an acknowledged centre of creative industries with particular strengths in industrial design and fashion design. The region is recognised as an exceptional centre of creative and cultural industries in Europe. Lombardy is ranked third among the top 25 European regions with important "clusters" of cultural and creative industries (see Chapter 2, Table 2.2.) The Lombardy region art sector is important not only for its major art schools (in particular Accademia di Brera), but also for the production and commercial distribution of art established and innovative artists and designers, auction houses, trade and art fairs, private commercial galleries, art collections of banks, art publishers, and art and design journals (see Table 4.1.).

Table 4.1. Selected galleries, auction houses and publishers in Milan

Actors	Examples
Public art galleries	Pinacoteca di Brera, Museo Poldi Pezzoli, Galleria d'Arte Moderna, PAC Padiglione d'Arte Contemporanea, Palazzo Reale, Museo del Novecento, La Triennale, La Permanente
Private art galleries	Hangar Bicocca, Fondazione Nicola Trussardi, Fondazione Antonio Mazzotta, Fondazione Prada
Auction houses	Christie's, Finarte, Sotheby's
Trade and art fairs	Salone Internazionale del Mobile with the Fuorisalone for design, MiArt and Mint for visual arts
Private commercial galleries, art collections of banks	Deutsche Bank Collection Italy, UniCredit, Intesa San Paolo, Fondazione Cariplo
Art publishers	Electa, Mazzotta, Mondadori, Prearo, Skira
Art and design journals	Arte, Flash Art, Ad, Domus

The role of creative industries in the future of the Lombardy economy is indicated by a study co-sponsored by the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Development Programme (UNDP). This study classifies creative industries into four broad groups: heritage, arts, media and functional creations. The study indicates that trade in creative goods and services worldwide increased 8.7% between 2000 and 2005. According to the UN study ranking, Italy was the second largest exporter of creative goods in the world in 2005, a position it has retained since the mid-1990s (UN, 2008). Its growth rate in creative exports between 2000 and 2005 was 5.9% (*ibid*). Of particular importance to the Lombardy economy is the growth in creative services exports, which, according to the report, grew 8.8% annually between 1996 and 2005.

Higher education strengths in cultural and creative industries

In Lombardy, universities provide a wide range of degree courses in arts and culture and also play an important role in preserving the cultural heritage of the region. This takes places, for example, through the Centre for the Exploitation of Lombardy's Cultural Heritage and in the Catalogue of Lombardy's Cultural Heritage, *Sistema Informativo dei Beni Culturali della Regione Lombardia,* (see Box 4.3.).

Box 4.3. Universities and cultural heritage in Lombardy

A Centre for the Exploitation of Lombardy's Cultural Heritage was established in 2007 by the Lombardy Region, the Politecnico di Milano, the University of Pavia, the University of Milan and University of Milan-Bicocca. At a cost of EUR 3.3 million, this is a permanent centre dedicated to the development and sharing of programmes related to research, experimentation of new technologies and technology transfer. The centre aims to:

- Rationalise research and funding priorities in the field of cultural wealth.
- Develop unit cataloguing systems.
- Create a more effective relationship between universities and SMEs in this field.
- Integrate training programmes and promote links between universities and labour market.

The Catalogue of Lombardy's Cultural Heritage, SIRBeC – *Sistema Informativo dei Beni Culturali della Regione Lombardia (www.lombardiabeniculturali.it/sirbec/*), was set up in 1992, to provide a coherent cataloguing system of Lombardy's cultural heritage in museums, collections and other cultural institutions. The cataloguing system at SIRBeC relate to the following cultural areas: architecture; art works and objects; photographs of artistic, historical and documentary interest; prints and engravings; archaeological finds; ethnographic objects; instruments, machinery and finds related to the history of science and technology. Provinces, municipalities, dioceses, museums, collections, cultural institutions, non-profit associations and foundations have taken part in the creation of the system. By mid-2010, almost 500 000 objects and more than 12 000 buildings had been catalogued.

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

At the heart of the Lombardy's strengths in the creative arts is, however, a large and prominent non-university higher education sector, which attracts students and practitioners from all over the world. There are 15 arts and music institutions in Lombardy, many, for instance, the Brera Academy, have a prestigious international reputation. Milan is home to major private design schools the largest design school in Italy. It is also home to the internationally recognised music conservatories such as the *Conservatorio di musica* "Giuseppe Verdi" di Milano. Unlike the public universities in Lombardy, these schools are specialised and distinguished by an individual identity and "brand", based on the prominence of their faculty and the type and style of training they provide. They also differ from their public counterparts in attracting many foreign students and should be recognised for their important role as an export "industry", particularly by comparison with the public university system, which attracts few foreign students.

Because of the separation of the creative arts training programmes from the university degree granting institutions and the individuality of the institutions in this sector, the governance of the non-university higher education sector is very different from that of the university degree granting sector. Nonetheless, the opportunities for building the regional strengths in the creative economy in Lombardy may be enhanced by finding venues to connect the two sectors through, for example, shared facilities and programmatic initiatives. The publicly-supported universities may benefit from connecting with the foreign students in the non-university creative arts sector.

One of the Lombardy region's most significant problems is attracting and retaining young people. In this regard, a focus on the creative economy is very important. Young talented people in the creative arts are drawn to and tend to remain in centres of world level expertise in their chosen field, whether music, dance, design or fashion. In addition, a vibrant creative and cultural sector can attract international talent from other sectors. Milan and Lombardy are certainly one of those centres. Bocconi university has taken steps to address the demand for business and management courses in this field and offers a degree in Economy and management for arts, culture, communication (*Economia e Management per Arte, Cultura e Communicazione*), and an English language masters Fashion, Experience & Design Management. Inter-disciplinary university programmes to foster research and knowledge about the creative sectors should be considered as a way to enhance the connection between the universities and the internationally recognised creative strengths of the region and beneficial to both the universities and the creative sector. (See Box 4.4.)

Box 4.4. Diaspora Dialogues: writing the new city

The concept and expression of diversity has become more important to the ways in which creativity is expressed and can be a potent tool in the search for common values and cultural respect in increasingly diverse urban communities. The Universal Declaration on Cultural Diversity adopted by UNESCO in 2001 is embodied in the "uniqueness and plurality" of the identities of various societies and groups, a common heritage of Humankind (UN, 2008).

In Toronto, efforts to integrate immigrant residents of the city extend to cultural programmes, such as The Diaspora Dialogs, a literary project that supports the creation and presentation of new fiction, poetry and drama – specifically works that reflect the complexity of the city back to Torontonians through the eyes of its richly diverse communities. This programme, which has spawned important immigrant authors of fiction, poetry and nonfiction, connects with students in secondary school and higher education institutions who want to write about the immigrant experience in the city.

According to its founder, Helen Walsh, "Diaspora Dialogues provides an outlet for writers and artists who are new to Canada, who are under-represented and who may not have found their audience and market. It's a two way relationship, since they provide longer term residents of the city with an up-to-date and ever changing picture of Toronto as it exists now, today."

Source: *http://citiesofmigration.ca/diasporadialogues/lang/en/*

Universities and environmental sustainability

Universities and other higher education institutions can contribute to sustainable environmental development in their regions in many ways, for example, by: *i)* generating human capital in the region through their learning and further education programmes in areas of sustainable development; *ii)* acting as a source of expertise through research, consultancy and demonstration; *iii)* playing a brokerage role in bringing together diverse regional actors and elements of capacity to the sustainability process; *iv)* demonstrating good practice through on-campus management and development activities, strategic planning, building design, waste minimisation and water and energy efficiency practice, responsible purchasing programmes and pursuing good citizen type initiatives like a "green campus"; and *v)* offering recognition and reward incentives for staff to be involved in sustainable development leadership groups in the regional community (OECD, 2007).

Some universities in Lombardy have taken steps to improve their own environmental management systems, including building design, waste management and minimisation. In general, however, the contribution of universities to sustainable development has not yet reached its full potential.

Five major universities in the region – Politecnico di Milano, University of Milan, University of Pavia, Catholic University of Milan and University of Milan-Bicocca – have established a long-term collaboration with the Lombardy Foundation for the Environment. This foundation was founded in 1986 by the Regional Government of Lombardy to support public and private initiatives in the protection of the environment and employs a significant network of professionals and university professors.

The universities' agenda incorporates research, education and dissemination activities. Universities are addressing the broad issues of climate change and sustainable development including contributions to environmental issues related to agriculture, through the rice genome project and in policy related research areas, such as land use. While the universities co-operate with one another in supporting larger enterprises, such as the Lombardy Foundation, co-operation between and among them is rare. In part this may be a product of competition over intellectual property rights for science-based innovation. The challenge for the Foundation is to identify areas of common interest, which can lead to stronger collaboration between the universities.

Food as a central focus

Lombardy's universities are actively participating in a regional initiative to mount an international exposition – the Expo2015 – organised around food (IReR, 2010). This multi-dimensional exposition will be organised around ideas and knowledge dissemination rather than around food products. The universities were participants at the inception of the proposal for the exposition and are taking a leading role in formulating the conception for this major international venture, which is intended to include scientific congresses and to foster business start-ups. Lombardy has a worldwide reputation for its food culture but the Expo 2015 aims to have a strong scientific dimension, building on the region's less well known expertise in food science and the agricultural sciences. The Expo 2015 will particularly emphasise the theme of bio-diversity, thus connecting the food theme to broader concerns for environmental sustainability. The ability to plan for an event that will market Lombardy's strengths in bio-science, agriculture and food processing reinforces the importance that urban development planning plays in sustaining the region's long-term competitiveness.

Supporting eco-efficiency of the regional industry

Generating eco-efficiency means creating more goods and services while using fewer resources and creating less waste and pollution. Universities and other higher education institutions can play an important role in supporting technical, organisational and process improvements for eco-efficiency of the existing industry.

