Republic of Croatia
Ministry of Science, Education and Sports

OECD THEMATIC REVIEW OF TERTIARY EDUCATION
COUNTRY BACKGROUND REPORT FOR CROATIA

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FOREWORD

The Ministry of Science, Education and Sports and the scholars and staff in higher education institutions in the Republic of Croatia have made large steps forward in the development of higher education over the past three and a half years. Some of the more notable achievements include the reform of all undergraduate study programmes, the organization of the quality assurance system, the reform of student representation, an unprecedented growth in budgetary expenditure of 46,4 % for higher education and the founding of five polytechnics, one university and several schools of professional higher education. Even though the very scope of these changes presents a significant achievement, Croatia is still facing many challenges on its path of building a high-quality, competitive and equitable higher education system. One of crucial steps in this process is the creation of a reliable system of gathering and analysis of data.

For this reason Croatia entered in 2004 the OECD project "Thematic Review of Tertiary Education". The project spans 24 countries and aims to provide higher education policy makers the data and analyses necessary for an efficient and effective planning and implementation of quality higher education policies. By joining the project the Ministry has exhibited political support for efforts at transparent identification of problems and challenges, as well as for developing independent guidelines for future development. At the same time, by participating in the project the Croatian higher education system joins the most advanced systems of the world and significantly increases the international visibility of the Croatian higher education. At the same time, the higher education scholars and policy makers in Croatia and abroad are able to gain access to data from the project and to use overarching indicators to compare the Croatian higher education with those of other countries participating in the Review.

The Review will produce two documents on each country: in the first, domestic experts provide a descriptive account of the most important elements of the higher education system. In the second, independent foreign experts write a country note and recommendations for future actions on the basis of the background report and a country visit. During 2005 a team of eminent Croatian experts prepared the country background report,

which you are currently holding in your hands. In June 2006 an OECD expert team visited Croatian higher education institutions and relevant authorities and provided guidelines for future actions.

This Country Background Report provides comprehensive information about the higher education system in Croatia. The topics covered in the report include the description of the wider economic and social context, the description of the higher education system, the role of higher education in the labour market and in research and innovation, the regional role of higher education, higher education and equality, higher education resourcing and governance, quality assurance and internationalization. The report also includes an extensive statistical annex on each of these subjects, which provides a strong background for further analysis.

This report is a result of comprehensive efforts of its authors and provides an unequalled mapping of the higher education system in Croatia. It is my pleasure that I can thank the authors on their work and the quality of their contributions, and that I can thank the associates that provided support in organizing the work on the report. I would also like to thank the OECD and the members of its team that visited Croatia and developed guidelines for the further development of the system. I would like to extend a special thank you to our Croatian national project coordinators, professors Željko Dujić and Pero Lučin. This report presents a decisive step forward in the development of both the higher education system and higher education scholarship in Croatia.

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May 2006

This report was prepared for the Ministry of Science, Education and Sports of the Republic of Croatia as an input to the OECD Thematic Review of Tertiary Education. The document was prepared in response to guidelines the OECD provided to all participating countries. The guidelines encouraged the authors to canvass a breadth of views and priorities on tertiary education issues. The opinions expressed are not necessarily those of the Ministry of Science, Education and Sports of the Republic of Croatia, the OECD or its Member countries.

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CHAPTER 1

INTRODUCTION

1.1 Basic information

Population: 4,437,460 (2001), 4,442,000 (2003, estimated)

Capital: Zagreb (population in 2001: 779,145)

Total land area: 56,594 sq. km

Population density: 78 inhabitants / sq. km

Official language: Croatian

Principal business sectors (percentage of gross value added, 2004): Manufacturing (16.6%), Wholesale and retail trade (10.2%), Real estate, rental and business activities (9%), Transportation, storage and communication (8.8%)

Principal trading partners: Italy, Germany, Austria, Slovenia, Bosnia and Herzegovina

Gross domestic product (GDP): EUR 27.6 billion (2004)

GDP per capita: EUR 6,220 (2004)

Labor force: 2.8 million

Economically active population: 1.9 million

Population aged 15 and over with at least a secondary school education: 59.0% (2001)

Population aged 15 and over with a tertiary education: 11.9% (2001)

Participation of population in adult education programs: 2%

Internet access: 39% of population aged 15 years and over (2004)

1.2 Brief overview of the transitional period (1990-present)

Croatia held its first free elections in 1990 and regained independence in 1991, after seceding from the former Yugoslavia by exercising its constitutional rights. However, this process was followed by an imposed war. The defense activities in some areas of the country lasted until 1995. Economic and social consequences of war are still felt in many affected areas, especially since such areas also tend to be underdeveloped.

Despite these problems, Croatia has been developing in economic, political and institutional terms. It is currently a functioning democracy. Since 2000, it has had several coalition governments. The current majority has been led by the center-right Croatian Democratic Union, which won the last parliamentary elections in late 2003. However, more efforts are needed to build institutions and strengthen the rule of law, including the protection of human and civil rights. Moreover, public administration reforms are needed in order to improve transparency, administrative capacity and effectiveness, as well as to reduce costs. Further decentralization of administrative authority and control of fiscal revenues must be implemented as well. Croatia has also been deepening its relationships with the European Union. Croatia signed the *Stability and Association Agreement* in 2001 and became a candidate for EU accession in 2004. The accession negotiations were opened on October 3, 2005.

1.3 Demographic and social trends

According to the census undertaken in 2001, Croatia has 4,437,460 inhabitants (Table 1.2). Estimates made in 2003 indicate a population of 4,442,000. The size of the population is stagnant and is likely to decline in the future. Although direct comparisons are not possible because of the changes in census methodology, estimates indicate a reduction of approximately 1.7% in relation to the 1991 census.

It is estimated that the total number of inhabitants will decline by 5.1% between 2000 and 2020[1].

In ethnic terms, the majority of Croatian citizens (89.7%) are Croats. The only minority with a share above 1% are Serbs (4.54%). Since at the time of the census, the return of Serb refugees had only just begun, it is likely that their numbers have increased in the meantime, although the majority of returnees are middle-aged people and senior citizens. In terms of cultural identity and representation in the national parliament, one can include Italian, Hungarian, Bosnian and some other minorities. Moreover, the officially reported share of Roma (0.21%) is likely to be seriously underestimated.

The age structure of the Croatian population is relatively unfavorable (Table 1.2). The population is ageing, but the life expectancy is also growing. Average ages of men and women in 2001 were 37.5 and 41.0 years, respectively, whereas life expectancy was 71.1 years for men and 78.1 years for women. Younger age groups are on average shrinking; this trend can be observed in the case of all 5-year age groups of men and women less than 45 years of age (with the exception of the age groups 25-29 and 30-34, which are even smaller than the trend would suggest). Consequently, an imminent reduction in the working age cohort due to lower birth rates and an ageing population can be expected. These trends will also influence the demand for TE, in that the increasing demand for education due to the labor market trends will be partly reduced due to the smaller size of younger age groups.

1 World Bank Edstats, 2004. Available on: http://devdata.worldbank.org/edstats/td61.asp. Accessed: January 18, 2007.

When it comes to migration, official data suggests net positive inflows, which amounted to 11,921 citizens in 2003. This is mainly due to an influx of citizens from Bosnia and Herzegovina. However, this number is decreasing every year. It is likely that the official statistics somewhat underestimate migration, mainly due to the difficulties in recording the movements of citizens – especially in war-affected areas and in the cases of students, professionals, etc.

Current educational achievement levels (Table 1.6) among the population 15 years and over indicate a need for improvement.

Only 11.9% of the population has obtained a TE, whereas 47.1% has completed secondary school. Moreover, 21.8% of the citizens have completed only primary school, while 18.6% of the population has no education at all.

The less educated largely pertain to senior segments of the population. However, the percentage of the total population that is both university graduates and 4-year secondary school graduates (15%) is not sufficient to meet the challenges of a knowledge-based society, especially given the low participation of working age citizens in adult education and lifelong learning (around 2%). There is a widespread perception that human knowledge and capabilities are strategic resources for future development. Knowledge and education are gradually being recognized as factors of personal achievement, corporate competitiveness and economic development as a whole. However, the practice of lifelong learning has not yet gained ground – neither in terms of the perceived needs of businesses and individuals, nor in terms of the institutional preconditions for such learning.

1.4 Economic environment and tertiary education reform

1.4.1 MACRO-LEVEL

During the last five years, the Croatian gross domestic product (GDP) has grown moderately - at annual rates ranging between 3.7% and 5.2% (Table 1.1). Domestic and government consumption and investments were the main drivers for this growth. In 2004, the GDP grew by 3.8%, reaching EUR 6,220 per capita, but its structure has changed. Government consumption has been reduced by 0.3%, whereas net exports have increased. If maintained, this rebalancing of growth drivers should facilitate the sustainability of future economic expansion. Current GDP levels place Croatia among the more advanced countries that are in the middle tier of economic development.

The World Bank classifies Croatia as falling within the group of upper-middle income economies. Becoming a developed country would entail increasing the GDP per capita by approximately 50%.

The tertiary (service) sector predominates within the current structure of the economy, accounting for 65.1% of the gross value added in 2003. The secondary (industrial) sector still contributes 27.1% of the gross value added, whereas the primary (agricultural) sector has shrunk to 7.8%. Further development of the Croatian economy will depend upon expansion of higher value-added manufacturing and services (through entrepreneurship and foreign direct investment), with continuing reliance on few sectors whereby clear competitive advantages exist – most notably tourism and real estate.

Despite the sustained expansion of economic activity and low inflation, there are less favorable aspects of the Croatian economy. Foreign trade and current account deficits are significant (Table 1.1). The central Government deficit reached 4.9% of GDP in 2004, indicating a continuation of high deficit levels. Moreover, the total public debt has reached high levels (46.8% at the end of 2004), and has so far demonstrated no clear signs of a

slowdown. Foreign debt has reached 82% of the estimated GDP. The sustainability of public finance will depend on the generation of higher tax revenues (which should primarily stem from the increased competitiveness of Croatian companies) and/or reduced government expenditures, whereby the costs of the pension and healthcare systems seem to represent the most difficult challenges. Given the deficit levels and a high share of public sector spending (more than 50% of the GDP), a medium-term fiscal consolidation seems likely.

Public expenditures on education amounted to 4.3% of the GDP in 2004. However, the role of the private sector is much less pronounced. Comprehensive and sustainable education reform requires an estimated increase of 1% of the GDP. On the other hand, educational reform and development will mostly occur in the context of fiscal consolidation. In other words, effective education sector reform will require a reorientation of fiscal priorities.

Since the development of a knowledge-based economy brings about increased demand for educated citizens, it can be expected that part of the stimuli will come (and some costs will be borne) by individuals and/or employers. However, concerted, ambitious and efficient government action is also crucial.

Employment rates for working age males and females in 2003 were 59.9% and 46.7% respectively, whereas the share of the economically inactive working age males and females amounted to 30.8% and 44.3%, respectively (Table 1.10). The transitional years brought about the restructuring of many older companies by cutting the workforce. These job cuts were not compensated for by new jobs at newly created or expanding enterprises. Despite some reductions in the last few years, the registered unemployment rate in Croatia remains rather high. During the year 2005, the registered unemployment rate decreased from 19.3% in January to 17.8% in November. About half of this figure is associated with long-term unemployment. Middle-aged citizens who had previously been employees of companies in traditional manufacturing sectors, many of which were radically downsized, suffer much of the long-term unemployment. Unemployment is clearly linked to the education level (Table 1.12). Despite the high variability of unemployment rates across counties (Tables 1.11 and 1.12), people with higher education level experience lower joblessness risks in all counties. Another open issue is youth unemployment, which is also above average. Despite poor coordination between the educational system and the labor market, the key labor issues remain the weak competitiveness of Croatian companies (which precludes their stronger growth and higher demand for employment), inadequate skills among many of the unemployed (which prevent them from finding jobs) and the high cost of labor. A reorientation toward active labor market policies aimed at increasing the employability of targeted groups of the unemployed was initiated in 2002, with varying degrees of success. Low educational achievement levels and high unemployment remain the main causes of poverty.

1.4.2 MICRO-LEVEL

The key issue at the micro-level is the competitiveness of Croatian companies in domestic and foreign markets. Transitional restructuring of the Croatian economy has entailed a shift from manufacturing towards services. However, productivity growth has often been grounded in the non-investment reallocation of resources, which was facilitated by privatization. The situation at the micro-level also has profound implications for TE.

The transitional restructuring of the economy has negatively affected the technological capability of many companies. Some industries at the medium-high technology levels have been negatively affected, and such companies have traditionally occupied crucial positions in the industrial sector (i.e. manufacturing of machinery and equipment, manufacturing of chemicals, and shipbuilding). Business activities that feature prominently within the current economic structure and display competitiveness are often characterized by relatively low knowledge and technology levels. This implies that the companies in such sectors mainly compete based on cost, rather than in a more sustainable way – through product differentiation and higher value added.

Correspondingly, the innovation of products and processes tends to occupy a secondary role within corporate strategy and therefore has a relatively weak economic impact.

Finally, entrepreneurial activity is insufficient, which points to the need to stimulate the emergence and growth of small and medium sized enterprises. This can be accomplished by the removal of administrative barriers, better education, the provision of financial resources, the facilitation of clusters, cooperation with academic institutions, the attraction of export-oriented foreign direct investments, public procurement, etc.

These conditions pose challenges to TE institutions. Namely, they influence the environment in which graduates of educational institutions will seek employment and in which these institutions may seek additional funding (through the provision of research and/or education services). Although current circumstances may seem unfavorable, solutions should be sought through stronger collaboration with the business sector (particularly through education, collaborative research projects, ongoing collaboration to improve labor market performance, and donations). Education policy should stimulate such collaboration.

1.4.3 PRIVATE COMPETITION

Due to high costs and the absence of fees for the majority of Croatian students, competition within the TE system comes mainly through private business education providers. These providers specialize in providing undergraduate or postgraduate degrees in specialized business areas, but tend to have few permanent staff and very poor research capability. There are currently no universities primarily funded through non-governmental sources, although the Roman Catholic Church has announced plans for founding such a university.

Although the creation of private TE institutions should be encouraged for the sake of quality, diversity and competition, their role in the transformation of TE is likely to be limited - at least in the medium term. Namely, private competition cannot become the key factor in changing TE in the near future. The capability for reform needs to be primarily generated from within the system and in partnership with the policy makers, as well as with current and potential students and the business sector.