In 2007, the regional government, the City of Milan and key stakeholders including universities established an EnergyLab Foundation, (see Box 4.5.) .

Box 4.5. EnergyLab Foundation

The EnergyLab Foundation (*www.energylabfoundation.org*) was founded in Milan in 2007 to address the need to connect the main universities and research centres with companies operating in the energy field and local institutions in Lombardy. EnergyLab is a non-profit foundation made up of the Regional Government of Lombardy, Municipality of Milan, Politecnico di Milano, University of Milan, Catholic University of Milan, University of Milan-Bicocca, Bocconi University and ERSE (ENEA - Research into the electrical supply system, operators and companies included).

The foundation supports research, development and innovation in the sectors of energy and environment and disseminates information about energy and environment. In 2008, the foundation drew up a map of competencies in research and innovation in the field of energy offered by Lombardy universities. This data bank is available on-line and is financially supported by the Regional Government of Lombardy. See *http://mappaturacompetenze.org/consultazione/.*

Source: IReR *(2010), "The Region of Lombardy, Italy: Self- Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, www.oecd.org/edu/imhe/regionaldevelopment.*

Despite the progress made, there is scope to build a stronger portfolio of specific programmes targeting emission reduction in industries within the Lombardy university system. Experience from programmes in Canada, Austria, the UK and the US shows that universities can become successful partners of local businesses who want to upgrade their environmental standards. (See Box 4.6.)

Box 4.6. Design programmes for sustainable urban growth

Faculties in the two traditional disciplines areas of architecture and design are increasingly developing projects branching out into urban smart design, environmental management and policy, greenhouse emission reduction and behaviour change. A core characteristic of these programmes is their dedication to government advice and technical assistance to local industries. They do it by developing and demonstrating new design strategies, decision support tools and processes, as well as by assisting industry to design and use greener products, buildings and services and to develop more strategic environmental directions.

- The Faculty of Environmental Design (EVDS) at the University of Calgary in Canada provides an interdisciplinary teaching and learning environment that emphasises a co-operative, collegial approach to research, scholarship, creative endeavour, professional practice and outreach.
- The Centre for Design, at the Royal Melbourne Institute of Technology (RMIT) in Australia, works with industry and others to develop and demonstrate new design methods, tools and processes aimed at improving the environmental performance of buildings, products and services.
- The Centre for Sustainable Design, University College for the Creative Arts, UK, facilitates discussion and research on eco-design in product and service development.
- Green Design Initiative at Carnegie Mellon University, US promotes environmentally conscious engineering, product and process design, manufacturing, and architecture. The initiative involves forming partnerships with industrial corporations, foundations, and government agencies to develop joint research and education programmes.

Source: OECD (2011), Higher Education in Cities and Regions. For Stronger, Cleaner and Fairer Regions, OECD, Paris, *forthcoming*.

Universities and other higher education institutions in Lombardy could also increase their co-operation with local or regional one-stop-shop agencies for business support. By training the trainers and other knowledge dissemination activities, universities could help these agencies acquire the specialised skills to advise firms on the cost-effective ways to reduce emissions.

The Politecnico di Milano is already engaged in the development of technologies and tools available to business to monitor the environmental

sustainability of their production and is undertaking action to improve environmental performance. These efforts should be upgraded.

Creating skills for green growth

Jobs related to renewable energy and energy efficiency are projected to increase to several millions worldwide by 2030, most of these new jobs in a small number of innovative regions. The concentration in a number of regions is due to new green technologies relying on local know-how and technologies developed by other, "non green" industries. For example, the design of the new, three-blade turbines in the wind-energy clusters of Aalborg and Arhus in Denmark was heavily influenced by the advances of the Danish agricultural engineering industry (OECD, 2011, *forthcoming*).

Human capital development is critical to enhance the opportunities for wide market penetration of renewable energy and low carbon technologies. Inadequate skills may limit the growth of renewable energy technologies. Many national and regional governments (*e.g.* the State of Victoria in Australia) are adjusting their skill strategies to address the emerging demand for new skills in the green industries, by introducing incentives to facilitate re-training and efficient mobility of learners between vocational institutes, universities and industries. Emerging green occupations will require the creation of new industry-recognised credentials and training programmes, and modifications of training packages for workers in traditional occupations (OECD, 2011, *forthcoming*).

In Lombardy, masters and post-graduate courses in environmental sustainability have been launched in many universities, including Bocconi, the University Cattolica del Sacro Cuore, the University of Milan, the Politecnico di Milano and the University Milan-Bicocca.

Box 4.7. University courses and Masters programmes in sustainability

Bocconi University offers a master's programme in "Environmental and Energy Management" (MEMAE - *Economia e Management dell'Ambiente e dell'Energia*) that focuses on traditional energy sources, renewable resources, emissions market, carbon finance, project finance for environment and energy, green marketing, management of waste, corporate social responsibility.

The University Cattolica del Sacro Cuore offers a master's programme through its Higher School for the Environment (*ASA – Alta Scuola per l'Ambiente)* in "Human Development and Environment" (*Sviluppo Umano e Ambientale*) in order to develop competencies in companies, non-profit bodies and associations.

Box 4.7. University courses and Masters programmes in sustainability (continued)

The University of Milan offers a masters in "Sustainability and Administration of Protected Mountain Areas" (*Sostenibilità e Gestione delle Aree Protette Montane*) and "Risk Assessment and Risk Analysis", for the training of European professionals.

The Politecnico di Milano offers a masters in "Sustainable Territory and Architecture" (*TAS – Territorio e Architettura Sostenibili*), for architectural planners to address issues in sustainability, protection and development of environmental and energy resources. Another Master's programme in Renewable Energy, Decentralisation and Energy Efficiency (Master RIDEF *Energia per Kyoto – Energie rinnovabili, decentramento, efficienza energetica*) aims to provide a solid basis in the mechanisms that govern energy systems and markets, and to develop technical knowledge of the most important energy efficient and renewable energy distributed generation solutions.

The University of Milan-Bicocca offers a master's programme in "Management and Retrieval of Environmental Resources" (*Gestione e Recupero delle Risorse Ambientali*), in order to train professionals to choose environmentally compatible advanced technologies in maintenance, restoration and new constructions.

Source: IReR (2010), "The Region of Lombardy, Italy: Self-Evaluation Report", OECD Reviews of Higher Education in Regional and City Development, IMHE, *www.oecd.org/edu/imhe/regionaldevelopment.*

Despite the good progress in this field, there appears to be a lack of collaborative action to support skills development for green jobs in Lombardy. Skill creation could be more efficiently organised by pooling learning resources of educational institutions and industries at the regional level to build capacity within the firm. Partnerships between higher education institutions could stimulate new modes of delivery of training and education.

Developing the urban environment

Reports comparing Milan with other European economic centres have noted that Milan has lagged behind other creative industrial capitals in investing in the urban development planning and infrastructure that can both make the city more attractive and more productive logistically. Plans, such as that for the exhibition complex at Rho-Pero are central to the

transformation of Lombardy from an economy based in heavy industry to one that emphasises knowledge-intensive industries and services. The Rho-Pero project will make the Milan fair the largest in Europe. There are also plans to invest in regional transportation infrastructure to link major urban centres in Lombardy – Brescia, Bergamo and Milan. These investments are critical to improving the access of Lombardy firms to European and global markets.

In addition to these regional investments, there is a need for urban redevelopment plans to foster the image of regional cities as creative hubs and centres for knowledge-based industry. The universities in Lombardy are playing an important role in this process. For example, in Milan, a major auto company closed most of its operations, leaving a 750 000 m^2 site empty. As a result of an international competition to transform the industrial space into a multi-functional environment, the University of Milan-Bicocca was developed.

Milan-Bicocca has similarities with, but lags behind the most innovative urban redevelopment initiatives that revitalise former industrial areas. An interesting example in urban generation comes from Barcelona, which has an innovative approach to urban development through transforming old industrial and / or distressed areas into much functional urban areas. There are clear socio-economic benefits in the Barcelona model that is based on the idea of developing vibrant creativity, social cohesion and economic development. 22@Barcelona also includes an "urban lab" for pilot studies in greening the urban environment, (see Box 4.8.).

Box 4.8. City of Barcelona and urban regeneration

The City of Barcelona has an innovative approach to urban regeneration, transforming old industrial and/or distressed areas into multi-functional urban areas, with mix of living space (including social housing), business and knowledge-intensive activities. Part of the strategy is to bring in or relocate universities as early movers.

One of the examples is the 22@Barcelona innovation district, an urban renewal model that offers modern, technologically advanced and flexible spaces for the top economic activities. The initiative that involves 2 km^2 nearby the downtown waterfront is also a way to revitalise its industrial heritage and an economic development project aimed to stimulate the creation of a scientific, technological and cultural pole.

Box 4.8. City of Barcelona and urban regeneration (continued)

There are 25 000 students in the area who study at tent university faculties and centres that have moved to 22@Barcelona District. These include communication campus of the University Pompeu Fabra. The university, in partnership with the Barcelona City Council and 14 companies have established the Barcelona Media Research Centre aimed to perform applied research in the area of communications and the media. The concept has been measurably successful. Between 2000 and the end of 2009, over 1 500 companies have established in the district, 45% new businesses. About 75% of the 45 000 new employees are linked to 22@Barcelona activities.

The model is being reduplicated in a contiguous area under the project of the Diagonal-Besòs Campus. This aims to revitalise a distressed area with immigrant population and high levels of delinquency.

22@Barcelona is home to 22@Urban Lab, which provides a base for tests and pilot studies for products and services with urban impact that benefits residents of Barcelona, such as a charging point for electric vehicles and street lighting with LED technology. Pilot studies have been carried out on regulating traffic light automatically depending on traffic, crossing lights adapted for the sight-impaired, different types of bicycle lanes, fibre optics to homes, and remote gas, electricity and water meter reading for more than 150 homes.

Source: OECD (2010c), *Higher Education in Regional and City Development: The Autonomous Region of Catalonia, Spain*, OECD, Paris, *www.oecd.org/dataoecd/28/36/46826969.pdf,* and Barcelona City Council –Barcelona Activa, *www.barcelonactiva.cat/barcelonactiva/en/index.jsp*.

There are major university research programmes in Lombardy aimed at addressing the logistics and freight transport problems facing the region and its industries. The University of Bergamo has a wide range of initiatives focused on regional development with particular reference to productive systems, transport, internationalisation and exploitation of cultural and historical resources. The University of Bergamo has the Centre for Territorial Studies, which studies land use planning and policy, including the development of Malpensa airport's impact of industries on the environment.

Another research centre with on-going programmes in this arena critical to the regional economy is the Centre for Research on Regional Economics, Transport and Tourism (CERTeT - *Centro di Economia Regionale, dei Trasporti e del Turismo*) of the Bocconi University.

Other research initiatives contributing to knowledge that can inform regional urban environmental development include the Centre for Research on Territorial Development (CERST - *Centro di Ricerca per lo Sviluppo del Territorio*) of the Carlo Cattaneo University - LIUC and the Centre of Research on the Internationalisation of the Local Economies (CRIEL - *Centro di Ricerca sull'Internazionalizzazione delle Economie Locali*) of the University of Insubria.

Co-operation among these programmes may strengthen their ability to influence an urban development agenda that improves the efficiency of the region through better transport planning but also builds the region's brand as an urban development knowledge centre with expertise in creative industries and historic preservation, (see Box 4.9.).

Box 4.9. The Design Commerce Montreal Project

In Montreal, the idea behind cultural districts and "design" are fully integrated into the urban planning strategy for the city. The "Design Commerce Montreal" project invited designers/architects to work on the look and feel of shopping areas by redesigning numerous shops and restaurants. Launched in 1995, the project goal was to foster knowledge and understanding of the benefits of investing in the design quality of commercial businesses with the help of qualified professionals. This will make business more competitive and boost local demand for commercial design services. "The whole purpose of this annual event was to develop the commercial design market in Montréal, so as to: *i)* improve the quality of urban life and make the metropolis more attractive, *ii)* make businesses more competitive, and *iii)* boost local demand for professional commercial design services." The project has the added goal and benefit of making the metropolis more attractive and improving the quality of life for Montreal residents.

Source: Design Montréal website: *http://ville.montreal.qc.ca/portal/page?_dad=portal&_pageid=5497,26455672&_schema=PORTAL*

Conclusions and recommendations

One of the goals of the OECD review process is to develop co-operation among the regional institutions of higher education in order to improve their educational programmes, particularly those focussed on regional issues. An analysis of the capacities of the Lombardy universities and other higher education institutions, however, indicates that they could play a more significant role in the region, both through leadership on critical social and cultural issues and through co-operation at the programmatic level in areas such as urban development.

Addressing the demographic changes

The agenda to address the aging of the Lombardy population must be multi-faceted, including strategies to extend the productive working lives of the workforce through lifelong learning initiatives and programmes to connect older generation business owners with younger generation entrepreneurs, and address the health needs of the ageing and more diverse population.

One area for attracting and retaining younger people in the region is the expansion and enhancement of the already significant creative economy in the region, particularly in fields such as design and music, which already attract talented foreign students and workers. Young people in the creative arts tend to be drawn to urban clusters in their particular field of endeavour. Building on the regional attraction to young creative workers will require more understanding of the role of the non-university higher education sector in the creative arts. The higher education institutions could contribute to the strengthening of the creative arts sector through interdisciplinary programmes to provide a better knowledge base in the Lombardy creative economy. In particular, higher education institutions could contribute to the social and cultural inclusion of the diverse immigrant population through arts and humanities programmes, and outreach activities that include creative immigrant contributions to the community, such as the Diaspora Dialogues, pioneered in Toronto, Canada.

Recognising and building the creative economy in the region

At the present time, the universities in Lombardy have a limited relationship to the development of skills that support the creative industry presence in the region, particularly in Milan. The role of non-university training and certification programmes is remarkable because they attract international students and tourists, and support high-quality and professionalised creative industries, including design and musical performance. At present, there is little information on the role of these programmes, their connections with universities and the effects of this education system on the creative industry sectors in the region.

In addition, given the high proportion of self-employment and small business in the creative sector, the regional universities may be able to contribute to the development of the regional creative economy by developing and expanding programmes in entrepreneurship and non-profit management, both in formal degree programmes and through outreach efforts. Creative SMEs face many challenges including a lack of business

skills in marketing and financial management, information gaps, and resource constraints affecting access to new technologies.

Specific decisions regarding the universities roles within this highly diverse and volatile sector need to be devised on the basis of more comprehensive information. The Lombardy universities could play an important role by jointly sponsoring an observatory on the creative sector.

Finally, the technology transfer programmes in the regional higher education institutions could begin to focus on the potential for development of productivity enhancing product and process innovations in creative fields, particularly industrial design. This kind of initiative is being explored by the Politecnico di Milano but will require a shift in university priorities away from the more conventional technology transfer fields.

The environmental and urban development arenas

The Lombardy universities have developed an ambitious agenda to build a global brand around Lombardy food "expertise". This agenda, incorporating both science-based initiatives and cultural programmes, not only takes advantage of the region's broad expertise and international food reputation, but also its special experience in co-ordinating international expositions and events. This agenda could be extended to incorporate value-added strategies for existing food industry SMEs, in order to foster technological innovation. In other words, the plan for Expo 2015 should not only be built around showcasing Lombardy's existing strengths in the broadly defined food industries but also utilised as an opportunity to bring new technologies into the regional SME sector. For example, the planning for Expo 2015 could be used as a vehicle to encourage regional industrial associations to develop programmes in collaboration with universities to make their SME members energy efficiency (for example, through energy audits).

The Lombardy universities should undertake both individual and collaborative initiatives to foster university demonstration of green building practices, including retrofitting of old buildings.

In the field of urban development, the collaboration between universities should help plan for urban investments that will enhance the region's image as a creative economy centre. These include not only resolving congestion and transport problems in Milan and making urban districts more accessible and visible to visitors, but also supporting the information and communication technology infrastructure. This work can provide a link between education and commerce and increase the viability of the small and medium-size businesses that are so critical to the regional economy.

The OECD review team recommends that the following measures are taken to promote universities' the social, cultural and development in Lombardy:

Recommendations for the regional government

- *Develop strategies to extend the productive working lives of the workforce through lifelong learning initiatives, programmes that connect retiring business owners with young entrepreneurs and collaborative action for comprehensive training in health sector to address the challenges of an ageing and more diverse population.*
- *In collaboration with educational institutions, build a global brand for Milan as a centre of design education with the aim to create a strong export industry.* Encourage collaboration with universities and non-university higher education institutions to develop the knowledge base in the regional economy and attract young creative workers and students to the region.
- *Build a global brand around Lombardy food "expertise". This agenda could be extended to incorporate value-added strategies for existing food industry SMEs, in order to foster technological innovation.* The plan for Expo 2015 should not only showcase Lombardy's existing strengths in the broadly defined food industries, but also bring new technologies into the regional SME sector.
- *In collaboration with the university expertise, resolve congestion and circulation problems in Milan, making urban districts more accessible and visible to visitors.*

Recommendations for higher education institutions

- *Contribute to the social and cultural inclusion of the diverse immigrant population through the university arts and humanities outreach activities, and programmes that include creative immigrant contributions.*
- *Develop interdisciplinary university programmes to provide a better knowledge base in the Lombardy creative economy*. Universities could play an important role by jointly sponsoring an observatory on the creative sector and establish a dialogue between art, architecture and design through joint education programmes.
- *Contribute to the development of the regional creative economy by developing and expanding programmes in entrepreneurship and non-profit management, both in formal degree programmes and through outreach efforts.*

- *Develop university technology transfer programmes to focus on the potential for development of productivity enhancing product and process innovations in creative fields in the region, particularly industrial design.*
- *In collaboration with the regional government, encourage and help plan urban investments that will enhance the region's image as a creative economy.*
- *Undertake both individual and collaborative initiatives to foster university demonstration of green building practices, including retrofitting of old buildings.*

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Chapter 5

Capacity building for regional development

The extent to which universities and other higher education institutions engage in regional human resource development and innovation depends greatly on the policy context and the incentives that are in place to encourage such collaboration. This chapter examines the current capacity and capacity building activities for region-wide and local co-operation in Lombardy. It addresses the policies, strategies and tools used by the central and regional governments, and universities.

The Regional Development Plan and the new university law can unleash the potential of universities for not only greater efficiency and accountability but also regional development, It will be important the forthcoming secondary legislation will translate into operational rules and that regulation is then effectively implemented. Collaboration among the diverse regional actors will also require special programmes, incentives and accountability schemes.

Introduction

The higher education sector is a major contributor to the development of the Lombardy's economy and society. It generates skills and knowledge for the Lombardy business, industry, community and government sectors. It constitutes an important knowledge-based service industry. An important goal of the regional agenda in Lombardy is the decentralisation of competencies relative to universities, innovation and research. The regional government has actively supported collaboration between universities. For example, the Roundtable of Rectors of Lombardy Universities has promoted collaboration among the institutions and with the government. While a large number of collaborative bodies have been established in the region, the main hurdle to overcome in order to reinforce co-ordination and collaboration within the region is the strong individualistic behaviour of both higher education institutions and the economic actors (IReR, 2010).