1.5 Europeanization and regionalization of tertiary education

Although this chapter tackles the national dimension of TE, it is argued that such a dimension should be understood in relation to two complementary processes - Europeanization and regionalization of TE. Their combined effects are expected to facilitate the reform of TE. Namely, by fulfilling their mission and improving their performance as research and teaching institutions in national and European contexts, TE institutions should also fulfill their roles as vehicles of entrepreneurship and regional development and serve as focal points of regional innovation systems.

On the one hand, the preparations for Croatia's negotiation and accession to the European Union form the context for various reforms (especially those encompassed by the Bologna process) that influence the development of the TE system.

Inclusion into the European Research Area and the European Higher Education Area should increase the mobility of students and teachers, provide transparency and benchmarking, necessitate quality control, as well as increase the opportunities for collaborative projects and financing.

These processes should assist TE institutions to improve their capabilities vis-à-vis their peer institutions in Croatia and abroad. Such processes should also facilitate better relationships between the TE institutions and their stakeholders within their regions. Moreover, these processes should help institutions transform into regional knowledge repositories that effectively interact with actors in their economic and social environment.

Croatia is constitutionally defined as a unified country divided into counties, some of which display higher levels of regional identity (e.g. Istria and Međimurje) (Figure 1.1). In the cases of some larger historic regions which comprise several counties (notably Slavonia and Dalmatia), their regional identities have not yet found full expression in developmental processes. This inclusion of regional identity is expected to be facilitated by the integration of Croatia into European regional policy processes, including the availability of pre-accession, structural and cohesion funds. Correspondingly, the role of universities as vehicles of regional development has so far been only partially recognized. This has partly been due to the lack of functional integration of different university departments within each university. In turn, this has precluded the formulation of a unified strategy and the development of common interfaces that would link universities with their environments. Moreover, a patchy university network is accompanied by - in terms of size - a disproportionate relationship between the largest institution (University of Zagreb) and institutions outside of Zagreb (Rijeka, Split and Osijek). The redistribution of TE institutions is still under development, with the recent founding of universities in Zadar and Dubrovnik (in Dalmatia), and Pula (in Istria).

Furthermore, a more systematic and coherent approach to regional policy is needed, which will enable the development of policies to address regional labor markets, entrepreneurship, industrial structures, regional innovation systems, etc.

If TE institutions upgrade their competencies in supporting education, research and entrepreneurship and develop appropriate interfaces with their main stakeholders, one may expect them to gain positive feedback and thus co-develop along with their regional environments. In this way, competencies would spill over between different sectors due to an ongoing, intensive and purposeful interaction.

CHAPTER 2

OVERALL DESCRIPTION OF THE TERTIARY EDUCATION SYSTEM

2.1 Purposes and objectives of the tertiary education system

A major purpose of the TE system in Croatia is the personal development of young people so that they gain competencies for active citizenship, employment on a flexible labor market and advanced learning. In addition to teaching, TE institutions are expected to conduct high quality and competitive research, extend the knowledge base and transfer knowledge to the economy and the community. Flexible and dynamic tertiary institutions are major players in integrating the Croatian tertiary system into the European Higher Education Area (EHEA) and the European Research Area (ERA). The institutions are also facilitators for the integration of the Republic of Croatia into the European Union.

A paradigmatic shift from teaching to learning and from the teachers' workload to the students' workload is under way following the introduction of the Bologna process (student-centered education).

In the next period, a shift from the workload to the learning outcome is expected.

These shifts will reduce tension between the tertiary institutions and external actors, primarily employers who often complain that the current TE system provides students with more general (theoretical) knowledge and insufficient practical skills required by employers. In addition, it is expected that the paradigmatic shift will contribute to the development of society and democracy in general.

2.2 Type of tertiary institutions

Tertiary education is conducted through university and professional studies. University studies qualify students for carrying out activities in science and TE, in business, and in the public sector and society. Such studies allow students to successfully develop and apply scientific and professional knowledge. Professional studies offer students the appropriate level of knowledge and skills in order for them to perform professionally and qualify for immediate employment.

Universities are educational institutions that prepare students for a profession through the exploration of scientific research and artistic values, youth education, social consciousness and the promotion of international, particularly European, cooperation in TE, science and art. Universities inform the public about the fulfillment of their tasks, particularly concerning the development of Croatian national culture, at least once a year.

According to the *Act on Scientific Activity and Higher Education* (adopted in 2003, amended in 2004), universities are expected to integrate functions of their constituent units, particularly faculties, academies and departments. In this way, a university is expected to ensure its uniform and harmonized operation in concert with strategic and developmental decisions on academic issues and scientific research. The coordinated functioning of a university also depends on effective financial operations and legal transactions, investments, plans for development and contacts with external partners in science and TE. Universities are also expected to ensure the internal and external mobility of students and teachers, the rational use of human and material resources, the development of multidisciplinary studies and fostering the constant growth of high-quality and competitive educational, scientific, artistic and professional work.

Universities are also expected to conduct scientific, artistic and developmental research, particularly to carry out research programs of strategic interest to the Republic of Croatia. In addition, universities are expected to perform their tasks according to the needs of the community in which they act.

Universities in Croatia, however, currently have difficulties ensuring all these functions primarily due to their legal disintegration (faculties are legal entities) and due to the governance model (state control model).

The period between 2003 and 2007 is considered as a transitional period in which a stepwise legal integration should be applied (the so-called functional integration of universities). By the end of 2007, it is expected that the legal integration should be completed.

Polytechnics and schools of professional higher education (SPHE) are expected to offer high-level professional education, and artistic and professional training according to the needs of their local communities.

Public scientific institutes conduct scientific research. Their task is primarily to carry out scientific programs of strategic interest to the Republic of Croatia, and to establish, together with universities, the scientific infrastructure for the whole system of science and TE. Public scientific institutes participate in the process of TE.

2.3 Type of studies

The structure of TE has changed according to the new *Act on Scientific Activity and Higher Education*. Before the new act, TE was organized into professional and scientific studies. Professional studies usually lasted for two years and were considered as a VI educational level (ISCED97 5B)[2]. Such studies provided students with practical skills and professional training. Scientific studies were organized as long-cycle studies. These programs lasted at least four years (up to 6 years for medical studies), were considered at the VII educational level and provided students with broad knowledge on the disciplines and opportunities for further education at the postgraduate level (ISCED97 5A). Postgraduate education was organized into two cycles: the Master of Science cycle, lasting at least two years (ISCED97 5A), and doctoral training - based on research - lasting an average of three to six years (ISCED97 6).

With the introduction of the new act, former university scientific studies were renamed as university programs and transformed into three-cycle programs: undergraduate, graduate and postgraduate studies (Figure 2.1). University studies are organized and conducted at the university. Graduate and postgraduate studies may be also conducted in collaboration with scientific institutes. In order to complete each academic level, students should obtain a title or degree. Particular programs can be integrated at the first and second levels of study. The European Credit Transfer System (ECTS) was introduced in 2005 as an instrument for transferring the credits and coursework of students.

Through **undergraduate studies**, which last for three to four years, 180 to 240 ECTS credits can be earned. Undergraduate studies qualify students for graduate study and offer them the possibility of employment. By completing undergraduate studies, the academic title of *baccalaureus* or *baccalaurea* is awarded, with a professional specification.

Through **graduate studies**, which last for one to two years, 60 to 120 ECTS credits can be earned. The total number of credits earned at undergraduate and graduate studies should be at least 300 ECTS credits. By completing graduate studies, a Master's degree (MA) is awarded. Exceptions occur in the case of university medical programs that award medical degrees (MD).

Postgraduate studies may be started upon the completion of graduate studies. Postgraduate study lasts three to four years and, upon completion, Doctor of Science (Dr. Sc.) or Doctor of Arts (Dr. Art.) degrees are awarded. The university may organize specialist postgraduate studies that last from one to two years and by which a specialist title for a particular area (Spec.) is awarded.

2 According to the *International Standard Classification of Education* (ISCED), that was approved by the UNESCO General Conference in 1997 (ISCED 1997), levels of tertiary education correspond to the educational level in the Croatian TE system as follows:

16. ISCED 5A - scientific (university) studies that have a minimum theoretical duration of three years, typically of four or more years. This level includes all the research programs which are not part of a doctorate, such as any type of Master's degree.
17. ISCED 5B - professional studies, more practically oriented and occupationally specific, do not provide direct access to advanced research programs and have minimum of two years full-time equivalent duration, but generally of two or three years.
18. ISCED 6 – the second stage of tertiary education (leading to an advanced research qualification) – doctoral studies.

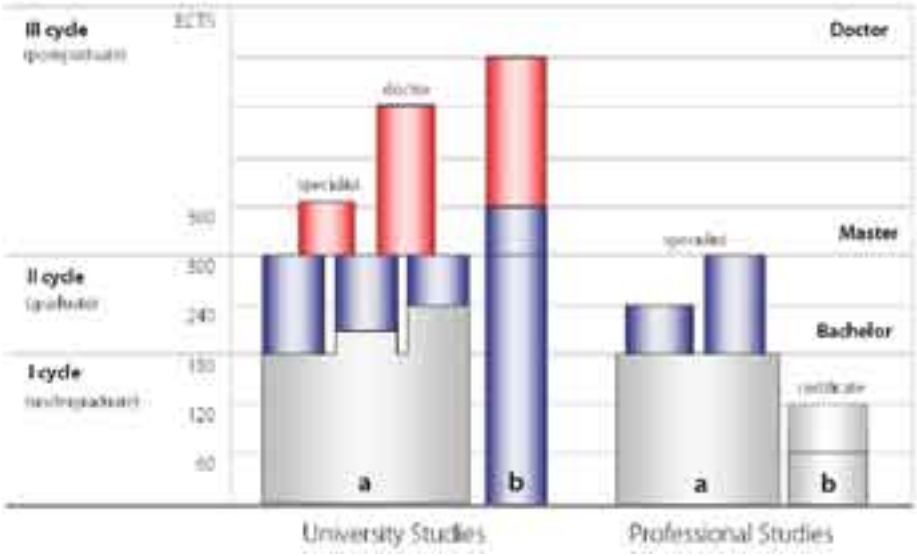

Figure 2.1 Current structure of tertiary education in Croatia

Professional studies are conducted primarily at polytechnics or schools of professional higher education, but also at universities. Professional studies last from two to three years and earn from 120 to 180 ECTS credits for graduates (Figure 2.1). Exceptionally, with the approval of the National Council for Higher Education (NCHE), professional study programs may last for four years when they comply with internationally recognized standards (up to 240 ECTS credits). By completing professional study programs with less than 180 ECTS credits, the corresponding professional title is awarded. By completing professional programs with 180 or more credits, a *baccalaureus* designating the profession is awarded. Polytechnics and schools of professional higher education may organize specialist graduate professional study programs for persons who have completed professional studies or undergraduate university studies. Such a program lasts from one to two years and confers upon the graduate the title of specialist in a particular profession (Spec.).

2.4 Overall size of the tertiary education system

The number of enrolled students over a period of 11 years is shown in Figure 2.2. All tertiary institutions, public and private, enrolled 126,322 students for the academic year 2003/04 (Table 6.2). In the academic year 2004/05, the reported number of enrolled students was 148,426[3].

During the period of 11 years (1991-2003), the number of enrolled students increased by 57.1%.

Female students in 2003 represented 55.83% of all students, which is a significant increase in comparison to 1991 (47.6% - Table 6.8).

3 Reported by HE institutions to the Ministry of Science, Education and Sports (Source: MoSES)

Increased enrollment is the result of increased pressure on students who finish secondary education. Out of 47,092 students that completed secondary school in 2003, 34,466 (Table 6.1) enrolled for the first year of study. This was a significant increase over the last 10 years, from 52.59% of secondary school graduates in 1995 to 73.19% in 2003.

Thus, 59.1% of the 18-year-old age group is enrolled in the first year of TE.

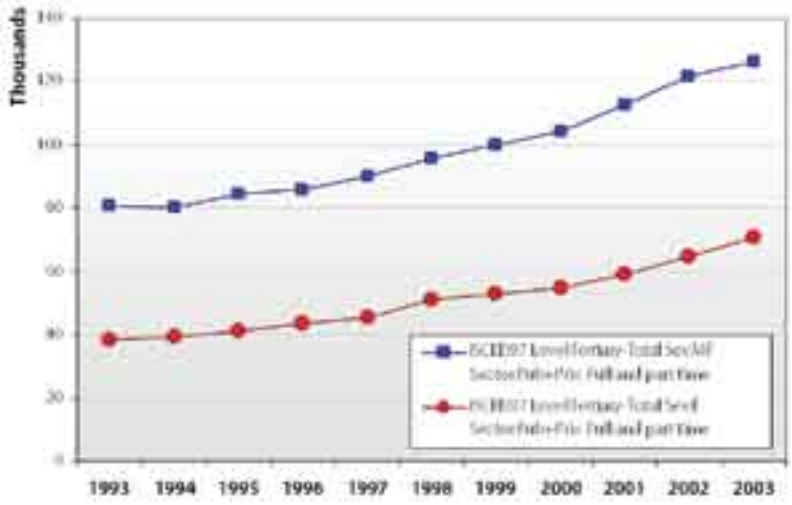

Figure 2.2 Number of enrolled students and female participation in tertiary education

Overall enrollment in the first year of study increased during the 11-year period from 23,368 to 35,073 students that are enrolled for the first time in the first year of study (a 50% increase). In addition to these figures, one must add the first year students who repeated the first year. The number of such students went from 4,065 in 1991 to 12,418 in 2003, indicating the increase in the dropout rate in the first year of study (Table 6.3). Altogether, including repeating students, the number of enrolled students in the first year of study over 11 years increased from 27,433 in 1991 to 47,491 in 2003 (Table 6.3).

During the last 10 years, the number of full-time students that are fully supported by the state budget did not increase proportionally with the overall increase in students, from 72,678 in 1993 to 88,991 in 2003 (22.4% in comparison to the 57% increase in the total number of students). (Table 6.2)

In the 10-year period, the number of students per 1,000 inhabitants increased from 17 in 1993 to 27 in 2003 (Table 6.2).

The total increase in the number of students over the 10-year period resulted primarily from the increased need for TE and an increase in the number of students who are willing to pay for school, either as full-time students or as part-time students. Tuition fees paid at public institutions range from 800 to 1,500 EUR, which is not the actual cost of study, and can be considered as only a portion of the expenses. These students have subsidies like fully supported students. In 1993, the fully supported (out of the state budget) students represented 88% of the student population (4% paid for their participation as full-time students and 8% as part-time students – Table 6.4).