In the context of organisational and institutional "thickness" coupled with a lack of co-ordination and a lack of clear local and regional mission for universities, this chapter examines the following questions:

- Does the current higher education system respond to the needs of Lombardy?
- Do the current structures and mechanisms support and incentivise regional and civic engagement of the universities and other higher education institutions of Lombardy?
- Does the Regional Government of Lombardy have the capacity to steer the higher education system to meet the needs of Lombardy and does it have a clear strategy for the development of higher education?
- What lessons can be learnt from international experience?

Higher education system: need for system diversity

System diversity in terms of the types of higher education institutions, study programmes and modes of delivery is necessary to ensure that the higher education system has the capacity to meet the challenges of a knowledge society. Those challenges increase considerably when the profile of the student population is changing, as is the case in most European countries, due to widening access and the educational needs of an ageing population.

The higher education sector in Lombardy is, principally, a university system; there is some diversity of mission, but the overwhelming emphasis is on classical academic provision. The university system covers the whole region with a university or a satellite campus in every province, albeit a high concentration in Milan. Conservatories and academies (AFAM) are also present in most provinces. Despite the presence of some of the most specialised institutions in the country, the university sector features insufficient differentiation in terms of degree programmes offered both regionally and generally, with overlap and repetition among the universities.

The focus on the university sector means that it operates at a distance from the rest of the higher education, for example, the vocational higher education institutions and AFAM institutions. While in many other European countries vocational higher education is the responsibility of universities of applied sciences – the *Fachhochschule* in Germany, the *ammattikorkeakoulu* in Finland or the *Politécnico* in Portugal –Italy has not developed a strong vocational higher education sector.

In 1996, the increased labour market demand for higher vocational qualifications led to the development of non-university vocational education. IFTS system (*Istruzione e Formazione Tecnica Superiore)* – co-ordinated, controlled and certified by the regional authorities – was conceived as a joint venture of a network of institutions, universities, firms, vocational training centres and secondary schools, as well as other public and private associations. Today, the IFTS programmes are the responsibility of professional training/education institutes.

In 2006, the Lombardy Region supported the creation of 31 centres for higher professional and technical training/education (*Poli formativi*) involving the educational sector (high schools, professional training centres, universities) and the economic/social sector (enterprises, trade unions and associations). The aim was to map and identify the needs of the different sectors in terms of labour market skills and develop short training programmes and courses to address those needs by upgrading the skills of students and employees and re-skill the unemployed population. No robust data is available about the number of students and their origin. Evaluation of the quality and impacts of this initiative on the region and the labour market would be necessary.

Type B tertiary education is important to build capacity at regional level. The development of a knowledge-based economy requires a diverse set of skills and competencies and vocational education has an important role in not only fostering those skills but also for widening access to higher education. Therefore, it is important that the current vocational professional

education in Lombardy is evaluated and ways to improve technical education are examined.

HE governance, funding and quality assurance

Governance mechanisms

During the last five to ten years there has been a strong European-wide movement to change university governance and management and to make the institutions more responsive, autonomous and accountable to the stakeholders. The aim is to endow universities with governance mechanisms capable of taking the appropriate decisions and ensuring that they are implemented in a timely manner. As a result, models of governance inspired by the corporate world are becoming more common in universities in many European countries.

The new university governance models typically include three levels of organisation: the Board, the Rector (or President), and the Management Council. The Board, which includes representatives of stakeholders, has competencies for strategic decision making and the responsibility for choosing and appointing the Rector. The Rector's competencies and responsibilities are similar to that of a Chief Executive Officer of the institution. The Management Council is often presided over by the Rector, and its membership is limited to a small number of appointed members, chosen by the Rector. In many cases, it is the Rector that appoints deans or heads of departments, which are nominated by a recruitment committee reporting to the Rector.

This governance model centralises decision power on the Rector and her/his team. It gives the Rectorate the responsibility of developing and leading the institution. At the same time, it also includes establishing adequate participatory mechanisms for the stakeholders and the university community. The model relies on the institutional leaders' leadership qualities to guarantee the necessary mobilisation within the institution. It is expected that this model will streamline the process from strategic decisions to implementation, help the institutions to adapt and respond to changes, and enact changes in the institutions themselves to meet the needs of the economy and society.

Universities in Italy and in many other countries have faced challenges in identifying the optimal degree of centralisation of power in decision making and implementation. Given the specific organisational

characteristics of the universities, strong co-ordination of decision making processes in many countries may be more appropriate than centralisation.

The 2010 law on university reform (law 240/2010) aims to enhance institutional autonomy and accountability by improved monitoring of performance and linking rewards to performance (see Annex 1.1). The new law is promoting the separation of academic and administrative management of the institutions. It is important that the universities take measures to ensure that new university statutes will strike the right balance between autonomy and accountability.

One of the important elements of university autonomy is in the area of staffing, *i.e.* the extent to which universities have control over the financial aspects related to their staff. This includes control over the overall salary costs and individual salary levels, as well as the degree of flexibility that universities have in the recruitment of their staff (even if procedures are regulated to a certain degree). In some countries, universities are gaining a greater flexibility in their staffing autonomy, in particular countries where staff are directly paid and/or employed by the university (instead of the state). The ability of universities to define individual salaries is still, however, controlled to a large degree by the state.

In some countries, the majority of staff at higher education institutions have civil servant status, which highlights the need to continue the change towards more flexible forms of employment for university staff. There are significant differences in the recruitment of staff, ranging from a larger degree of freedom to formalised procedures including external approvals, sometimes by the country's highest authorities. Although this is sometimes a formality, it, nonetheless, has an impact on the length of a recruitment procedure and the flexibility to act quickly in a competitive, increasingly international recruitment environment.

In Italy, the new university law has abolished automatic salary increases, but procedures to recruit and promote higher education staff are still highly regulated by national tribunals.

Another challenge is the ageing of academic staff, particularly professors and to some extent associate professors. This may have the effect that the most mobile associate professors will look elsewhere for employment as professors. The fact that 53% of professors are above sixty years of age, approaching the time of retirement, will provide an opportunity to plan ahead in terms of positions and strengths areas.

Incentive mechanisms for university faculty and staff

There is a lack of national, regional and institutional policies to improve the incentives for regional and local engagement of universities and their faculty and staff. In Lombardy, the recruitment and promotion of the university staff are nearly exclusively determined by research performance, measured primarily by publications. Management and leadership functions are poorly rewarded, and the "third mission" activities have been traditionally absent from the list of factors that have an impact on faculty career development.

Universities need to have their own policies, mechanisms and incentive structures to enhance, recognise and reward the importance of regional engagement. There also needs to be appropriate methods to evaluate the contribution of staff to regional development in order to take it into consideration in staff appraisal.

The University Rovira i Virgili in Tarragona, Spain provides an example of innovative management response by a public institution operating under the Spanish university legislation. The universities in Lombardy are encouraged to examine this example to help mobilise their faculty and other staff for local and regional development, (see Box 5.1.).

Box 5.1. Incentives for faculty participation in "third mission" activities

The University Rovira i Virgili in Tarragona, Spain has a very active agenda in "third mission" activities, including creating entry points for small and medium-sized enterprises (SMEs) to the university knowledge base, developing social and cultural programming in 22 cities in Southern Catalonia, and participating actively in fostering a knowledge based petro-chemical industry cluster in the sub-region.

The university faculty contracts recognise the importance of and give value to faculty participation in these outreach efforts. The university faculty contract has been re-organised around a system with a ten-point base. All faculties are expected to do 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 an SME to implement a technology transfer or technology commercialisation project. For other faculty, reaching the ten points may mean additional research and publication.

Box 5.1. Incentives for faculty participation in "third mission" activities (continued)

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 to expand its third mission activities. All of the criteria for performance to constitute a unit contributing to the ten-point base 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.

Source: OECD (2010), Higher Education in Regional and City Development: The Autonomous Region of Catalonia, Spain, OECD, Paris.
www.oecd.org/dataoecd/28/36/46826969.pdf.

Funding mechanisms

Italy devotes fewer financial resources to tertiary education than other OECD countries. (See also Chapter 1.). University revenues are made of tuition fees (capped at 20% of the state funding, FFO), contracts, research grants and state funding provided by MIUR through the Ordinary Fund for Higher Education (FFO – *Fondo per il Finanziamento Ordinario*) and project based funding.

In 2010, 10% of state funding (FFO) (increased from 7% in 2009 and from 0.5% in 2006 and 2007) was allocated to universities on the basis of teaching and research performance (with weights on one-third and two-thirds respectively). While 10% is a small share to be useful in steering university performance, Italy intends to progressively grow this share to 30%. Teaching indicators include the number of students enrolled (those that complete 5 credits) and the ratio of the credits actually gained to the number of full-time students "should" have gained in a years. In addition, the indicators take into account the impact of the universities on the productive sector, for example, the percentage of university graduates that find employment three years after graduation and knowledge transfer activities (patents, spinoffs, university-industry collaboration). ANVUR will decide on future criteria.

A considerable share of the state funding (FFO) has been spent on the annual salary expenses of the permanently employed staff. This share was 82% in 1998 and grew to 89% in 2008 due to new recruitments and career

progress of the staff but, above all, to the increases in pay to staff as laid down by the national regulations. In future, staff costs will remain capped at 90% of an institution's funding.

One of the most effective mechanisms in steering higher education system is the funding model. Introducing a strong performance-based allocation model can help to achieve policy objectives, increase efficiency, improve accountability and encourage a greater degree of institutional innovation and specialisation. Performance-based funding also encourages greater transparency in how resources are utilised by directly relating inputs to outputs. The state funding (FFO) of Italian universities has a performance-based element but this has not been fully implemented. There is also a lack of robust data about the specific indicators.

The Regional Government of Lombardy has requested larger competencies in the field of higher education, and the transfer of state resources for university to the region. A careful design and implementation of the university funding model would provide a tool for the regional government to steer the university system to encourage the required institutional behaviour, for example, in order to ensure that courses and programmes are aligned with regional needs and that an appropriate number of graduates are educated in a particular discipline. It would be important to ensure that indicators are clear and shared by the institutions, that a process is in place to analyse the impacts of the funding system. Furthermore, information about the individual universities' performance and the cost of their operations should be made more transparent.

The university funding model could establish strong incentives to mobilise universities for regional engagement through the launch of a competitive funding model for programmes that are needed in the region and its labour market. Competitive funds could fulfil many objectives including the improvement of quality, relevance and efficiency of the universities.

Experience in OECD countries shows that a variety of funding mechanisms can be used to provide incentives for regional engagement of higher education institutions, for example:

- Formulae for block grant funding could include higher weights for enrolment from special populations such as students from low socio-economic and/or immigrant backgrounds or for enrolments in academic programmes related to regional labour market needs.
- Policies governing financial aid to students can provide higher amounts for in-region students and special populations.

- Eligibility for special or "categorical" funding could be contingent on evidence of regional engagement and focus.
- Requirements that institutions collaborate in order to obtain funding. This could provide incentives for higher education institutions to facilitate mobility of students (credit transfer within the region) and share programmes and other resources in efforts to serve the region.
- Provision of matched funding schemes to encourage higher education institutions to engage with regional employers in education and training services.

Quality assurance mechanisms

The importance of quality in higher education has increased in Europe during the last decade due to the key challenges of promoting the Bologna process, participating in the European Higher Education Area and creating the European knowledge society. Quality and its assessment are important in order to guarantee the trust between higher education institutions, and the private and public sectors to ensure recognition of degrees. It is also important for mobility to ensure that the institutions accept students who have acquired a certain number of credits in another institution (or abroad). Quality development in higher education includes not only quality assurance (QA) processes, but also the evaluation of teaching, research, institutional management and governance, as well as implementing change to improve the institution on the basis of the evaluation. The key factor for quality enhancement is not the nature of external or internal QA processes but the availability of resources to implement the required changes, plus appropriate governance and strong leadership to carry them through.

The system of accreditation of university degree programmes in Italy was launched in 2001 with the double objective of formal approval of new degree programmes after the Bologna restructuration and accreditation subject to minimum quality standards in teaching personnel, libraries, laboratories and other facilities. Programmes that do not meet the minimum quality standards are not funded.

The process of accreditation has been the responsibility of the Committee for Evaluation of the University System (CNSVU). The score board of indicators used in the funding formula for distributing the 10% of the FFO (Fund for University Finance) were originally developed by the Committee for Evaluation of the University System (CNSVU) together with the Committee for Research Evaluation (CIVR). The Italian Evaluation Agency (ANVUR, *Agenzia nazionale di valutazione del sistema universitario e della ricerca*)[1] recently replaced these bodies. ANVUR can

develop into an important instrument not only for degree accreditation, but also to work with universities in enhancing their performance and quality. The institution responsible for the evaluation of the governance and management of the institutions provides a powerful tool not only to validate institutional policies, but also to lead the change process.

The quality of higher education is at the heart of the setting up of a European Higher Education Area. Consequently, the development of quality assurance at the institutional, national and European level is essential and points to the need of developing mutually shared criteria and methodologies on quality assurance.[2] A most important point in the European Standards and Guidelines, in operation since 2007, is the emphasis on the assumption that the primary responsibility for quality assurance in higher education lies within each institution itself, therefore providing the basis for real accountability of the academic system within the national quality framework. Institutional autonomy in the areas of employment, budgets and policies is a necessary condition for effective quality assurance. This autonomy means that the leadership and appropriate governance in higher education institutions are key factors for institutional quality enhancement.

The development of the quality assurance system is key to helping higher education institutions in Lombardy improve their teaching, research and public service functions in order to become an internationally competitive higher education system. If the region wishes to improve its global positioning, significant efforts should be made to improve the quality of higher education institutions and their education provision using as a reference the highest international benchmarks. It is also important to emphasise the need for flexibility and diversity in the higher education system. Furthermore, the quality assurance system should place significant importance to the learning and employment performance of graduates, and should include the information provided by the employers. By doing this, higher education institutions would benefit from input for their academic programmes, strengthened ties with graduates, employers and the community at large.

The Regional Government of Lombardy could explore the ways to develop a roadmap that would guide the transition to a mature quality development system. Lombardy could also explore the feasibility of establishing a regional quality assurance organisation or agency, in co-ordination with the national agency, to which all higher education institutions could be invited to participate on a voluntary basis. An independent agency could establish accreditation criteria that are competitive at the international level. At the initial stage, voluntary involvement could be supported with incentives offered to those institutions willing to participate. This should be supported by professional training

within the higher education community and external stakeholders such as employers, parents of potential and current students and alumni. Engaging key stakeholders in the process and linking efforts more concretely with outcomes, incentives and institutional change will help higher education institutions take more "ownership" of their own institutional quality assurance systems as a tool for improving their institutional effectiveness rather than a mere requisite imposed by government agencies.

Furthermore, the experience of other OECD countries suggests that criteria emphasising regional engagement and responsiveness can be included in programme review and approval. In the case of Lombardy, these regional criteria could include:

- Data documenting the specific gaps in access and opportunity for the population and important sub-groups (e.g. students from low socio-economic background).
- Data documenting relevant regional labour market needs and potential future needs arising from regional development plans.
- Evidence of the engagement of regional stakeholders (employers, community representatives and representatives of under-served population groups) in programme planning and design.
- Emphasis on regional engagement (e.g. internships, community service, student research on regional issues) within the curricula and student experience.

Table 5.1. Typology of tertiary education quality frameworks

Variable/ type	Type 1: Traditional	Type 11: Transitional	Type 111: Mature
Approach for quality	Quality Control (QC).	Quality Assurance (QA).	Quality Enhancement (QE).
National efforts	Focus on procedures to control/impose quality measures.	Procedures accompanied by incentives, training and monitoring.	Accreditation based on adoption of QA practices.
Level of institutional intervention	Institution-wide.	At the level of academic offerings.	Institutional and academic offerings.
Timing of intervention	*Ex ante facto.*	*Ex post facto.*	Both.
Dominant evaluation approach	Educational inputs. Emphasis on institutional indicators.	Educational outcomes and processes. Emphasis on learning outcomes and institutional effectiveness.	Both.
Participatory approach	Mandatory participation.	Voluntary participation.	Both.
Applicability by institution type	Either private OR public educational institutions. Differential treatment.	Private AND public educational institutions. Trends towards equal treatment.	Educational institutions and specialised accrediting agencies. Equal treatment.
Applicability by institutional level	Universities.	Universities and some non-university institutions.	All levels of the tertiary education system.
Level of government participation	Central. Government Agency.	Semi-autonomous.	Independent. Non-governmental entity.
Level of student participation	QA system application.	QA system design.	Both

Source: Adapted from Marmolejo (2005). "*Internacionalización de la Educación Superior: Algunas Reflexiones*", *Educación Global*, No. 9, AMPEI, Guadalajara.

Strategies and capacity building at the regional level

Building capacity within the region requires a new approach to the relationship between the regional government and higher education institutions. That approach should include an integrated vision for the region, an implementation plan, allocation of resources and an embedded system of evaluation. This is particularly important in Lombardy, where the regional government is requesting more competencies in university education.

Lombardy, one of Italy's 20 regions, comprises 12 provinces and 1 546 municipalities. The legislative power, remit and responsibilities regarding education are divided between the state and the region according to the principle of subsidiarity. The state has the responsibility for the general provision of education. The Regional Government of Lombardy is responsible for the provision of student services and financial support for new degree programmes or university buildings. Furthermore, the region is also responsible for vocational education, in particular in terms of creating an integrated system of education and professional training. (See also Chapter 1, Table 1.1.)

At the moment, five autonomous regions (Sardinia, Sicily, Trentino-Alto Adige, Aosta Valley and Friuli-Venezia Giulia) have greater powers in relation to legislation, administration and finance. For example, the province of Trento has, since February 2010, enjoyed full competencies in university education.

The regional government of Lombardy has requested additional competencies from the Italian state in several areas, including the university sector. With the new competencies, the regional government of Lombardy is seeking to establish a Regional University System with greater autonomy concerning the provision of degree courses with a specific regional focus and to transfer state resources for university funding to the region (IReR, 2010).

In March 2010, the President of the Lombardy region, Roberto Formigoni, was re-elected for a five-year period and following the election, a five-year Regional Development Plan was designed. The Regional Development Plan is the planning and co-ordination instrument involving different stakeholders, such as universities. It has a strong focus on the knowledge society, sustainability and demographic change. The most important goal of the regional agenda is the decentralisation of competencies relative to universities, innovation and research. This provides an opportunity for the higher education institutions to become more active

players in regional development. Taking full advantage of this opportunity requires both a strategic plan and action plans involving all higher education institutions. A strategic plan is necessary to enable the regional government to strengthen its request for greater autonomy in higher education, and to eventually help the regional government take full advantage of such powers.

To promote interaction between the region and higher education a number of initiatives and co-ordination mechanisms have been established. The Rectors' Regional Coordination Committee, a regional section of the CRUI, makes proposals at the national level based on regional needs. The Conference of Autonomies aims to encourage the dialogue among regional stakeholders: provinces, municipalities, chambers of commerce, universities and others. The Regional Scholastic Office brings together representatives from universities and secondary schools to analyse regional training needs and to identify best practices in teaching.