In 2003, the figure is entirely different: 47% of students were fully supported by the state, 24% paid for their participation as full-time students and 28% as part-time students.

The gross enrollment ratio (GER), which represents the number of students enrolled in the tertiary level of education, regardless of age, as a percentage of the population of official school age students for that level, significantly increased over the last 10 years, from 24.6 in 1994 to 41.3 in 2003 (Table 6.5). The gender parity index (GPI) has also changed, from 0.98 in 1994 to 1.21 in 2003, indicating greater female participation in TE (Table 6.5).

In 1997, the first students were enrolled in the newly established non-university institutions: polytechnics and schools for higher professional education. The number of enrolled students in non-university institutions has increased, from 702 at polytechnics and 5,732 at schools of professional higher education in 1997, to 13,198 at polytechnics and 14,595 at schools of professional higher education for the academic year 2003/2004 (Tables 6.7 and 6.9). The majority of students enrolled in schools of professional higher education are social studies and humanities students. Thus, the increase in the number of students stems from enrollment in non-university institutions. Universities also increased enrollment, from 79,274 in 1995 to 91,976 in 2003. This increase is the result of the increased enrollment in university programs (from 63,119 in 1995 to 75,937 in 2003). Universities also offer professional studies with an enrollment range of approximately 16,000 students (Table 6.9). The decrease of enrolled students in professional studies programs from 1998-2001 resulted from a policy to separate professional studies from the universities. This policy failed in 2001 and resulted in moving professional studies back to the universities that had established the programs. Altogether, in 2003, 43,832 students enrolled in professional studies at university and non-university institutions (Tables 2.4 and 6.9). Enrollment in professional studies programs at both types of institutions demonstrates a shift towards social studies and humanities (almost two-thirds of the enrolled students).

Similar relationships can be identified with the university programs: the majority of students was enrolled in social sciences and humanities (58.78% of students in 2003) with a 35% increase during a period of nine years (Table 6.9).

Similar rates were maintained over the last 10 years. The number of students in natural sciences is extremely low (4.9% in 2003) with a tendency to increase slightly. The number of students in the medical sciences (6.74% in 2003) and biotechnology (5.6% in 2003) have not changed over the last 10 years (Table 6.9).

Postgraduate education before 2005 was organized at two levels: Master of Science education and Doctor of Science education. In 2003, the number of Master of Science students was 4,091, which was an increase of 20.9% over a period of six years. However, the total number of doctoral students is difficult to estimate since doctoral education was not organized as a program with enrollment, but rather as a continuation of the Master's program completed through research. The total number of graduating PhD students vary from year to year, but fall in the range of 250 to 350 annually.

The number of tertiary institutions has increased during the last 10 years, from 63 registered institutions in 1993, to 102 registered institutions in 2003 (Table 2.2). The increase is primarily the result of establishing a number of non-university institutions (polytechnics and schools of professional higher education), both in the public and the private sector.

The increase in the number of students was not paralleled by an increase in educational staff[4]. At TE institutions during 1998 - 2003 the number of teaching staff[5] increased from 6,748 to 7,917 (17%) (Tables 7.2 to 7.6). Most of the teaching staff at tertiary institutions (almost all at universities, and some at polytechnics and schools of professional higher education) is also registered as R&D personnel. Such staff has the obligation to perform research activities. In the 10-year period, the number of young researchers (Master's and PhD students employed at scientific institutions as early stage researchers/teaching assistants) has increased dramatically, from 915 in 1996 to 2,602 in 2004 (Table 5.3). This represents an almost threefold increase. The majority of these young people are employed at HE institutions mostly at universities (71.56%) and represent a basis for teaching staff renewal.

2.5 National goals and targets for growth in tertiary education

The proportion of persons with postsecondary education in the active labor force (age 25 - 65) is rather low (15.2%) and significantly below the average of the European Union. While the national goal was not clearly established, it was mentioned in the *Education Sector Development Plan 2005 - 2010* (to reach 20% by the year 2010). The number of students and the gross enrollment ratio have increased during the last 10 years, and the estimated goal can be reached by increasing efficiency and the current enrollment rate: increasing the graduation rate, reducing the dropout rate and decreasing the graduation time (now an average of 7.1 years) are all key factors. Current reforms within the framework of the Bologna process are expected to increase efficiency indicators, i.e. restructuring study programs from long-cycle programs into two shorter cycles, building a quality assurance system, reforming the financing model and remodeling student participation and student support. With an increase in efficiency, the 20% value can be reached by 2010. However, if a more ambitious goal can be established, more students should be enrolled (outside the traditional age group; enrollment of employed persons) and new forms of TE should be organized.

The whole system will require more flexibility, accreditation of learning outcomes (prior learning) and the accumulation of credits (a national system of lifelong learning).

The type of graduates entering the workforce (see above) is unfavorable for economic development that is based on advanced technologies (i.e. ICT and biotechnology). Instead, these graduates compose a workforce based on services and administration. For example, the number of graduates in natural sciences, mathematics and ICT is too low to promote the development of industries that demand these skills. Unfortunately, there is no balance between current labor market needs and the qualification structure of unemployed persons. In addition, there is a lack of communication between tertiary institutions and stakeholders. With improvement in the above-mentioned areas, the mission of TE in a knowledge-based society would be clear: tertiary institutions could identify the labor force and the needs and demands of the labor force. The transformation into a knowledge-based economy and society is a big challenge for the entire Croatian society and for TE institutions in particular.

4 According to the *European Glossary on Education: Teaching Staff* (see references), educational staff can be divided into three main categories according to their responsibilities in the education system: (a) staff directly responsible for teaching activities and instruction, (b) staff indirectly intervening in the teaching process, and (c) staff who work in administration, in welfare and healthcare, logistical and supervisory support, or the maintenance and operation of an institution.

5 The number of teaching staff refers to staff directly responsible for teaching activities and instruction: (a) teachers/instructors and (b) teaching assistants/auxiliary teaching staff. The other two categories (see footnote above) are not included.

Another national goal is integration into the EHEA and ERA. Besides the structural reforms, a significant challenge for Croatian education policy is to increase the competence and competitiveness of teaching and research staff, and of TE institutions in general. Today, out of approximately 4,000 university teachers, some 15% are internationally recognized as scientists, and around 5% regularly contribute to internationally renowned professional publications and take an active part in international research projects.

For the development of the knowledge-based economy, a new qualification structure will be required. The highest level will be a doctoral education, which should be based on learning through access to highly competitive research, more efficient and faster learning methods, and brought into line with international trends and examples of best practices. It is clear that the current production of doctorates is insufficient in meeting preset goals. The low international participation by university teachers is an obstacle and huge challenge for implementing reforms in doctoral education. Joint studies at the national and international level can provide a way to bridge the current situation, and it will be a significant challenge facing the tertiary institutions over the next five years.

The mobility of students and teachers, both nationally and internationally, is at an unacceptably low level of development. There are a number of obstacles inside the national legal and administrative system, but external problems exist because Croatia was not eligible to join European Union mobility programs.

Further differentiation and diversification of the Croatian TE system should be clarified as soon as possible. So far, no decision has been made about which aspects of the system need to be particularly developed as a long-term priority.

Croatian TE is currently insufficiently diversified, with too many institutions having "mixed" goals and objectives (EUA report, 2005).

In particular, some faculties are offering programs that are typically regarded as academic, alongside programs that are vocational or professional in nature. There is a need for a much greater degree of differentiation of the institutional profile than currently exists, and for institutions to be clear about their purposes and identity. A common problem for universities in Croatia is that they not only have to share their human resources among themselves, but also with other non-university institutions. Given that there is a limited supply of staff to meet the needs of the existing system, it is a challenge for the entire TE system to introduce and apply quality standards and build up a national system for quality assurance. Thus, the Croatian TE system is faced with an important challenge: to increase differentiation within a unique system, or continue separating the types of institutions in a binary model.

2.6 Development of the national tertiary education policy

Currently the national policy for developing the tertiary system is based on open communication between the National Council for Higher Education (NCHE), the National Council for Science (NCS), the Ministry of Science, Education and Sports (MoSES) and tertiary institutions. It is also based on the national Rectors' Conference meetings and the participation of the Council of Polytechnics and Schools of Professional Higher Education (CPHE). The fragmentation of the system, particularly by universities, was overridden by the change in policy of the MoSES. Since 2002, the MoSES does not communicate or negotiate with faculties, but rather interacts with universities through regular meetings with university leadership and at the Rector's Conference meetings.

Apart from the intermediary bodies (NCHE and NCS), a policy for the integration of the tertiary institutions into the EHEA (Bologna process) was created through two specialized bodies formed jointly by the MoSES and the Rectors' Conference: the Committee for Implementation of the Bologna process and the Committee for the Harmonization of Normative Acts. Financial policy is discussed at the Science and Higher Education Funding Council, a body formed in 2005 by NCHE and NCS, and the Committee for the Introduction of Lump Sum Financing, formed jointly by the MoSES and the Rector's Conference.

A system of quality indicators and quality standards is still not developed at the national level, which means that the development of policy based on indicators and accountability is not well organized. Therefore, an information system and information network for data collection, both at the level of tertiary institutions and at the national level, should be developed. Currently, a number of elements of an information system do exist, however a focal point for the networking of data and the establishment of a national quality assurance network is still not functional.

Although many initiatives are coming from the bottom-up (from tertiary institutions), the NCHE is the major body responsible for the development of the national policy of general quality assurance system.

The NCHE has the support of the Agency for Science and Higher Education (ASHE).

2.7 Governance and the regulatory framework for the tertiary education system

2.7.1 REGULATORY FRAMEWORK

During last decade, the legal framework for the governance and operation of TE institutions was provided by two acts: the *Act on Higher Education Institutions* and the *Act on Scientific Research Activities*. These acts were merged into one in 2003, when a new act was adopted.

The *Act on Scientific Activity and Higher Education* provided a framework for the reform of universities and the implementation of the principles of the Bologna Declaration. A number of amendments were added to this Act during 2004. Based on the new Act, in December 2004 the Minister of Science, Education and Sports prescribed five documents of the rules of procedures covering the field of TE. The rules of procedure[6] regulate the establishment of HEIs, the measures and criteria for evaluating the quality and efficiency of institutions and study programs, the content of student databases, the content of student documents, and the content of diplomas and diploma supplements. The ASHE was established by the decree of the Government in 2004.

On the basis of the *Act and the Rules and Procedures*, TE institutions organize their activities according to their statutes (all tertiary institution changed their statutes in 2004 and 2005), and a number of accompanying acts regulating specific topics (i.e. *Study Regulations*, *Ethical Codex*, *Regulation of Financial Issues*, etc.).

Another legislative adjustment was made in the field of recognition of foreign educational qualifications. The *Act on Recognition of Foreign Educational Qualifications* came into force in July 2003. The rules of procedure stipulating considerably lower fees for the recognition process entered into force in May 2005.

The scientific activities of tertiary institutions were regulated by the *Act on Scientific Research Activities*, which regulated scientific undertakings separately from teaching activities. The new legislation adopted in 2003 integrated these two acts into The *Act on Scientific Activity and Higher Education*. Financing and scientific

6 *Rules of Procedure in the Field of Higher Education*, OG 9/05

priorities were determined by the *National Scientific Research Program* and the *Strategy of Development of the Republic of Croatia in the 21st Century – Science*. The legal framework for encouraging university-business cooperation is provided by the first innovation program – the *Croatian Program for Innovative Technological Development* (HITRA), adopted by the Government of the Republic of Croatia on April 5, 2001.

Organization of students in Croatia is regulated by the *Student Assembly Act*, the *Rules on the Student Council Register* and the *Rules on the Register of Student Associations*. Student support is regulated by the Rules on Subsidies for covering the cost of student meals (see references).

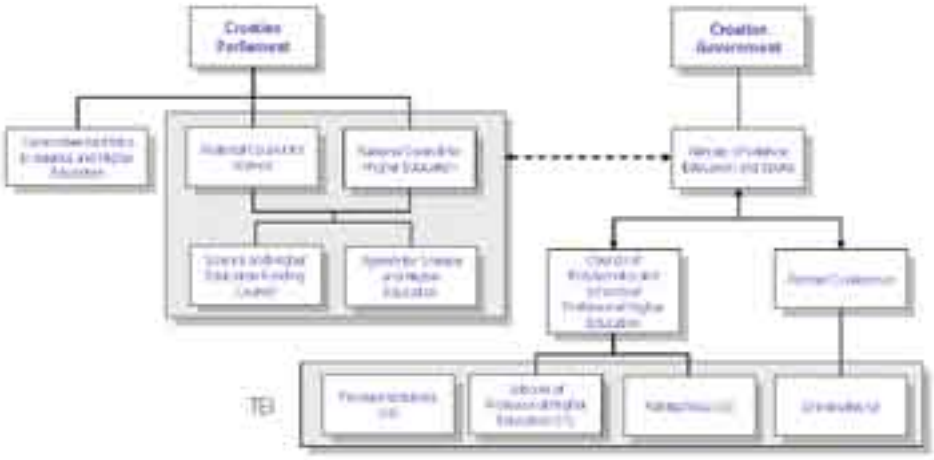

Figure 2.3 Tertiary education system in Croatia in 2005

2.7.2 STEERING THE TERTIARY INSTITUTION SYSTEM

The Ministry of Science, Education and Sports (MoSES) is the administrative body responsible for planning, funding and monitoring the overall education system (Figure 2.3). The MoSES is working closely with other responsible bodies, such as the NCS, the NCHE, the Science and Higher Education Funding Council (SHEFC), the Rectors' Conference, the Council of Polytechnics and Schools of Professional Higher Education (CPSPHE) and the Committee for Ethics. In addition, the MoSES closely cooperates with other independent institutions such as the ASHE, the Agency for Vocational Education and the Institute for Education, as well as other partners such as the Ministry of Health and Social Welfare, the Ministry of Economy, the Croatian Chamber of Economy, the Chamber of Crafts, the Croatian Employment Service, the Croatian Association of Employers, and the Croatian Association for Adult Education.

The National Council for Science (NCS) is an expert and advisory body tasked with the development and quality of science in the Republic of Croatia. The NCS has a president and twelve members, four of whom are scientists with the title of scientific advisers employed in scientific institutions. The members also include six full-time professors and three persons from outside the system of science and TE.