The Roundtable of Rectors of Lombardy Universities was set up by the regional government with the aim of making comparisons between the different strategies and priorities and of starting concrete collaboration (IReR, 2010). One of the outcomes of its work has been "the Agreement for the Collaboration and Creation of Initiatives to Increase the Attractiveness of Lombardy." This agreement was signed in 2009 between the regional authorities and universities in order to establish a collaboration network of all higher education institutions. The agreement has been backed up by funding (EUR 61 million), co-financed in equal parts by the regional government and the universities. Two representatives of each university and three members coming from the regional government make up the steering committee. So far, the agreement has been used to support post-doctoral research in selected areas such as agriculture, food, energy, environment, health, advanced manufacturing and cultural heritage.

At the same time, there are few examples of collaboration among institutions, joint degree programmes or joint planning of degree programmes, which would be important for a rational use of resources. Collaboration in education provision should be addressed by the Roundtable of Rectors in an effort to rationalise the system and avoid unnecessary competition.

In order to ensure return on public investment there is a need for better co-ordination between the strategic plans and monitoring the results. There is currently no overarching plan that integrates the efforts and assesses the results of the various bodies and initiatives. For example, while the Agreement for the Collaboration and Creation of Initiatives to Increase the Attractiveness of Lombardy is a good example of collaboration, it would be

important to support it with monitoring and evaluation mechanisms in order to ensure positive impacts on regional development.

A permanent partnership structure bringing together the regional government, higher education sector, and key public and private stakeholders has been established to provide a vision and an action plan for the implementation of a long term strategy. The *Patto per lo Sviluppo* (Pact for Development) was signed in 1998 and updated in 2001). It was subscribed by nearly 50 social and economic organisations, including the largest trade unions and business associations. The Pact inaugurated a partnership approach to define social and economic policies in Lombardy. Through it, social and economic partners co-operate to set and share strategic choices and priorities, as well as the ensuing measures, to which everyone – in accordance with their own role and autonomous competences – commit themselves. In particular, the Regional Government committed itself to consult the partners in each crucial step of social and economic policymaking (for instance before the adoption of the Regional Development Plan. The regional government could also consider introducing competitive funds to mobilise the higher education sector for regionally relevant action and challenge-driven research. Box 5.2 contains a few examples from OECD countries and regions.

Box 5.2. Examples of strategic co-operation in regions

Twente, The Netherlands

In the Netherlands, the Innovation platform Twente, originally established by the Province of Overrijssel and Network City Twente, involves representatives from industry, local governments and major higher education institutions contributing to the development of the region. It elaborates a vision for an innovative Twente region and publishes a delivery plan. It has identified key innovative actors and projects that could be harnessed to boost innovation in five key clusters. The delivery plan aligns funding from municipalities, the province and the regional development agency, and has aimed to develop multi-agent projects across the five regional clusters.

Regional Growth Forums, Denmark

In Denmark, in the wake of the local government reform that came into effect in 2007, Regional Growth Forums were established with representatives from the newly created regions, municipalities, local trade and industry, the institutions of education and research and the parties of the labour market. Regional Growth Forums monitor local and regional opportunities for growth and formulate regional development business strategies that provide input into the development plans of the regional councils. The success of this reform and the forums is dependent on the financial resources that will be devoted to the new regions and to their ability to influence national and local policy making.

Maakunta, Finland

In Finland, the Ministry of Education has requested higher education institutions to jointly devise regional strategies for areas that are larger than a municipality or a county (maakunta). At the same time, each regional council elaborates a four year regional programme for its maakunta. Though higher education does not belong to the matters governed by the regional development legislation, the maakunta-specific implementation plans list a number of expectations regarding universities and polytechnics.

The Helsinki Culminatum Ltd. in Finland provides an example of a long-standing "triple helix" partnership structure that brings together all higher education institutions in the Helsinki metropolitan area, the regional council, local governments and the business community to promote cluster development in knowledge-based industries and to build an innovation ecosystem (see Box 5.3).

Box 5.3. Triple Helix model: the Helsinki Culminatum Ltd.

For more than 15 years, the University of Helsinki and the City of Helsinki have built up their co-operation, which has a focus on: science-driven business formation with the support of a business incubator and science park; urban planning and traffic planning to develop campuses, and transport and logistics between them; a common Student City concept to increase the city's international appeal; urban research supported by nine professorships, and collaboration with the city's own think tank, Helsinki City Urban Facts.

The University and City of Helsinki have also initiated the establishment of the Helsinki Region Centre of Expertise Culminatum Ltd. This public-private organisation is based on the "triple helix" model: one-third of its shares are owned by the local universities and research institutes, one-third by the City of Helsinki, its neighbouring municipalities and the Uusimaa Regional Council, and one-third by the business community, financers and science park companies.

Helsinki Culminatum, which forms a co-operation forum and a basis for the development of common projects, has two key missions:

- Managing regional cluster-building activities in six knowledge-based industries. Development programmes and actions are funded mainly by the local governments and by national innovation agencies. Universities and polytechnics play a catalysing role in the development projects. One of the aims is to help university spin-off companies grow. Cluster-building activities by Culminatum combined with funding from the National Technology Agency (Tekes) have contributed to increased interaction between SMEs and higher education institutions.

- Developing the Helsinki region as a world-class innovation ecosystem (Ideopolis). Early 2005 saw the creation of a joint innovation strategy *Yhdessä Huipulle* (Together to the Top). It highlighted 26 development collaborations between the universities, local governments and the business community that aimed: *i)* to increase the international appeal of local research and education; *ii)* to develop strong clusters, and create test beds and living labs for product-service development; *iii*) to apply innovations to renew the welfare services provided by the cities and to consolidate the role of the cities in the R&D; and *iv*) to support university-driven business growth by, for example, developing a second-generation science park concept.

Source: OECD (2006b), OECD Territorial Reviews: Stockholm: Sweden, OECD, Paris.

Regional competitiveness framework of Lombardy

A regional competitiveness framework is often seen as the key to regional development. The regional competitiveness approach argues that regional capacity can be nurtured and developed by identifying the competitive advantages of the region. Furthermore, public investments must be aligned with economic niches (Porter, 1998 and 1999). Table 5.2 shows the progress made in Lombardy in terms of the four essential elements for competitiveness in the global economy: strategy, governance, innovation and entrepreneurship. It also identifies a number of gaps that need to be bridged.

Table 5.2. The Lombardy's competitiveness framework and HE's role

Essential ingredient	Target (Ideal)	Lombardy (Actual)
Strategy	To identify the region's distinct competitive advantage. To align public and private actions necessary to seize it.	• Progress made in achieving a shared vision among stakeholders in terms of key knowledge-based focus areas. The Regional Development Plan (2010-15) provides a framework for Lombardy's development and was formulated with the input from regional stakeholders. • Plans to internationalise the region through focus on RDI, human capital development, and excellence in health fields. • Lack of alignment between public, private and non-profit investments.
Governance	To supply a framework to unite public, private and non-profit leaders as a collective guide and owner of the strategy.	• The regional government has limited revenue raising authority, but has requested stronger competencies in 12 areas including university education, research and innovation. • Advisory bodies and roundtables with limited authority to draw together key stakeholders.
Innovation	To link the region with new technologies, and new ways of working and living that can transform the region's social and economic assets.	• Regional Government has secured matched funding from central government to support high technology development (EUR 59 million from ministry and EUR 61.5 million from the region). • Universities' RDI activities have a technology/science push approach, with limited focus on SMEs or cultural and creative industries. • Universities are also more focused on knowledge generation (publication) than knowledge transfer.

Table 5.2. The Lombardy's competitiveness framework and HE's role (continued)

Entrepreneurship	To provide a fertile climate in which new ideas can be transferred successfully into the marketplace.	• High degree of entrepreneurialism in the ageing SME base. • Universities support knowledge-based start-ups. Fragmented efforts to support SMEs and ethnic entrepreneurship. • Active industry associations.

Source: Adapted from Drabenstott, M. (2008), "Universities, Innovation and Regional Development: A View from the United States", Tertiary education Management and Policy, Vol. 20, No. 2, OECD, pp 43-55.

Conclusions and recommendations

Lombardy has a growing capacity for strategic collaboration at the regional level. The Regional Development Plan has a strong focus on developing the knowledge society, sustainability and demographic change, and has been developed in collaboration with key stakeholders, including the universities. An important goal of the regional agenda is the decentralisation of competencies relative to universities, innovation and research. A number of instruments and bodies have been established to promote university-industry collaboration and between the universities and the regional government.

The Lombardy higher education system has a high number of institutions distributed across the region, but limited diversity due to the underdevelopment of the vocational higher education sector. The focus on the university sector means that it operates at a distance from the rest of the higher education sector, including AFAM institutions and vocational higher education institutions. The development of Type B tertiary education would be particularly important for Lombardy to build capacity at regional level. The knowledge-based economy requires a diverse set of skills and competencies and vocational education has an important role in fostering those skills and widening access to higher education.

The universities in Lombardy are increasingly involved in science and technology transfer activities and most have developed their own interface structures to manage these tasks. The principal driver for universities is scientific excellence and/or its applicability to business competitiveness wherever firms may be located. There is a narrow understanding of the third mission and regional engagement, focusing on "science and technology push," which may act as a constraint for a broader approach to regional and local development. Moving away from the transactional or consultancy approach of knowledge exchange towards long term partnerships and

partnership building would allow the universities to improve access to knowledge captured within the institution and improve the quality and scale of knowledge exchange activities.

Building capacity for co-operation between the universities and the region requires a new approach to the relationship between government and institutions. Within universities, there is a need for greater alignment with the local and regional needs. Currently, despite the networks and roundtables, universities have a limited tradition for collaboration and the university degree programme portfolio remains supply-driven. While there is an abundance of projects and also evidence of excellence, collaborative mechanisms among universities and higher education institutions in general, have not yet been fully mobilised to build capacity and foster joint efforts for regional development remain limited. The participation of higher education institutions in fora linked to local and regional development appears fragmented and there is scant information about involvement in activities related to regional development or social integration. There is also a need to clarify the remit and increase collaboration between the existing collaborative organs, and to develop robust monitoring and evaluation systems.

Understanding the needs of the region, evaluating the policies, the system and institutions, and acting upon the results is essential to building a responsive and responsible network of institutions that addresses the regional needs, and has a national and international impact. Effective ways to mobilise universities for regional engagement are linked to funding incentives and quality assurance.

As elsewhere in Italy, there is no explicit third task or regional development task assigned to higher education institutions, but regional engagement is left to the initiative of the individual institutions. The university sector in Italy has traditionally had limited autonomy in key areas of staffing and funding decision. The new university law enhances institutional autonomy and accountability, and provides an opportunity for the universities to enhance their external engagement with regional and local stakeholders. Within the universities, creating incentives to promote interaction with the region is a good tool to combine international reputation with regional relevance.

Lombardy has significant activities under way for the promotion of regional development and innovation. The OECD review team recommends that the chances of success can be increased if the following measures are taken to enhance partnership building and to reform university governance:

Recommendations for the national policy

- *Make regional engagement and its wide agenda for economic, social and cultural development explicit in higher education legislation and policy.* Provide incentives for higher education institutions' regional engagement in the form of strategic incentive-based funding schemes on a competitive basis.
- *Strengthen higher education institutions' accountability to society by developing indicators and monitoring outcomes to assess the impact of the higher education institutions on regional performance.* Include the contribution of higher education institutions to local and regional development in their annual evaluations.
- *Move from an ex ante bureaucratic process of accreditation of degrees into one of a periodical evaluation of institutions and programmes in the framework of the European Standards and Guidelines*. Most important: internationalise the evaluation process. An international evaluation of higher education institutions in Lombardy with the aim of supporting innovative governance and management is recommended.

Recommendations for the regional government

- *Build an integrated vision of the Lombardy higher education system.* The most important goal of the regional government's agenda is the decentralisation of competencies relative to universities, innovation and research. A strategic plan and capacity building is of utmost importance to enable the regional government to strengthen its request to have greater autonomy in higher education and to be in a position to take full advantage of these special powers.
- *Develop a common vision of local and regional development among higher education institutions, by building on existing links and initiatives that align higher education institutions with the regional needs.* Support the vision with a strategy and milestones, and funding in order to ensure that local engagement is part of higher education institutions' activities and reflected in their development plans.
- *Develop and encourage collaboration between regional stakeholders and higher education institutions in order to foster economic and social wellbeing in the region.* Promote collaboration between the organisations, bodies and units already in existence, clarify their tasks and remit, and strengthen their accountability to the public.

- *Invest jointly with higher education institutions in programmes that bring benefit to regional businesses and community*, for example, translational research facilities that are aligned with the needs and opportunities of the region, advisory services for SMEs, professional development programmes, graduate retention and talent attraction programmes. Consider introducing a region-wide independent quality assurance organisation or agency in co-ordination with the national agency and invite all higher education institutions to participate in it on a voluntary basis.

Recommendations for the universities

- *Take full advantage of the new university law and the subsequent governance change.* It is important that the new university statutes strike the right balance between autonomy and accountability and are well formulated to accommodate this complexity.

- *Make promotions based on merit only.* Inverted age pyramid for university teaching staff enables human resource planning. Review staff recruitment, hiring and reward systems so as to include the regional development agenda. Create mechanisms to monitor and evaluate the activities in this area, to share good practice between the institutions and benchmark this experience with other organisations and localities.

- *Prioritise regional and local development by developing the senior management teams to deliver corporate response expected by regional and local stakeholders without disincentivising entrepreneurial academics.* The universities in Lombardy should attach a top priority to the region-wide socio-economic development and engagement by making the rector or pro-rector (who is reporting directly to the head of the institution) responsible for this task. A professional management structure should be put in place to support this task. Along with science and technology transfer, stronger focus should be given to a broad range of regional and local development such as human capital development as well as social, cultural and environmental development. Incentives should be created to encourage university faculty and staff engagement.

- *Collaborate to rationalise the degree programme offer.* The universities in Lombardy should develop ways to rationalise their offer of degree programmes and to develop joint degree programmes at master's and PhD level.

Notes

1. The decision to establish ANVUR was taken by the Council of Ministers in July 2009. The president of ANVUR was appointed on 2 May 2011.

2. The European Standards and Guidelines (ESG) were developed by the European Association for Quality Assurance in Higher Education (ENQA), European University Association (EUA), European Student Union (ESU) and European Association of Institutions in Higher Education (EURASHE), and adopted at the Ministers of Education meeting in Bergen 2005. The establishment of the European Register (EQAR) for Quality Assurance Agencies was endorsed at the London meeting in 2007 and is now in operation.

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Annex A OECD review team members

Jaana Puukka leads the OECD work on Higher Education and Regional and City Development. She joined the OECD Programme on International Management in Higher Education (IMHE) in 2005 to co-ordinate and manage the first round of OECD Reviews of Higher Education in Regional Development, which took place in 2005-07 and embraced 14 regions in 12 countries. She has led the second round of reviews in 2008-11, which reached out to 14 regions and city-regions in 11 countries, and is also leading the third round of reviews. She is the co-author and editor of the OECD publication "Higher Education and Regions – Globally Competitive, Locally Engaged" (OECD, 2007). Before joining the OECD, she had experience in higher education and regional development in Finland as a national and local government adviser, programme manager, practitioner and evaluator. She has management experience from both the university and polytechnic sector, and has worked in university internationalisation, PR & communication and stakeholder management. In addition, she has experience in the corporate sector in the pharmaceutical industry.

Susan Christopherson is J. Thomas Clark Professor in the Department of City and Regional Planning at Cornell University. She is an economic geographer (PhD, U.C. Berkeley) whose research focuses on economic policy and economic development. Her work in the field of economic development has focused on strategies for revitalising the New York State economy. In the past five years, she has completed policy studies on economic development via targeted workforce development; a clusters strategy to build the photonics industry; the role of universities and colleges in revitalising regional economies; and production trends affecting media industries in New York City. She is an expert on the film and television industries and particularly on work and the workforce in those industries. Her recent research has focused on the way in which trends in media work foreshadow changes in work organization across the economy. She has served as a consultant to the OECD Working Party on the Role of Women in the Economy. In the field of media services, she has examined the

implications of media globalisation and trade policy in China and Jordan for the United Nations Conference on Trade and Development (UNCTAD). Her current projects include studies of phoenix industries in resilient regions and entrepreneurship in creative industries.

Patrick Dubarle, former Principal Administrator at the OECD Public Governance and Territorial Development Directorate (GOV), has co-ordinated and contributed to a number of OECD territorial reviews at the national and regional level and has recently participated in the regional innovation reviews in Italy and Mexico. In 2004-07 he represented GOV in the OECD project on supporting the Contribution of Higher Education Institutions to Regional Development and coordinated the review of the Mid-Norwegian region. He is a graduate from the French "Ecole des Mines", and holds a Master's degree in Economics from the University of Paris Sorbonne. He joined the OECD in 1978 as Administrator in the Directorate for Science Technology and Industry. He was appointed Secretary of the OECD Working Party on regional development policies in 1992, where he was responsible for country regional policy reviews and horizontal programmes. He has worked with national governments in many OECD countries and has spoken at several international conferences. He is the author of documents on high technology policies and sectoral questions including space industry, technological change, technology fusion, innovation and higher education in regional development.

Andrea Hofer, a German/Italian national, joined the OECD in spring 2004 and works as a policy analyst in local governance, employment and skills, entrepreneurship, innovation and SME development at the LEED Trento Centre for Local Development in Italy. She has managed several country reviews and pioneered capacity building activities around local governance and entrepreneurship development. Before joining the OECD, she undertook research and local policy development projects on decentralisation, local governance and public administration reform issues at the University of Federal Armed Forces in Munich, and at the United Nations (UNDP and UNODC). She holds a MA degree in Political Science from the Ludwig-Maximilians University in Munich and MSc degree in Agricultural Engineering/Rural Development from the Technical University of Munich. She has written several articles and book chapters on local governance in transition economies, policy frameworks for local entrepreneurship and innovation support, the role of universities in local economic development, and the impact of outmigration on skills and business sector development. She is pursuing doctoral studies on the impact of local governance on local economic development.

Maria Helena Nazaré began her academic career in Mozambique, in 1973, lecturing at the University Eduardo Mondlane. Before her special

interest in Physics was to take her to the University of Aveiro, in Portugal, she spent three years working on her PhD at King's College London, graduating in 1978. In 1986, she took up leadership of the research group in Spectroscopy of Semiconductors in the Department of Physics at the University of Aveiro. She has been developing a long-standing activity in higher education management, be it at the University of Aveiro, as well as in national and international positions. Rector of the University of Aveiro since 2002, she has formerly been Head of Department, between 1978 and 1980 and again between 1988 and 1990, Vice-President of the Scientific Council in 1990-91 and Vice-Rector of the University of Aveiro, a position held until 1998. Member of the Research Working Group of the European University Association, and member of the EUA Institutional Evaluation Pool, since 2004, she has participated in the evaluation of universities in Spain, Turkey, Palestine and Slovenia. She was appointed Vice-President of the EUA in 2009 and will become EUA President in 2012. She is also chair of the Portuguese Rector's Conference Committee for Research and Knowledge-transfer and a member of the administration board of Portugal Telecom.