The National Council for Higher Education (NCHE) is an expert and advisory body tasked with the development and quality of TE in the Republic of Croatia. The NCHE has a president and12 members, seven

of whom are university professors, while one is from the area of teacher education. There are two professors from polytechnics or schools of professional higher education, two scientists employed at scientific institutes and two persons from outside the system of science and TE.

The Croatian Parliament at the recommendation of the Government appoints members of the NCS and the NCHE. Members are ideally representative of all areas of science and the arts, all regions, and – regarding the NCS – scientists employed in industry.

The Science and Higher Education Funding Council (SHEFC) is an expert body of the NCS and the NCHE. The Council consists of 15 members, three of whom from scientific institutes, six from universities, two from polytechnics, two representatives from trade unions and two representatives appointed by the Minister. The NCS and the NCHE appoint members of the Council jointly upon the recommendation of the Rectors' Conference, the Council of Polytechnics and Schools of professional higher education, public scientific institutes, universities, polytechnics and schools of professional higher education as well as the MoSES and trade unions.

The Rectors' Conference (RC) consists of all university rectors. A representative of the Council of Polytechnics and Schools of professional higher education participates in the work of the RC, but lacks the right to vote. The RC decides on issues of common interest for the development of universities.

The Council of Polytechnics and Schools of Professional Higher Education (CPSPHE) consists of deans of all polytechnics and schools of professional higher education. The representative of the RC participates in the work of the Council, but lacks the right to vote. The CPSPHE decides on issues of common interest for the development of polytechnics and schools of professional higher education.

The Committee for Ethics in Science and Higher Education consists of nine members appointed by the Parliament, six of whom are chosen among distinguished scientists and university professors, as well as three persons who enjoy an appropriate public reputation. The task of the committee is to promote ethical principles and values in science and higher education, in business relations, in public relations, in the application of current technologies and in environmental protection.

2.7.3 GOVERNANCE OF TERTIARY INSTITUTIONS

The Rector, the Senate and the University Advisory Board govern the university. This is minimal standard required by the law, but universities may create additional management and advisory bodies that is within the scope of the institutional autonomy. In addition, the university may entrust the management of its business or part of it to a certain body (managing director, managing board or similar actors). The decision-making body is the Senate. It is composed of teaching staff, which makes up at least 60% of the body, student representatives elected by the students (at least 15% of the members) and representatives of other employees. The University Board has 6 or 12 members, with half of them appointed by the Senate (at least one is a student), and half of them appointed by the founder, local government bodies and the Chamber of Commerce.

The Dean, an expert council (usually the Faculty Council) and other bodies stipulated by the university statute or other acts, governs the faculty and the academy of arts.

The Dean, the Professional Council, the Governing Board, and other professional and advisory bodies govern the polytechnics and schools of professional higher education. The Dean is elected by the Professional Council and approved by the Governing Board. The Professional Council of the polytechnics and schools of professional higher education consists of teachers, associates and students (at least 15% of the members

are elected by students themselves). The Governing Board has five members. The founder appoints three and the Professional Council elects two members.

The Director, the Scientific Council, the Governing Board and other bodies stipulated by the statute or amendments based on the statute, governs the institutes. The Governing Board is composed of members appointed by the founder and members elected by the Scientific Council of the institute.

2.8 Higher education institutions (institutions that provide tertiary education)

Tertiary education institutions are universities, polytechnics and schools of professional higher education. The universities may include faculties and academies of arts as legal entities, and may establish a number of other constituent units (departments, institutes, etc.). Polytechnics and schools of professional higher education may not establish other TE institutions.

Tertiary education institutions perform their activities as a public service. The university, the faculty and the academy provide TE, perform scientific, professional and artistic programs, and other activities in accordance with the law and their statutes. Within the framework of TE programs, these TE institutions conduct university studies and may organize and conduct professional studies. The polytechnics and schools of professional higher education organize professional studies and professional, scientific and other public activities.

Tertiary education institutions may be public or private. Public TE institutions are those established by the state. The state establishes universities by law and polytechnics and schools of professional higher education by government decree. Founder's rights over TE institutions are transferred from the Parliament to the Government (MoSES) in accordance with the act of foundation and other related regulations. Private universities, polytechnics and schools of professional higher education can be established by the founders in the manner prescribed by the provisions of the law and regulations relating to the establishment of institutions. Counties, towns and municipalities can establish schools of professional higher education by their representative bodies. All TE institutions in Croatia are non-profit institutions.

2.9 Number of tertiary education institutions

In the Republic of Croatia, there are 85 public tertiary education institutions.[7]

In Northern Croatia (Zagreb area), there are 41 public institutions of TE: one university, four polytechnics and four schools of professional higher education. The University of Zagreb is the largest institution in Croatia, with 28 faculties (two of them located in Varaždin and one in Sisak), three academies, one teacher education academy and one university course of study. Three polytechnics are located in Zagreb: the Technical Polytechnic, the four-year Humanities School of professional higher education and the Polytechnic of Professional Higher Education in Health Services. One polytechnic is located in Karlovac. The Police School of professional higher education acts as a school of professional higher education for specialized education

7 MoSES website (www.mzos.hr as accessed in August 2005). At the end of 2006, Croatia had seven public universities, 16 public polytechnics and 18 private polytechnics and schools for professional higher education. There are altogether 102 legal entities dealing with TE (Report of the MoSES, see references).

in Zagreb. There are also schools of professional higher education of agriculture in Križevci, and two primary school teacher-training colleges in Čakovec and Petrinja.

In Southern Croatia (Dalmatia), there are 18 institutions of TE, including three universities and one school of professional higher education. The University of Split has 11 faculties, one academy, and one university department. The University of Zadar has 15 university departments and one department for professional TE. The University of Dubrovnik has seven university departments. The School of professional higher education of Tourist Management is located in Šibenik.

In Western Croatia there are 14 institutions of TE, including the University of Rijeka with 10 faculties, two of which are located in Pula[8], three primary school teacher-training colleges (in Rijeka, Pula and Gospić), and the Polytechnic in Rijeka with six departments and branches in Otočac, Pula, Poreč, Pazin, Gospić and Rovinj.

Figure 2.4 Regional distribution of Croatian tertiary education institutions (2005)

In Eastern Croatia, there are 12 public institutions of TE. The University Josip Juraj Strossmayer in Osijek has nine faculties (one is located in Slavonski Brod), one primary school teacher-training college, one university department and the Polytechnic in Požega with three departments.

In addition, there are 17 accredited private schools of professional TE.

8 In 2006, the University of Pula was established from parts of the University of Rijeka that are located in the city of Pula.

Croatia has 27 public research institutes. According to their scientific areas of specialization, there are the following institutes: nine in social sciences; six in the humanities: five in natural sciences; one technical (engineering) institute; three institutes in biotechnical sciences (agriculture and forestry); and three institutes in biomedical sciences (one institute for medical research and occupational health, one for veterinary medicine and the Mediterranean Institute for Life Sciences in Split). In addition, R&D activities are performed at 11 research centers (state and private), three academic institutions and one military research center. Approximately 50 other legal scientific research entities are identified as parts of business, cultural, health and state institutions[9].

2.10 Qualification framework

Tertiary education institutions in Croatia offer study programs according to the national qualification framework established two decades ago. Ongoing reform in accordance with the action lines of the Bologna process will change the national qualification structure and academic degrees. Degrees are regulated by the *Act on Academic Titles and Degrees*. The real restructuring of the framework of qualification is expected by the end of 2007, as part of a commitment resulting from the Bergen ministerial conference.

Polytechnics, higher schools of professional education and universities offered vocational and professional training of two to three years (ISCED 5B). A qualification obtained from such a program is considered at the VI educational level (*viša školska sprema*) with a limited chance for the continuation of education and a narrow range of employment opportunities. Titles conferred upon graduation usually indicate the profession and the level of education (i.e. *ing* for VI level in engineering studies, and *dipl. ing.* for VII level studying science at the university, or *oecc.* and *dipl. oecc.* for economic studies, etc.).

Scientific higher education at universities offered qualifications that are considered as a VII level (ISCED 5A) of education (*visoka stručna sprema*). These qualifications come with the academic degree that relates to a profession (i.e. *dr. med*, *dipl. ing.*, *dipl. oecc.*, *dipl. iur.* etc.). The VII level opened up opportunities for continuing education at the postgraduate level (master's and doctoral) and a wider range of employment opportunities.

Over a period of 10 years, the number of professional graduates increased, particularly with the introduction of the binary system (*Act on Higher Education Institutions* in 1994) and establishment of non-university institutions in 1997. The degree profile of professional education shifted over time towards social and humanities studies. In many cases, these profiles represented condensed versions of scientific studies, but with a significantly reduced scientific base. On the other hand, the expansion of non-university institutions in the face of financial constraints and limited employment possibilities resulted in insufficient professional profiling.

Over the last five years, an increased profiling of both types of qualification levels took place, particularly with the expansion of entrepreneurial activities, in order to move towards developing generic competencies. Previously, both types provided insufficient generic skills and competencies (i.e. teamwork, project management, communication skills, etc.). Vocational qualifications resulted in a narrow and inflexible professional profile and scientific studies presented an overly wide and theoretically oriented profile that prepared students for research rather than provide them with practical skills.

9 *A New Candidate to EU Accession – Croatia*, *S&T developments*, European Commission 2004.

The development of the Bologna process significantly influenced the development of the national qualification framework: both professional and university studies were put at the same level (first-cycle degree and qualification).

The introduction of the ECTS, the transfer of credits, quality assurance and a discussion of competencies provided by TE will transform the profiles of both types of studies. The second cycle of education will provide a diversification of degree profiles, and introduce sublevels in both professional and university studies.

The development of a credit accumulation system and the accreditation of prior learning, the development of different learning paths, lifelong learning and distance learning will further diversify and fine-tune the qualification framework.

2.11 Major changes over the last ten years

Over the last 10 years, one prominent change that took place was the diversification of scientific and TE institutions, which started by separating scientific institutes from universities, exerting pressure on universities to focus on teaching activities and establishing non-university institutions committed to professional education (polytechnics and schools of professional higher education) as well as developing the binary system.

The diversification of tertiary institutions was a result of increased pressure for wider enrolment in TE and for the development of an entrepreneurial spirit within tertiary institutions, particularly in non-university institutions.

Since the increased access to TE was not followed by an appropriate increase in the budget for TE, including human and material resources, this resulted in an increase in the number of students financing their own studies, a heavier teaching burden for teaching staff, and increased interest of the public for quality of TE.

Regional policy regarding TE also changed and resulted in the establishment of three new universities, a number of non-university institutions, and the further decentralization and autonomy of institutions. By strengthening regional initiatives, a policy for the integration of universities, first functional then legal, was designed and put into practice.

An academic information and communication infrastructure was developed at the national level by establishing the Croatian Academic and Research Network (CARNet) and the University Computing Centre (SRCE), and by building a complete giga-based infrastructure.

In 2001, Croatia signed the Bologna Declaration and accepted all action lines of the Bologna process and EU funding sources opened up to Croatian tertiary institutions that fostered reforms and that encouraged opening up universities towards an international environment. Unfortunately, the mobility of students and teachers was not developed. In 2003, a new Act was adopted which introduced all principles of the Bologna process, and in 2005 the new TE structure became operational. All long-cycle study programs were restructured as part of the two-cycle programs, then evaluated and passed through an accreditation procedure. The NCHE and national agency for quality assurance (ASHE) were established in 2005.

The Government recognized the commitment of the Croatian academic community to reform, and decided to direct significant investment into infrastructure and tertiary institution staff.

Almost two billion HRK are invested in infrastructure, the development of campuses and scientific equipment.

Almost 700 new academic positions were created in addition to the ongoing program of early stage researchers[10] (which experienced a three-fold increase in five years).

Due to the initiation of reforms, and by addressing the student's workload and learning outcomes, students are increasingly more interested in participating in the process (two national student conferences were held in 2005). Current regulation on student organizations (Student Assembly Act), which stipulates organization of students outside institutional bodies, led to numerous activities of students that are not linked to institutional policies and strategies. Although student participation in governing bodies was guaranteed, this is considered as a major obstacle for more active student participation in developing and governing TE.

10 The term "**early stage researchers" (ESRs)**, used within the frame of the Lisbon agenda, relates to postgraduate students employed at tertiary institutions or research institutions. According to the *Act on Scientific Research Activities*, the ESRs are research assistants in the system of higher education and science. At higher education institutions, research assistants who obtained the associate grade of assistant or senior assistant participate in teaching as a part of their working hours. In Croatian documents the term is often referred to as "research novices" or "junior researchers".

CHAPTER 3

THE TERTIARY EDUCATION SYSTEM AND THE LABOR MARKET

3.1 Wage structure

The structure of wages prevalent in the economies of the former Eastern bloc differed considerably from the wage structure in Western countries. Communist countries had an exceptionally egalitarian wage structure, which reduced the wage premiums of educated workers. Such a rigid wage structure resulted in fewer incentives to invest in education[11]. The result was insufficient investment in TE compared to excessive investment in secondary-level vocational training[12]. The educated workers reacted to the established system of incentives in an economically meaningful way – they became intellectually stagnant and had even fewer educational successes. Moreover, skills acquired under communism were excessively specialized and tightly bound to specific, outdated technologies, making much of the human capital obsolete with the advent of the transition[13]. One can therefore conclude that low wage premiums during communist rule were accompanied by unsatisfactory enrollment in TE.

Distorted wage structures in Eastern Europe have several sources. First and foremost, wage equality was by itself one of the major objectives of political elites, so it is not surprising that wages in the countries of Central and Eastern Europe were among the most egalitarian in Europe[14]. This fact alone explains the lower rate of return on investment in education. Furthermore, as the same author notes, the ideological preferences of social planners led them to put special emphasis on the industrial sector, especially heavy industry, which in turn led to the predominance of vocational training. Services were deemed “non-productive”, so intellectual pursuits

11 Some authors believe that due to substantial subsidies for higher education in communist countries, motivation for education nonetheless existed (e.g. Katz, 1998; Orazem and Vodopivec, 1997). Even so, it should not be forgotten that in most capitalist countries governments also subsidize the largest portion of investment in education.

12 As explained later, there were most probably other (purely ideological) reasons why secondary-level vocational training was promoted at the expense of higher education.