Giuseppe Ronsisvalle is the Dean of the Faculty of Pharmacy at the University of Catania and President of the Italian Conference of Deans of Pharmacy. He is in Italian Bologna Expert team and is Ministerial Delegate in the IMHE Governing Board from 2000 and Italian academic representative and Bureau Member in the CD-ESR of the Council of Europe. He has been member of the Italian ministerial committee for the evaluation of strategies for the internationalization of the university system for long time and Rector Delegate for International Affairs and for University Continuing Education. He was member of the university panel for the CRE evaluation of the University of Catania. He has been recipient of grants within the EU program on Learning Regions, a project led by the University of Stirling. He was also is a graduated of the University of Catania and had several sabbatical leaves in Milan (I) (Polytechnic) and Minneapolis, Minnesota. He participated in 2005 in the EUA project on Doctoral Studies and has been member of the GRUNDTWIG EU working party. Former president of the MedChem Division of the Italian Chemical Society is now Member of the Gioenia Academy of Natural Sciences of Italy.

Annex B Review visit agenda

OECD review visit programme
28 June -2 July 2010

Monday 28 June 2010

09:15 - 10:30 **"Patto per lo sviluppo"**, Pirelli Tower [Milan]

10:30 - 13:00 **Meeting with Steering Committee**, IReR [Milan]

13:30 - 15:00 **Workshop on "University-industry relationship: the best practice of PhD Executive"**, IReR [Milan]

Uberto MINGHI, Senior Executive of Assolombarda

Paolo BISCARI, Member of the Steering Committee of the PhD School of the Politecnico di Milano

16:00 - 18:30 **Bocconi University**, [Milan]

Campus tour

Erika ZANCAN, Executive Assistant to the CEO

Student Affair Division

Cristina MILESI, Head of Graduate Recruitment

Sonia GIUDICI, Head of the Student Services Office

Isabelle LHUILLIER, Career Service, Markets and External Affairs Division

Meeting with Rector and Dean of School of Management

Guido TABELLINI, Rector

Alberto GRANDO, Dean of SDA Bocconi

Tuesday 29 June 2010

9:30 - 10:30 **University of Bergamo**, [Bergamo]

Stefano PALEARI, Rector

Sergio BARAGETTI, Member of the Centre on Innovation Management and Technology Transfer

Giuliano BERNINI, Vice-Chancellor International Relations

Gianpietro COSSALI, Vice-Chancellor Scientific Research

Remo MORZENTI PELLEGRINI, Vice-Chancellor Relations with Public Institutions

11:00 - 13:30 **Workshop on "Knowledge economy and innovation**", Kilometro Rosso Science Park [Bergamo]

Cristiano ARRIGONI, Director of Bergamo Formazione - Chamber of Commerce of Bergamo

Lucio CASSIA, Deputy Dean of Faculty of Engineering, University of Bergamo

Valeriano D'URBANO, Managing Director, Centrobanca (UBI Group)

Giancarlo MACCARINI, Scientific Director, Intellimec

Massimo MERLINO, Director Centre on Innovation Management and Technology Transfer, University of Bergamo

Stefano SCAGLIA, Vice-President Innovation, Confindustria Bergamo

Mirano SANCIN, General Manager, Kilometro Rosso Science Park

Alessandra TERRANEO, Lombardy Region, Local Division Bergamo

Roberto VAVASSORI, IR and Business development Director, Brembo

Gianluigi VISCARDI, President Cosberg S.p.A. and President PMI Bergamo

15:00 - 17:30 **Workshop on "Higher education contribution to the demographic challenge. Health and assistance"**, Vita-Salute San Raffaele University [Milan]
Speakers:

Massimo CLEMENTI, Head of Faculty of Medicine and Surgery, Vita-Salute San Raffaele University

Alessandro COLOMBO, Director of Research, IReR

Carlo FERRARESE, Professor of Neurology, University of Milano-Bicocca, and Director of Department of Neurology, San Gerardo Hospital Monza

Jacopo MELDOLESI, Director of Neurosciences Department, San Raffaele University del "Monte Tabor" Foundation

Giovanni NEGRI, Director of Anesthesia and Intensive care Unit, Hospital of Legnano

Pasquale SPINELLI, Past-President FISM, Association of the Italian medical scientific companies

Contributors:

Alessandro *COLNAGHI,* Lombardy Region*,* Health Department

Claudio DI LEO, Director of the Nuclear Medicine Department, Manzoni Hospital, Lecco

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Sonia LEVI, Professor of Biology, Vita-Salute San Raffaele University

Antonio MALGAROLI, Professor of Physiology, Vita-Salute San Raffaele University

David A. MERLINI, First level Doctor General Surgery Department, Hospital Rho - A.O. G. Salvini, Garbagnate

Bernardo Maria ROCCO, Director of Robotics Surgery, IEO-European Institute of Oncology

Norberto SILVESTRI, Medical Director, IRCSS Humanitas

18:00 - 19:00 **Expo 2015**, Expo 2015 Spa Headquarters [Milan]

Stefano BOCCHI, Professor of Crop cultivation methods - Soil preservation - Cultivation of alpine soils, University of Milan

Stefano BURATTI, Lombardy Region, Planning Department

Adriano E. GASPERI, Segretary general of the Scientific Committee Expo Milano 2015

Marialuisa LAVITRANO, Associate Professor of Clinical Pathology and Immunology, University of Milan-Bicocca

Edilio MAZZOLENI, Head of Operations - International Office, Università Cattolica del Sacro Cuore

Alberto MINA, Director on Institutional relations, Expo 2015 Spa

Carlo SECCHI, Member of Board of Directors, Expo 2015 Spa; Professor of European economic policy, Bocconi University

Alessandro TUZZI, Secretary General Rectorate, Università

Cattolica del Sacro Cuore

Gloria ZAVATTA, Theme Development & Institutional Relations Department Agro-Food Area, Expo 2015 S.p.A.

Roberto ZOBOLI, Professor of Economic Geography, Università Cattolica del Sacro Cuore

Wednesday 30 June 2010

9:30 - 11:30 **Workshop on "Sustainable development and beyond: Lombardy and the universities for a low carbon region"**, Fondazione Politecnico [Milan]

Romano *AMBROGI,* Head of Development & Planning Dept., ERSE

Antonio BALLARIN DENTI, Chief Science Advisor, FLA-Lombardy Foundation for the Environment

Umberto BENEZZOLI, Director General of ARPA-Environmental Protection Agency of Lombardy

Matteo BOGANA, Project Manager, Fondazione Politecnico

Angelo CARDANI, Bocconi University

Roberto CHIESA, Member of the Scientific Committee, NanoSurfaces s.r.l.

Edoardo CROCI, Research Director, IEFE-Institute of Economics and Policy of Energy and Environment

Giovanni DOTELLI, *Genport S.r.l.*

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Giuseppe SERAZZI, Member of the Board, Fondazione Politecnico

Alessandro ZEIGNER, Co-ordinator of Politecnico di Milano High Tech Incubator (Acceleratore d'impresa), Fondazione Politecnico di Milano

12:00 - 14:00 **Meeting with students**, IReR [Milan]

14:30 - 15:30 **Lombardy Region Government**, Pirelli Tower [Milan]

Roberto FORMIGONI, President

Gianni ROSSONI, Regional Ministry of Education, training and labour

Paolo ALLI, Under Secretary for Implementation of the government programme and Expo 2015

Alberto CAVALLI, Under Secretary for University and research

Armando DE CRINITO, Director of University and research Unit

16:00 - 18:00 **Workshop on "Creativity in the design sector"**, Politecnico di Milano [Milan]

Mimma BASEGGIO, Design innovation

Arturo DELL'ACQUA BELLAVITIS, Director of Department of Industrial Design, Art, Communication and Fashion - Politecnico di Milano

Carlo VALERIO, Member of Board of Directors, IED-Istituto Europeo di Design

Elena PACENTI, Domus Academy

Marc SADLER, Designer

Patrizia SCARZELLA, Architect and Member of Designer Department, ADI-Association for Industrial Design

Thursday 1 July 2010

9:45 - 11:45 **Workshop on "Agro-food"**, Parco Tecnologico Padano [Lodi]

Roberto BOLLINI, Director Istituto di Biologia e Biotecnologia Agraria, CNR-National Research Council

Cesare BONACINA, Director, Istituto Sperimentale Lazzaro Spallanzani

Gianluca CARENZO, Executive Director, Parco Tecnologico Padano

Giovanni FADIGATI, Lombardy Region, Local Division Lodi

Marcello DURANTI, President of Degree Course in Plant, Food and Environmental Biotechnology, University of Milan

Mario LUINI, Head Section of Lodi, Lombardy and Emilia Romagna Experimental Zootechnic Institute

Carlo MANGO and Rita BACCHELLA, Fondazione Cariplo

Lorenzo MORELLI, Head of Faculty of Agriculture, Università

Cattolica del Sacro Cuore

Giorgio VARISCO, Technical Director, Lombardy and Emilia Romagna Experimental Zootechnic Institute

John WILLIAMS, Science Director, Parco Tecnologico Padano

11:45 – 12:45 **Tour of Parco Tecnologico Padano**

14:00 - 16:00 **Politecnico di Milano**, Politecnico di Milano [Milan]

Meeting with Rectors

Giulio BALLIO, Rector until 31st December 2010

Giovanni AZZONE, Rector since 1st January 2011

Technological Transfert Office

Giuseppe CONTI, Head of Technological Transfert Office, Politecnico di Milano

Gianluca VALENTINI, Rector deputy for intellectual property and spin-off

Career Service

Colombo FEDERICO, Head of Career Service

16:30 - 17:45 **Workshop on "Migration and Lombardy universities: new challenges"**, Fondazione ISMU [Milan]

Gian Carlo BLANGIARDO, Professor of Demography, Università of Milan-Bicocca and Member of Scientific Committee, Fondazione ISMU

Guia GILARDONI, Researcher, Università of Milan-Bicocca

Friday 2 July 2010

9:00 - 14:00 **OECD Review Team internal meeting**, IReR [Milan]

14:00 - 16:00 **Feedback session with Steering Committee and Regional stakeholders**, IReR [Milan]

16:00 - 17:00 **Closing session with Regional Coordinator and Working Group**, IReR [Milan]

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