13 Campos and Jolliffe, 2004

14 Flanagan, 1998

were considered to be worth less than physical labor. This perspective led to an additional bias in wages to the benefit of manual laborers. Finally, social planners preferred secondary schooling, especially vocational training, over TE – also for ideological reasons. Vocational training increased the share of proletarians (considered the mainstays of the communist party) in the labor force, while intellectuals were often viewed as potential threats to the system. Therefore, limiting the number of workers with broader knowledge facilitated political control.

At the beginning of the 1990's, transition resulted in the abolishment (or considerable reduction) of political control over the wage structure. Orazem and Vodopivec (1997) categorize the fundamental forces that influenced the transitioning wage structure into three groups. The first group consists of corrections in labor market distortions that were present during the previous regime, i.e. the correction of policies aimed at securing the egalitarian distribution of wages. The second group consists of changes in the final demand for goods and services that indirectly reduced the demand for manufacturing workers. The final group of demand factors pertains to the disequilibria that emerge during the process of transition. Since education and entrepreneurship associated with transition were not desired during the communist era, once the economic system and incentives change, the demand for education will be weaker due to the inelasticity of the labor supply over the short and medium term. All forces, both those that correct imposed imbalances and those that react to new disequilibria, push the wage structure in the same direction, toward growing wage premiums for education. On the other hand, the obsolete skills acquired under communism might depress a return to education, so the dynamics of a return during the transition are not straightforward[15].

Once the transition began, wages and renewed investment in education quickly responded to market signals, and premiums began to grow as the first group of effects outweighed the declining value of skills. The growth of wage premiums for educated workers brought relative wages closer to individual productivity ratios, and thereby contributed to the more efficient allocation of resources. Rutkowski[16] finds that in Poland, shortly after the start of the transition, the rate of return for an additional year of education reached 7.5%, compared to approximately 5% prior to the transition. Clark[17] cites Vecernik, according to whom the same rate in the Czech Republic reached 5.3% for men and 6.7% for women in 1992, while in 1988 the rate was 4% for men and 5.7% for women. The increase in the rate of return was particularly dramatic in Hungary where the rate of return increased from 6.4% in 1986 to 11.3% in 1998[18]. The return to education, therefore, increased very quickly in Eastern Europe. The rate of return to education caught-up with and sometimes even surpassed the rate in advanced market economies.

During the transition period, average real wages in Croatia fluctuated highly. The contraction in average real wages in Croatia during the first years of transition was the most intense among all transition countries in Central and Eastern Europe. Mostly due to the war, by 1993 the average real wage in Croatia was only one-third of what it was in 1989. Croatia is also atypical because of the high growth of average wages. This high growth rate started in 1994 and was especially strong in 1995. In 1995, the war ended and the average real wage grew at a rate of approximately 40%. After a period of exceptional wage growth by the end of the 1990's, the average real wage dropped towards the initial pre-transition level, a trend typical for most of the transition countries in Central and Eastern Europe. However, in spite of the aforementioned transition forces and exceptional average wage level fluctuations, the structure of relative wages in Croatia showed astonishing stability during the first half of the transition period. The growth of wage premiums for education was recorded only at the

15 Campos and Jolliffe, 2004

16 Rutkowski, 1996

17 Clark, 2000

18 Campos and Jolliffe, 2004

end of the 1990's, which makes the wage structure dynamics in Croatia different from in other Central and East European transition countries. While almost all Central and Eastern European countries (except for East Germany) experienced an increase in wage dispersion, particularly in the upper level of distribution[19], there was practically no adjustment in Croatia that would have mirrored the experience of other transition countries. Slovenia and Croatia inherited similar educational systems, making comparisons between them quite reliable. In Croatia, wage premiums for highly educated workers declined until 1996 and then grew substantially only after 1997 (Table 3.2). In Slovenia, at the same time, changes in the wage structure were relatively fast-paced, and in terms of the direction and intensity of these changes, they corresponded to changes that occurred in other transition countries. While in Croatia wage premiums for education during most of the transition period were relatively stable (with growth occurring at the end of the period), in Slovenia clear growth in premiums became apparent during the first half of the 1990's. It seems that the dispersion of wages in Slovenia was already somewhat greater at the beginning of the transition, i.e. closer to assumed market equilibrium.

While the change in the employment level in Croatia was relatively slow and of considerably less intensity than the average wage fluctuation, the same cannot be asserted for changes that occurred in the employment structure. Adjustment did not occur through changes in relative prices, i.e. relative wages for different categories of workers, but rather through an adjustment in quantity, i.e. relative employment. Demand for less-educated workers and for workers with vocational training declined considerably. The number of employees with only elementary school qualifications and semi-skilled and unskilled employees in Croatia was almost halved between 1988 and 2001, and the same phenomenon also happened to the number of employees with vocational education. This reduction in of the number of less skilled employees was counterbalanced by the growth in the number of university and professionally educated employees, as well as those with a general secondary school education.

While the ratio of college-educated employees' wages to wages of employees with secondary education increased by around 10% between late 1980's and 2002, the average wage remained approximately the same in real terms. However, this stagnation of the average wage over the observed period was a combination of wage reductions in all educational categories (except for wages of employees with university/college education, whose wages stagnated on average) and increasing share of employees with university/college education.

The long duration of the average period of study (around 6.5 years, non-weighted by university) and the large number of students that drop out of studies are serious obstacles for the convergence of the educational structure of the Croatian workforce towards the structures that are present in developed countries.

These problems are a result of a combination of various factors, so they cannot be easily resolved. The choice of a longer studying period over participation in the labor market is probably related to the labor market rigidities and difficulties in finding work for youth. The process of introducing more labor market flexibility will contribute towards the reduction of the average duration of unemployment and to an easier entry into the labor market. Higher university tuition fees, that were recently (but gradually) introduced, could contribute to shorter average periods of study and could therefore help eliminate the quasi-social public spending which subsidizes prolonged participation of unsuccessful students in education, this category accounting for around one third of all students.

19 Rutkovski, 1996

3.2 Adaptation of the tertiary education system to meet labor market needs

The rigidity of the TE system in terms of adapting to the needs of the economy has been subject to much criticism[20], mostly due to the rigidity of the existing TE institutions. Meanwhile, the establishment of new non-university institutions points to the improving adaptability of the system and to an enhanced sensibility to the needs of the market.[21]

However, the needs of the labor market are not systematically assessed and there is a large degree of inertia in setting up enrollment quotas, especially with respect to the portion of students financed by the MoSES.

Data from the Croatian Employment Service shows that inflows into the unemployment register and outflows out of the register, as well as reported vacancies. can be used to assess how graduates of different TE institutions fare in the labor market. Actual outflows of first-time job seekers point to an excess supply of workers in all educational categories. These experienced workers overwhelm newly employed workers with no working experience. However, those surpluses represent by far the smallest decrease in persons with TE[22], which demonstrates that the waiting period for employment is much shorter. Moreover, the aggregate surplus of labor in TE has also recently decreased, mostly because of growing demand. However, one has to remain cautious when comparing the numbers of enrolled students to reported vacancies, as graduations represent only a portion of total enrollments. Therefore, a large surplus of enrolled students does not necessarily indicate a surplus of highly educated labor. Similarly to the aggregate numbers, there has been an excess supply of enrolled students in most occupations. The largest relative surpluses of enrolled students to vacancies are evident in occupations related to shipping and transportation, and metallurgy and textiles. The job search period on average appears to be the shortest in fields such as education and electronics, although these are only tentative conclusions and there is a need for further research.

3.3 Mobility of the workforce

Although fears of a *brain drain* are widespread in Croatia due to its geographic proximity to the EU, a long history of emigration and a substantial difference in wages, there are no exact migration figures. The estimates of the number of migrants with TE during the 1990's are subject to much speculation. As Adamović and Mežnarić note[23], these estimates range between 5,000 (according to a statement made by the Minister of Science and Technology in early 2003) and 140,000 persons. The last population census confirms a significant decline in both the growth rate of persons with TE and their share in the total population during the 1990's compared to earlier periods. This decline occurred despite a simultaneous growth in the number of graduates (while the number of persons with TE grew at an annual rate of 5.6% during the period from 1971-1991, the annual growth rate declined to 1.5% between 1991 and 2001). Such dynamics are consistent with an increasing *brain drain*, although the higher range of estimates probably overstates the true extent of the *brain drain*,

20 e.g. Berryman and Drabek, 2002

21 OECD, 2001

22 Some of the unemployed probably found employment without it being recorded by the Croatian Employment Service even before the reform of the *Employment Act* in 2002 abolished the requirement for employers to report vacancies to the Croatian Employment Service. Therefore, Croatian Employment Service data probably overestimates the extent of the labor supply excess.

23 Adamović and Mežnarić, 2003

as it exceeds the number of graduates during that period. Some recent estimates point to around 40,000 migrants with TE during the 1990's, which is nevertheless around one-tenth of the total. However, Adamović and Mežnarić note[23] that nowadays economic reasons are less important considerations for potential young migrants within the scientific community compared to the 1990's. Meanwhile, the importance of working conditions (equipment) is growing, which might stimulate more favorable migration trends in the future.

CHAPTER 4

THE REGIONAL ROLE OF TERTIARY EDUCATION

4.1 Regional dimension of national tertiary education policy

Official data demonstrating regional dimensions in TE policy is rather poor. A statement from the website of the MoSES reads as follows: "In Croatia there are large regional differences in application rates to secondary and TE institutions. The MoSES, in cooperation with the ministries responsible for economy and regional development, as well as employment services and social partners, will help develop regional human resource development plans in line with economic and social goals. They will make efforts to adjust education and training provisions in regions to implement these plans. Local governments will be consulted on the plans. Measures will be taken to ensure that all young people have the opportunity to gain access to TE".

Although there have been few official statements and well-defined policy measures concerning regional development of TE, in practice the development of new TE initiatives, new approaches and the establishment of new institutions in the last two decades have had a clear regional dimension (Figure 2.4 represents an outline of the different types of TE institutions in all parts of Croatia).

Although there has been a rapid increase in the number of TE institutions outside of Zagreb during the last two decades, more than 50% of students are nonetheless enrolled in TE institutions in Zagreb (75,926 in Zagreb, 26,530 in Split, 18,483 in Rijeka and 5,343 in Zadar). (See statistical annex for Chapter 6).

In parallel to the developments in student enrollment, the teaching load of institutions outside Zagreb has increased. However, this was not followed by adequate staffing leading to the imbalance in teaching load between older and new institutions. Staff development in regional institutions was seriously impaired by the national policy designed in 1990, which did not allow the hiring of new staff in the TE sector.

Thus, although almost half of the students in Croatia are enrolled in HE institutions outside Zagreb, only one-third of Croatian academic staff is employed in these institutions. (See statistical annex for Chapter 7).

The early stage researchers program opened up the possibility for staff renewal, particularly in the last four years when the number of early stage researchers tripled. However, it still does not reflect the needs of

regional institutions. Out of 2,602 early stage researchers employed at tertiary and scientific institutions (Table 4.1), 741 are employed at regional tertiary institutions, which represent 28.8%.

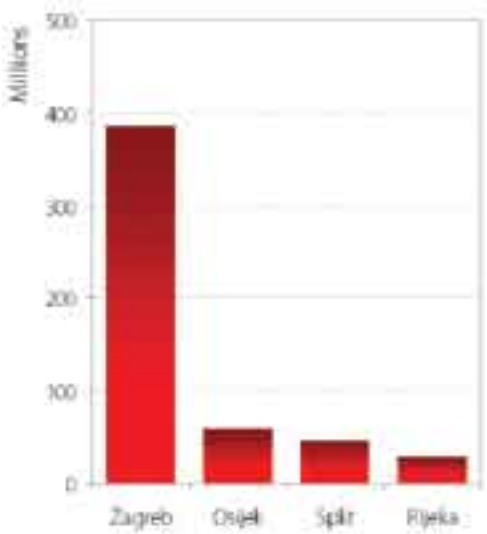

Figure 4.1 Total capital expenditures from the state budget by university, 1996 – 2001
(Source: The State Budget, respected years)

Given that salaries for staff represent almost 90% of the budget of HE institutions, the overall allocation of the budget reflects the proportions related to the staff (Figure 4.1). Similar proportions could be reflected also in capital investments (Table 4.2) and investments in educational and scientific equipment (Table 4.3). Thus, the increasing enrollment in regional tertiary institutions is not matched by adequate staffing, financial and material resources.

Recent investments in scientific equipment reflect a gradual change in policy, and represent a shift towards the development of regional research institutions (Table 4.3). Approximately 30% of investment is allocated to regional universities and regional research institutions.

Similarly to the overall funding levels, the financing of research is based on traditional evaluation of individual scientific grants. This process reflects an even sharper regional imbalance. Among all scientific projects (1,803 in April 2005), 70% of the overall number and 65% of the funds were allocated to universities (Table 4.4). Given that the majority of scientific institutes are located in Zagreb and that regional universities carry out the majority of research outside of Zagreb, the allocation of research funds to universities reflects the overall allocation to regional research activities (Table 4.5).

Altogether, approximately 20% of the total money allocated for research is allocated to research activities outside Zagreb, mostly to the regional universities (18%).

Similar linkages could be identified in the allocation of technology funds.

4.2 Establishment of new tertiary institutions in all regional centers

The regional expansion of the economy in the 1970's was one of the main reasons for establishing new TE institutions, primarily to meet the need for a more highly-qualified workforce. However, due to the economic recession in the 1990's caused by war in Croatia and the resulting economic restructuring, a number of small enterprises in all regions emerged and a number of large economic concerns closed down. Therefore, on the one hand, an increased need for postsecondary education emerged, while on the other hand, a distinct social dimension of the postsecondary education developed. Namely, a number of young people who were not able to find a job decided to continue education and pressured TE institutions to increase their enrollment. At the same time, traditional university education was inefficient as can be evidenced by a high dropout rate. This traditional education was also inflexible and too general in its approach, meaning that it did not offer enough instruction on practical skills and provided insufficient orientation towards the needs of employers.

4.3 Development of a university network and their regional orientation

The University of Zagreb is the oldest TE institution in Croatia, which extends its activity to a number of Croatian cities. These institutions developed for two to three decades within the University of Zagreb and represented the basis for subsequently founding new universities in Rijeka, Split and Osijek. However, the University of Zagreb still has faculties outside the city of Zagreb namely in Varaždin and Sisak.

The University of Rijeka was founded in 1973 and was constituted by previously existing TE institutions that had either acted as parts of the University of Zagreb or as independent institutions in the regions of Lika, Primorje and Gorski kotar and Istria. The University of Rijeka also has branches in Pula and Gospić.

The University of Split was established in 1974 and was constituted by all previously existing TE institutions in the region of Dalmatia (Split, Zadar and Dubrovnik). During the last 30 years, the University of Split has played a crucial role in the development of scientific and educational activities in Southern Croatia. Two of the most recent developments in the national network of universities (the establishment the University of Zadar and the University of Dubrovnik) occurred by separating them from the University of Split.

The Josip Juraj Strossmayer University was established in 1975. It operates in the town of Osijek and manages the Faculty of Mechanical Engineering in the town of Slavonski Brod.

The University of Zadar was established in 2003, based on the Faculty of Philosophy that was founded in 1956 as a part of the University of Zagreb (and later reassigned to the Faculty of Philosophy of the University of Split). Joint efforts made by Croatian Ministry of Science and Technology, institutions of TE in Zadar, the city government, the county government, Zadar´s archdiocese, and the support of the University of Split and the Croatian Academy of Arts and Sciences, yielded the *Act of Instituting the University of Zadar*, which was passed by the Croatian Parliament in 2002. This Act led to the registration of the University in January 2003.

The University of Dubrovnik was registered in 2003 by combining several TE institutions that existed in Dubrovnik: the Polytechnic of Dubrovnik (which was established in 1998), the Faculty of Tourism and Trade and the Maritime Faculty that operated as parts of the University of Split since 1984 and 1996, respectively.

In 2004, the discussions about establishment of the university in Pula were initiated. The basis for new university in Pula were parts of the University of Rijeka that are located in the city of Pula. The University of Pula was founded by the Act[24] in 2006, and it is expected to become fully operational in 2007.

4.4 Differentiation of tertiary education institutions

The introduction of professional studies by the *Act on Higher Education Institutions* (1993) initiated a discussion on the differentiation of TE provisions and institutions in Croatia. It was proclaimed that the new structure should be established within 5 years of the adoption of the Act. However, the initial discussion was not fruitful and neither the structure nor the institutions were devised in 1998, when the decision should have been implemented. At that time, all professional studies organized by universities were transformed into new types of institutions called *veleučilišta* (a similar word to the word "university" in Croatian, although whose meaning is "polytechnic"), but which were established without a proper infrastructure and with human resources often borrowed from universities. However, these institutions did have an organizational structure that would correspond to an entrepreneurial university (led by a Rector). In most cases, these institutions were expected to organize educational programs in conjunction with the personnel of the university on the premises of the university itself. This type of approach significantly altered the autonomy of universities, and produced confusion and tension within TE institutions. Teachers from faculties, who thereby earned extra wages but who also – in some cases – accumulated an unusually high teaching load, carried out most of the teaching. There was therefore a significant alteration in the quality of education, both at universities and at new TE institutions, as well as in the quality of research activities of university teachers.

The entrepreneurial spirit introduced by these new TE institutions represented a challenge for traditional TE providers and resulted in pressure to expand into new study programs as well as to not restrict the enrollment of students. This was of particular significance to the leadership of the new institutions since the Ministry proclaimed that most of these students could be supported by the state budget and paid tuition fees. Overall, the introduction of this entrepreneurial spirit and market-based principles were positive in the way they challenged traditional TE institutions. However, this spirit was expanded within the framework of undeveloped accreditation procedures, quality standards and evaluation procedures. Frequently, low quality education was considered easier and faster to obtain than a traditional university education. In addition, these institutions in many cases opened new programs that were shortened versions of existing university programs, in particular within the field of economics and information technologies – programs that were in particularly high demand.

The entrepreneurial spirit introduced by the new institutions increased demand for education and stronger regional initiatives significantly expanded the TE market, resulting in the opening of a number of private institutions that provide professional education.

Unfortunately, many of these institutions are located only in Zagreb.

With the new *Act on Scientific Activities and Higher Education* (2003) in place, non-university institutions are allowed to organize first-cycle education with a similar structure and duration to the first-cycle at universities. This results in a less clear differentiation between university institutions and professional institutions. In

24 OG, 111/06

particular, this will lead to further debate regarding the binary system and HE provisions within the context of the Bologna process, as well as a quality assurance system.

4.5 Regional dimension of establishing polytechnic and other institutions of higher professional education

Professional higher education has a long history in Croatia: the majority of professional HE institutions were established in the 1990's. With the rapid restructuring of the Croatian economy during the last decade, and with the decline of large state enterprises following privatization, education became attractive to the private sector.

Nowadays, professional HE institutions enroll approximately 30,000 students.

Eleven institutions are private and 20 of them are state-funded institutions.

The *Act on Higher Education Institutions* (1993) promoted the dual or binary system and stated that professional programs are primarily to be offered at polytechnics and other institutions of professional higher education. Professional programs may also be conducted at universities.

In 1996, the National Council for Higher Education (NCHE) adopted the basic principles for establishing non-university institutions (*veleučilišta*) in the Republic of Croatia, as well as basic principles for the separation of professional and university studies[25]. The NCHE recommended establishing polytechnics (*veleučilišta*) as part of a Croatian network of TE institutions. The NCHE also recommended their integrated organizational structure and identified their potential locations (based on the strength of existing universities, the number of inhabitants and regional needs) in university centers such as Rijeka, Osijek, Split and Zagreb, as well as in towns like Varaždin, Slavonski Brod, Zadar, Dubrovnik, Karlovac and Vukovar. The NCHE also defined the minimal criteria for establishing polytechnics (in terms of staff and material resources) and required their regional orientation in terms of human resource development. Besides existing polytechnics in Karlovac and Dubrovnik (which were established 1997), new institutions were to be established in Požega, Split and Rijeka, as well as two new institutions in Zagreb[26]. These institutions were established in 1998 as a part of the network of seven polytechnics.

The new institutions in Karlovac, Dubrovnik and Požega had sufficient material resources and space for independent development, with additional support from the local community and municipalities. In contrast, polytechnics in Rijeka and Split suffered from lack of space, equipment and staff. Therefore, they were forced to make partnership arrangements with existing universities. These arrangements created a number of conflicts and problems, particularly with the financial restrictions of the new institutions. The two polytechnics in Zagreb had different development paths: the Technical Polytechnic developed independently with the support of the City of Zagreb, and the Social Polytechnic did not in fact separate from the Faculty of Law and continued its operations within the structure of this Faculty.

Conflict between universities and new non-university TE institutions resulted from the fact that a number of professional programs had been established and delivered by faculties within universities for over two decades. These programs were transferred by an administrative decision to the polytechnics within the same

25 At its 27th session held on 11 July 1996.

26 *Regulations on Conditions for Performing Activities of Higher Education Institutions*, passed on 17 July 1996.

city, and the new institutions in fact continued to function within the structure of the universities[27]. In 2001, all professional studies were returned to the universities, and the Polytechnic in Split was closed in 2003 and joined the University of Split.

The Polytechnic of Rijeka continued its development within the region and established branches in a number of cities: Rijeka, Pula, Poreč, Otočac and Gospić. Local governments, municipalities and a number of businesses in the region supported the branches.

The most recent development resulted in the opening of five new non-university institutions (*veleučilišta*) in the cities of Knin, Vukovar, Gospić, Šibenik and Slavonski Brod[28], as part of a Government program to establish TE institutions in cities and regions affected by the war in order to support their development.

4.6 Distance learning programs

Beside their regional dispersion, Croatian universities offer distance study programs in a number of cities throughout Croatia. Some faculties of the University of Zagreb are offering distance learning in Rijeka, Čakovec, Varaždin, Križevci and Zabok. Some faculties of the University of Rijeka are offering courses in the towns of Buje, Otočac, Bjelovar and Zabok and some faculties of the University of Osijek are offering courses in Vukovar and Varaždin. The University of Zadar is offering courses in Šibenik.

The distance learning approach was accepted and incorporated into the newly formed non-university institutions. The most efficient institution in the development and opening of distance learning programs throughout Croatia was the Polytechnic in Split. This institution generated a conflict with the Government in 2003 that resulted in the closing of this institution. The Polytechnic in Rijeka also offers distance-learning programs, but mostly within the region where this institution operates (Istra, Primorje and Gorski Kotar, and Lika).

4.7 Funding mechanisms to reward institutions for their regional engagements

Although the criteria for funding TE institutions are based on the number of enrolled students, in fact the funding primarily depends on the number of employees.

No funding mechanisms that specifically provide core funding to reward HE institutions for their regional engagement have been developed so far.

Regional differentiation in terms of research and teaching has not been defined, and therefore, no particular financial measures were applied.

The only well-defined regional priority is the *Adriatic Sea Project*. In 1997, the Government decided to launch a program entitled *Systematic Research of the Adriatic Sea* as a prerequisite for the sustainable development of the Republic of Croatia. The project was based on existing national monitoring and collection of data,

27 Rijeka Polytechnic, www.veleri.hr

28 Polytechnics "Marko Marulić" in Knin and Polytechnics "Lavoslav Ružička" in Vukovar were founded in 2005 (OG, 73/05 and 92/05, respectively). Polytechnics "Nikola Tesla" in Gospić, Polytechnics in Šibenik and Polytechnics in Slavonski Brod were founded in 2006 (OG, 75/06 and 108/06, respectively).

as well as international activities that included Croatian institutions. The primary goal of the project was to determine the special requirements for resolving restrictions that disrupt the sustainable development of the Croatian Adriatic area. Seven scientific research institutions and departments, four of which are located in Zagreb, implemented this project[29]. No regional universities were involved.

In July 2005, the Government founded[30] the Center for Karst in the city of Gospić. The Center is aimed to conduct research activities and developmental projects, organization of scientific meetings and preparation of publications related to the research of the karst region. The goal is to ensure sustainable development and economic growth of the karst region.

The Government has launched special programs to stimulate employment in science and TE, thus decreasing both *brain drain* and the internal drain in the science and TE system. In 2003, the Ministry of Science and Technology approved 300 new positions for university teachers and researchers, and programs for young researchers, such as securing funds for their accommodation (construction of residential buildings in Zagreb, providing accommodation at student dormitories, meals in student restaurants, transportation, etc.). In 2005, the MoSES initiated a program of 400 new positions for teaching and academic staff, particularly for those in the regions. More positions that are new were allocated to regional universities, particularly to universities in Dubrovnik and Zadar. The Government has also launched a campaign entitled *From University to Work* in order to provide employment incentives for the best students.

4.8 Investment policy and creating a favorable academic environment in Croatian regions

The most important recent development that can be recognized as a regional policy of the Government was the decision to concentrate capital investments in universities in order to improve the teaching and working standards (Table 4.6).

By the end of 2001, the University of Rijeka applied an entirely new approach for financing capital investments in the HE system. The University directly agreed upon a loan with a commercial bank. The national model was developed after one year of use and applied to other universities. The investment program started with the University of Rijeka, in which approximately 120 million HRK (approx. 16.5 million EUR) was invested during the year 2002-2003. This was followed by investments of 180 million HRK (24 million EUR) in the University of Osijek, 345 million HRK (46 million EUR) in the campus of the University of Split and 490 million HRK (66 million EUR) in the faculties of the University of Zagreb. These investments were expected to be completed during the 2004-2006 period. In 2005, the Government decided to invest additional 490 million HRK (around 66 million EUR) in the new campus of the University of Rijeka (Table 4.6). This project should be completed by 2008.

A significant effort was made to improve the housing conditions of those employed at universities. Employees were given a chance to agree on housing loans that had better terms than prevailing market conditions. Universities took over the responsibility of negotiating with commercial banks, and the MoSES subsidized the

29 The Institute for Oceanography and Fisheries, Split; The Institute for Oceanography and Fisheries, Laboratory at Dubrovnik; Rudjer Bošković Institute – Centre for Marine Research, Rovinj; Rudjer Bošković Institute, Zagreb; The Faculty of Natural Sciences and Mathematics, Zagreb, Biology Department; The Faculty of Natural Sciences and Mathematics, Zagreb, Department for Geophysics; The Croatian Hydrographical Institute, Split.

30 OG, 92/05

interest (66% of the interest) on the commercial loan. The outcome was a loan with an interest rate of less than 2% (i.e. 1.67% in 2006) for a period of up to 30 years. In this period, more than 1,900 such loans were realized (e.g. 273 in Rijeka, 255 in Split), and an additional 700 are planned for year 2007. Local communities supported the aforementioned efforts of the universities and the MoSES. For example, the cities of Split and Rijeka contributed to communal expenses, which reduced the price for almost 20% of the loan recipients.

4.9 Regional dimension of universities

With the introduction of the functional integration of universities during the preparatory phase of the new Act on TE, it became clear that regional development could be impacted only by the universities as integrated institutions with interdisciplinary resources and a critical mass of work force. Such universities would be able to significantly contribute to the development of regional industry and civil society. Institutional policy initiatives that aim to promote regional cooperation between tertiary institutions and industry, government and civil society have appeared recently.

Previously, the direct impact of tertiary institutions on the development of industry, regional units and civil society was rather poor and mostly indirect.

A major reason for the lack of direct impact resulted from the fact that universities are not recognized as strong institutions because of the fragmentation of the university system.

This is similar to higher schools and polytechnics, mostly because they were weak institutions without significant human and material resources. Thus, cooperation with local governments (counties, communities and municipalities) mostly progressed in such a manner that a county and city co-financed the needs of the tertiary institution. For example, sharing educational costs included the construction of capital structures, the acquisition of information, instructional and other equipment, the co-financing of scientific projects, the co-financing of participation in scientific gatherings, book purchasing, etc. From this point of view, cooperation between local governments and tertiary institutions was successful. However, cooperation on scientific and developmental projects for the benefit of a county and a city has been sporadic and based only on individual contacts among the county's and the city's functionaries and individual experts at the university. Similar cooperation had been established between industry and civil society. Such cooperation was inefficient and did not allow the large staff potential of the tertiary institutions, particularly at universities, to be tapped.

4.10 The national technology policy

Technology policy is to create a well-defined and organized policy to help tertiary institutions respond to, and shape the economic and labor market requirements of the regions in which they are located. The Croatian Parliament formulated the policy for *Innovative Technological Development* (HITRA) as described in Chapter 5. The institutional framework for technology development has been created and includes several institutions defined by the HITRA program: the Research and Development Technology Institute, the Research and Development Centers, the Technology Innovation Centers and the Business and Innovation Center of Croatia (BICRO).

The Technology Innovation Centers (TICs) are infrastructure institutions established by academic institutions and supported by local government and economic entities. They aim to operationalize ideas, innovations and research results that arise from scientific research projects funded by public or private sources. In terms of

organization, TICs are incubators for knowledge-based small and medium-sized enterprises. There are four technology centers established so far: in Zagreb (established in 1996), in Split (established in 1997), in Rijeka (established in 1997) and in Osijek (established in 2003). In addition to the TICs, there are two research and development centers: the Research and Development Center for Marine Agriculture in Dubrovnik (established 2001), and the Center for Production Processes in Zagreb (established in 2002).

4.11 Best practices for the regional impact of tertiary education institutions

The only university that has formalized cooperation with regional structures is the University of Rijeka. It has an agreement with the Primorsko-goranska County and the City of Rijeka regarding scientific and developmental projects that benefit the county and the city. The cooperation started with the *Agreement on Scientific and Developmental Cooperation* signed in 2002[31]. This agreement was implemented through the important projects for the development of Primorsko-goranska County and the City of Rijeka. According to the Agreement, the partners identified that scientific and developmental cooperation are necessary to reach the goals of sustainable and balanced development of the region, economic progress and good living standards for the citizens living in a specific county and city. These goals have to be based on credible scientific and professional achievements, especially those resulting from the successful functioning of the scientific and research community represented by the university. They are all aware of the importance of institutional cooperation between the scientific and research community and the regional and local government institutions. By signing the agreement, the county and city have committed to provide financial, professional and other necessary support in the course of the project tasks, to the extent of their authority. For the project tasks with appropriate scientific content, the university can ask the MoSES for co-financing.

In a two-year period, the University of Rijeka has signed agreements for 13 projects with a total value of more than 4 million HRK. Seven projects were completed by the end of 2004 (three projects in 2003 and four in 2004), and six projects in 2005. The employees of the university's nine scientific institutions have been involved in implementing the contracted projects. Specifically, 99 professors, 22 assistants, 15 early stage researchers, 46 students and 40 external collaborators have all been active in the project.

31 Available on: http://www.uniri.hr/index.php?option=com_wrapper&Itemid=188. Accessed: January 18, 2007.

CHAPTER 5

THE ROLE OF TERTIARY EDUCATION IN RESEARCH AND INNOVATION

5.1 Balancing effort between teaching and research

Croatian universities, similarly to all European universities, face the necessity to adapt to a series of profound changes brought upon by the emerging knowledge-based economy. Universities hold the key for moving towards a knowledge-based society since they create a national knowledge base and educate a highly skilled labor force. On the other hand, they are faced with the growing necessity of accelerating technological change and of producing innovation and fostering overall economic development. The policy of the Croatian Government for strengthening the role of the university in research and innovation reflects both processes of university modernization: basic research activities and cooperation with the business sector. However, while the first task is easily accomplished since research is a standard part of university practice, cooperation with the business sector is rather dysfunctional. Cooperation is poor because the research market in Croatia is weak due to the lack of demand for scientific research from the industrial and business sector, which is still adjusting to the difficulties of transition to a market economy.

The legal framework for developing research within TE was provided by the *Act on Scientific Research Activity*, which came into force in 2003, and by the *Act on Scientific Activity and Higher Education* adopted in 2003. The *National Scientific Research Program 1996-2000* (1996) and *the Strategy of Development of the Republic of Croatia in the 21st Century – Science* (2003) formulated the policy and strategic framework. Recently, Croatian Government adopted the *Science and Technology Policy* of the Republic of Croatia for the period 2006-2010 (MoSES, 2006).

The legal framework for encouraging university-business cooperation is provided by the first innovation program – the *Croatian Program for Innovative Technological Development* (HITRA), adopted by the Government of the Republic of Croatia in 2001 (MoSES, 2001).

Scientific and research activities in Croatia are carried out within an institutional system that consists of five types of institutions: (a) public (state) institutes; (b) institutions of TE; (c) other corporate bodies like the Croatian Academy of Sciences and Arts and health care institutions; (d) independent institutes; and (e) corporate industrial institutes. The first three types of institutions make up the state or public sectors of R&D,

while the corporate in-house institutes and independent institutes form the private business sector of R&D. The R&D and tertiary education sector consists of six universities, 26 public institutes, 11 research centers in industry, three academies, 20 colleges, eight polytechnics, one military research center, five technology centers and one business-innovation center (MoSES, 2006).

The system of science and innovation in Croatia is given in Figure 5.1.

The largest part of research activities in terms of human resources and the number of R&D legal entities recorded by the Central Bureau of Statistics (CBS) rests within the TE sector. This sector makes up around 44% of all the R&D institutions (Table 5.1) and employs between 50%-60% of all researchers (Table 5.2 and Figure 5.2). In 2003, the university sector and the government sector together (public institutes and other entities) comprised almost 80% of all the R&D institutions in Croatia and employed 85% of all researchers.

The state sector is, therefore, the largely dominant sector in the Croatian R&D system, especially comparing to research potentials in the business sector.

As reported in 2003, the business sector employed only 15% of researchers and encompassed around 20% of all research units. The R&D units in the business sector are mostly involved in technical sciences (70 - 80%) while research units within the government sector are primarily engaged in medical sciences (Table 5.1). The majority of R&D units in the TE sector, around 65%, are involved in social and technical sciences, while the remaining units are in medical and biotechnical sciences and humanities. The distribution of researchers by scientific fields (Table 5.2) roughly corresponds to the institutional infrastructure. This indicates a satisfactory institutional infrastructure of the university sector for a variety of academic research and possibly for a stronger engagement in innovation and technological development.

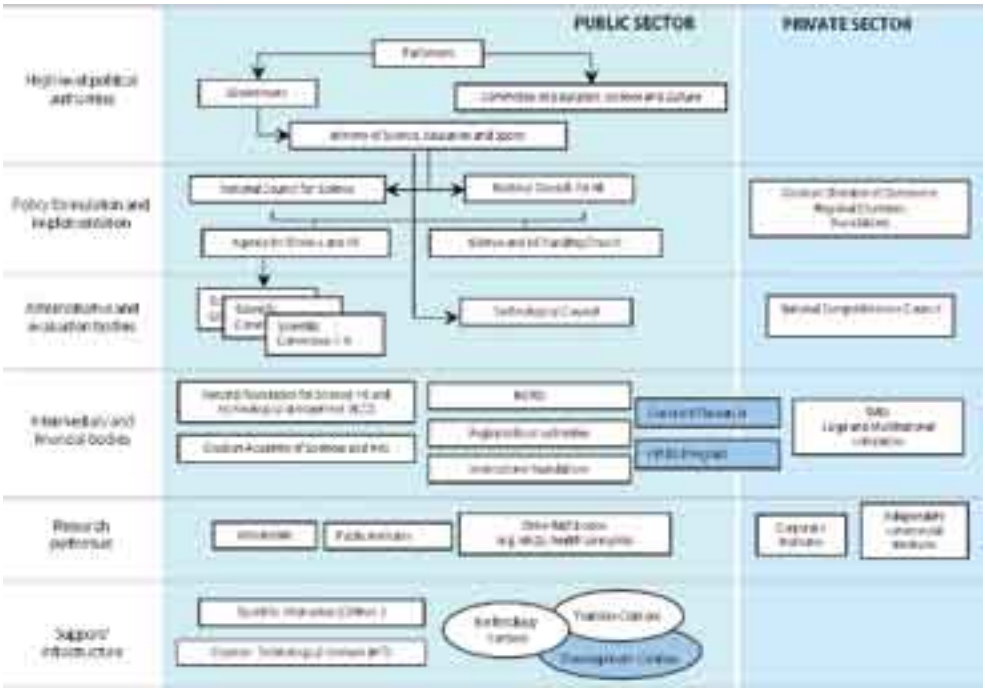

Figure 5.1 Science and innovation system of Croatia

The total number of researchers has remained almost the same over the last 7 years, at around 7,000 (despite some oscillations mainly caused by the calculation method of FTE[32]) (Figure 5.2 and Table 5.2), making Croatia lag behind developed European countries regarding research work force. In order to assess how many people are actively involved in R&D and how important research jobs are in the labor market, it is necessary to calculate the number of full-time equivalent researchers (FTE) relative to the total number of people (headcount - HC) in the labor force. In the referent year 2003, Croatia reported 3.8 researchers per 1,000 labor force compared to 5.4 researchers in the European Union (EU25) and 3.5 researchers in the new EU Member States (EU10). With the exception of Slovenia, Estonia and Lithuania, Croatia has a larger pool of researchers than the remaining EU10 countries (Figure 5.3).

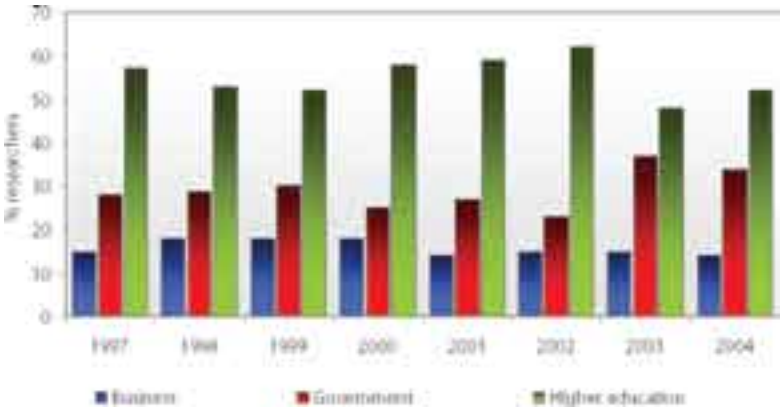

Figure 5.2 Total researchers (FTE) by sectors in Croatia
(Source: CBS; Annual Reports)

The MoSES is taking special care to rejuvenate research staff both in universities and state institutes, while also supporting the implementation of the integration of young researchers into corporate institutes. The integration of young scientists into the scientific community is conducted under a special program called *Junior Researchers* which is supported by 23% of the MoSES-Science directorate's total resources in 2003 (MEI, 2004). The total number of young researchers increased to 2,600 in 2004 (Figure 5.4 and Table 5.3). This increase guarantees an important and systemic solution for reviving not only the research work force at faculties, but also the strength of human capital in the research sector at a national level.

32 See note related to Table 5.2

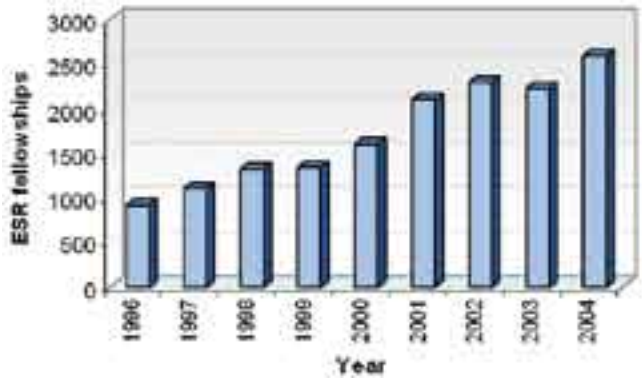

Figure 5.4 Number of early stage researchers in Croatia

Almost 70% of the young researchers are located in universities, around 20% are at public institutes, while the remaining researchers are affiliated with institutions such as research units at hospitals, the Croatian Academy of Sciences and Arts and private industrial institutes (Table 5.3).

In line with the provision of a substantial number of researchers, a reform of doctoral studies is underway in order to increase the number of persons holding doctoral degrees in the total population of Croatia. Presently the share of doctors of science in the population is very low and amounts to 0.25% of population while the target is to increase their share to 1% of population in the next 10 years. The implementation of this goal requires the reform of doctoral studies in line with the Bologna process as envisaged in the *Principles for Establishing Postgraduate Studies*, approved by the National Council for Higher Education (NCHE, 2006).

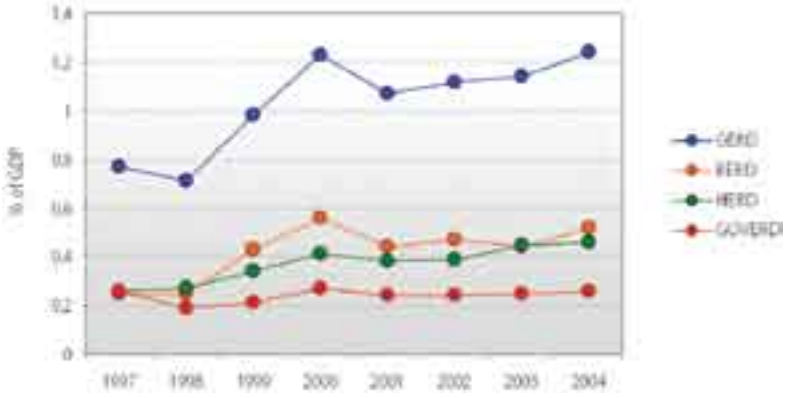

Figure 5.5 Growth of R&D expenditures by main sectors of performance in Croatia
(Source: CBS, Annual reports)

The Croatian research intensity (usually measured by R&D expenditure or investment as a proportion of GDP) has been continuously rising since the mid 1990's (Figure 5.5 and Table 5.4). This places Croatia above the average of the new EU Member States (EU-10) (Figure 5.6). Croatia is also well above acceding countries

- Romania and Bulgaria, and significantly above remaining candidate countries - FYR Macedonia and Turkey as well as Serbia as a potential candidate country (Figure 5.7). These countries usually serve as the main reference point in Croatia's benchmarking.

In 2003, the new Member States (EU 10) invested 0.74% GDP in R&D (ranging from 0.27% of the GDP in Malta to 1.54% of the GDP in Slovenia), which is well below the EU R&D intensity (1.92%). Most of the new Member States and candidate countries have had relatively low R&D intensities, below 1% of GDP, with the exception of Slovenia and the Czech Republic, and Croatia as a candidate country (Figure 5.6).

In terms of research intensity measured in full-time equivalent researchers and total intramural investments in R&D (GERD), Croatia is among the leading countries in the region (Figure 5.7). However, investments in R&D in Croatia are well below the levels in developed European countries, especially in rapidly growing countries such as Finland, which invests more than 3% of its GDP in R&D.

Although research within the TE sector has always been important for increasing the knowledge base in Croatia, it began to play a more substantial role in national research activities from the mid-1990s. The shares of research expenditures of the TE sector (HERD), the business sector (BERD) and the government sector (GOVERD) in total expenditures (GERD) used to be almost the same, that is approximately 33% (Figure 5.8). However, from 1997 to 2004 the share of GERD spent on the business sector (BERD) grew from 32% to 42%, while the expenditures for government institutes and laboratories (GOVERD), experienced the opposite effect, and declined from 34% to 21%.

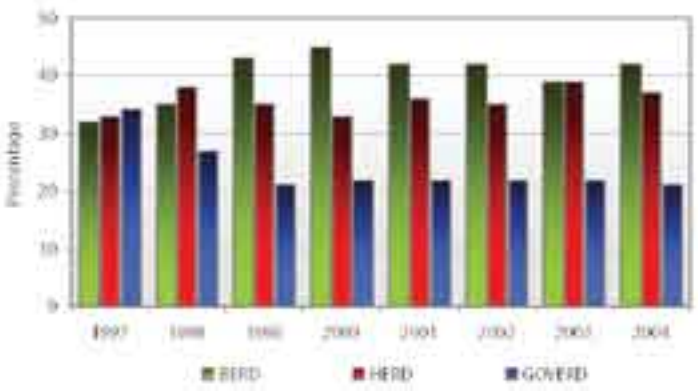

Figure 5.8 The share of R&D expenditures by the main sectors of R&D performance in GERD
(Source: CBS, Annual reports)

Therefore, although the share of the TE sector in GERD remained almost constant over the last 7 years (with some upward fluctuations ranging from 33% to 39%), it has exceeded the government sector and has become responsible for the greater part of R&D conducted by the public sector institutions. Similarly to most Western European countries where public expenditure on R&D is mainly executed by the TE sector, TE expenditure on R&D in Croatia also amounts to almost 65% of the total public R&D expenditures in 2003 (Figure 5.9).

The share of expenditures on R&D (GERD) by source of funds has not changed significantly in the last 8 years (Table 5.8). For example, the business share in financing R&D in HE is almost constant and amounts to approximately 7%, while the state participates with 70%.

The TE and government sectors employs the vast majority of researchers in Croatia, almost 85% (Figure 5.2 and Figure 5.10), and in 2004 spent almost 0.70% of GDP on research and development. The business sector in Croatia employs a modest 15.5% of the researchers and invests 0.44% of GDP, indicating a certain structural imbalance in the Croatian R&D system. Such an imbalance calls for the adaptation to the requirements of the emerging knowledge-based economy, both through investment in R&D and through building human capital.

In developed and rapidly growing countries, the research capabilities of the industry and business sectors in both research work force and investments largely overshadow the public sector. According to EUROSTAT, the business sector in Western European countries invests more than 1% of the GDP, ranging from 0.19% in Greece to 2.95 % in Sweden and employs a large proportion of all researchers, almost 50% on average (ranging from to 13.6% in Luxembourg to 66.3% in Austria. In Croatia, however, the opposite is the case, as the Croatian R&D system is dominated by the public sector.

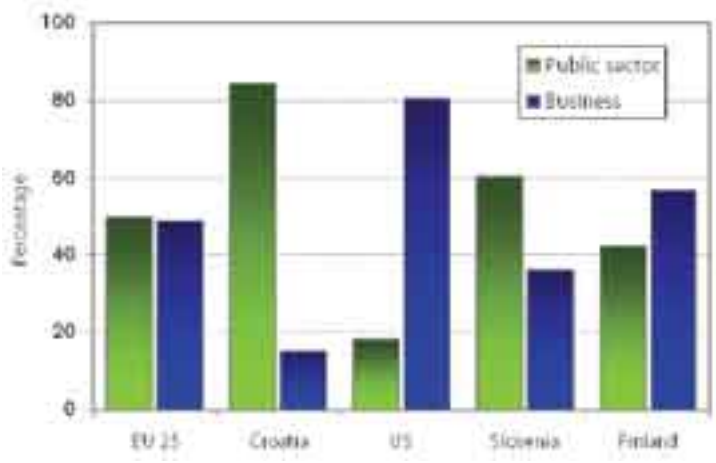

Figure 5.10 Researchers in public and business sectors in 2003

(Source: Towards a European Research Area: Science, Technology and Innovation: Key Figures 2003-2004; Croatia -CBS, Croatia)

Contributions of the business sector (compared to that of the government sector) to both financing and to enhancing the performance of R&D have evolved in Croatia, but the ratio of business/government contribution should be reversed in order to provide sufficient business support to R&D. The government sector not only plays a major role in financing R&D, but it also performs most R&D. In 2003, the Government financed 55.9 % of GERD and performed 0.70 % of R&D while the business sector financed 42.1% of GERD and performed 0.45 % of R&D (Figure 5.11 and Figure 5.12). Although this ratio is more convenient than in many new Member States, it is still unsatisfactory in comparison to leading countries in the area, such as Slovenia and the Czech Republic. The flow-chart of financing and performing R&D in Croatia is provided in Figure 5.13.

Figure 5.13 Flowchart of financing and performing R&D in Croatia (2003)

R&D expenditures per researcher in Croatia have increased consistently in recent years. The most significant increase was perceived in the business sectors while the increase in TE and the government sector was rather modest. In 2001, the expenditure per researcher amounted EUR 36,000 - significantly below the EU15 average of EUR 171,000. However, Croatia is keeping pace with the newly integrated European countries (EU10) whose average investment per researcher amounts to EUR 35,000 (Figure 5.14). The proportion of R&D expenditures per researcher by sector mirrors the proportions of other European countries. Croatia spends the largest amount of money per researcher in the business sector, significantly less in the government sector, while research posts in TE receive the minimum (Figure 5.15).

Croatian universities are traditionally very strong in research activities. The basic process of performing research at universities is through national research projects financed by the MoSES. Research projects provide academic staff with the most sustainable financial means for research materials such as equipment, utilities, publishing, conferences, etc. According to the CBS, during the period 1998-2003, on average half of the full-time equivalent research-teaching staff at TE institutions were actively involved in R&D projects. Currently, however, university personnel are rather overloaded with teaching activities and involvement in R&D has put them under serious strain. Therefore, university staff should be significantly increased to maintain research excellence and meet the needs of a developing modern university. This requirement is of special importance in view of meeting the Bologna standards as well as ensuring the quality of teaching and of TE institutions within the Bologna process.

5.2 Funding research conducted within tertiary education

There is a growing recognition that universities today are facing pressure to change and are in the process of moving towards new mode of knowledge production. The changing position of universities assumes their active role in local and regional economic development, technology transfer and closer cooperation with the industrial sector and private businesses. Currently, Croatian universities are deeply rooted in the European tradition of academic freedom and curiosity-driven academic research. For this reason, they have mainly preserved their conventional role of scientific research aimed at broadening the frontiers of science and

promoting the national cultural heritage. Therefore, the organization of research projects at TE institutions, evaluation criteria and allied financial support has mainly favored scientific excellence and fundamental and applied research. Meanwhile, the commercialization of science through scientific cooperation (e.g. contract research) or spin-off companies is still a new practice in the Croatian academic community. However, the intensity of science-industry cooperation is largely determined by the strength and efficiency of the research market. In this marketplace both sides, the universities as the main suppliers and the business sector as the main consumer, are playing equal roles. Due to the decline of the manufacturing industry during the past decade, the demand of Croatian enterprises for R&D and innovation and business interest in utilizing technological achievements has been substantially reduced. The "vicious circle" of mutually interrelated "underdevelopment" and "underinvestment" have led to the cutting of financial resources for R&D activities in the private sector and seriously diminished demand for R&D services.

Mainly driven by the aforementioned factors, the share of TE expenditures on R&D (hereafter HERD) financed by the private business enterprises or industry makes up around 10% of such spending, while the majority of HERD is financed by the central Government, at more than 70% (Figure 5.16). In the EU, science-industry cooperation sees the industry share in financing HERD amounting to 6.8% (EC, 2003). Thus, although the share of private involvement in university research in Croatia is of great importance for technology transfer and development, the real problem stems from the underdeveloped R&D sector within the business sector itself.

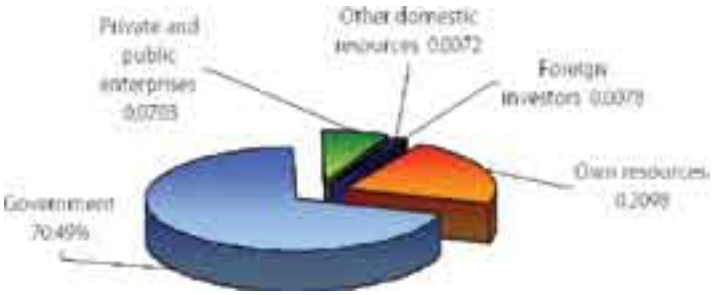

Figure 5.16 HERD by source of funds in 2004
(Source: CBS)

The scientific and technological productivity of Croatian universities indicated by the number of scientific publications (Table 5.6) and patents (Table 5.7) within national statistics reported by the CBS demonstrates a dominant orientation of academic staff towards publishing research works. In Croatia, there are around 100 published papers per one registered patent (MoSES, 2006). As reported by the European Patent Office (EPO), Croatia submitted 12 patent applications per million inhabitants to EPO in 2002, which is a modest contribution in comparison to developed countries (Figure 5.17) . However, Croatia is topping the list of new member states in patent applications (Figure 5.17) and is keeping the pace in scientific publications (Figure 5.18).

Patenting at universities has been opposed by some influential scientists in the Croatian scientific community and has never become a part of the scientific culture and ethos. However, the domination of "scientific puritanism" and the stigmatization of science as a commodity prevents researchers with commercial ideas from either making direct financial gain from their research or from establishing official cooperation with an

industry. Patenting, however, represents a direct link between science and its capitalization and patents play a role in creating closer links between research and technology development. Therefore, a range of new activities for promoting intellectual property rights (IPR) in the academic community and the stronger orientation of universities towards "making profits from knowledge" are planned within the *Croatian Program for Innovative Technological Development* (HITRA).

International scientific cooperation is of high importance to the Croatian scientific community for achieving scientific excellence and technology advancement. The most important aspect is integration into ERA through the EU *Framework Program for Research and Technological Development*. Croatia is fully associated with the *6th Framework Program* (FP6) from January 2006. Previously Croatia has participated as a "third country", which restricted its access to EU calls for proposals and programs. However, Croatia demonstrated a high absorption capacity for FP6 projects. As a fully associated member state, Croatia has participated in FP6 with 6.4 million EUR in 2006, of which 3.18 million EUR was provided by the state budget and remaining funds covered by the PHARE program. From 2003 to July 2006, Croatian scientists concluded 95 research contracts of the total value of 7.8 million EUR. In 2006 alone, the total value of research contracts amounted to 3.6 million EUR, thus exceeding the national contribution. Croatian scientists are most successful in information sciences, knowledge society and biomedical/biotechnological sciences since the majority of research projects are awarded in those areas.

5.3 Allocation of research funds and assessing the quality and effectiveness of research in tertiary education institutions

Science and research activities undertaken by TE institutions are under the authority of the MoSES. The MoSES, as stipulated by the Croatian legislation, carries out administrative and other tasks related to the planning, financing, implementing and monitoring of science and technology in Croatia. One basic structure for conducting research activities in the public research sector (including TE) are scientific research projects and programs within the nation-wide program *Scientific Projects* (*ZProjekti*) managed by the MoSES. In 2003, the MoSES supported around 1,800 research projects and programs at the total cost of 124,306,000 HRK (Table 5.8). The majority of research projects, over 70%, are implemented by universities, while the remaining are implemented by public institutes, private institutes and other research units.

The strategic and advisory body for developing and maintaining the quality of the overall scientific activity in Croatia is the National Council for Science (NCS). The Council is appointed by the Croatian Parliament based on the recommendation of the Government of the Republic of Croatia. Among other tasks, it monitors and evaluates the quality of scientific organizations, proposes budgets for scientific activities and organizes the evaluation of scientific projects and programs. In coordination with the NCHE, the principal advisory body for TE, it submits annual budget proposals for science and TE to the Croatian Government. To serve both the councils, the Science and Higher Education Funding Council (SHEFC) was established in May 2005 to provide the councils with the expertise and professional assistance on budget planning and expenditures. The ASHE provides the administrative and professional support to the NCS and the NCHE. The ASHE carries out technical and expert activities related to, among others, the evaluation of research and TE institutions, scientific research projects, the distribution of scientific equipment and maintaining the quality of university and professional education.

The advisory body for technology is the Technology Field Council, established by the Ministry of Science and Technology in 2001. It consists of 13 members appointed by the Minister od Science, Education and Sports. Its main purpose is to evaluate technology projects (TEST program) and propose to the MoSES the

financial support and grants needed for each project. TEST is as a part of the *Croatian Program for Innovative Technological Development* (HITRA) (Table 5.9).

The MoSES manages the budget for R&D activities for both public institutes and TE intuitions. Budgetary allocation is made after the evaluation of the projects that are submitted by the public call and judged on a competitive basis. There are no significant differences between the submission procedures and the evaluation process of research proposals coming from public institutes and HE institutions.

For the purposes of evaluating project proposals, the NCS appoints six Scientific Field Councils, classified by scientific area - natural, technical, biomedical, bio-technical, social science and the humanities. The councils rely on recommendations of around 40 panel review groups appointed by the Minister. Their task is to nominate peer reviewers for each project proposal and, based on their grades, reach a decision on accepting or declining a project. The final decision is made by the Minister. Project awards are granted for a period of three to five years. Principal researchers of contracted projects submit a report on their research once a year. Based on the evaluation of this report, the Minister decides on the continuation of project activities. The peer review groups evaluate project proposals, interim (annual) reports and final reports.

Research projects financed by the MoSES are mainly basic and long-term scientific projects to serve the need for development of the national scientific base, research excellence and cutting-edge research. The principal performance indicator is the number of scientific publications (stressing Current Content journals) and attendance at conferences.

Although there have been no clearly defined priorities, the number of projects and the allocation of funds in the Republic of Croatia demonstrate that the majority of research takes place within the natural and technical sciences, while the majority of research funds has recently shifted from technical to biomedical sciences (Table 5.8). The four short-term priorities that have been determined by the National Science Council for the period 2005-2010, for the purpose of implementing a new public call for national scientific projects (as announced on January 2006), are the following: (1) Environment, (2) Health, (3) Energy and materials, and (4) Croatian identity.

In 2000, the Croatian Parliament passed an Act establishing the National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ).

The establishment of the NZZ was of outstanding importance for supporting scientific excellence, higher education and technological development in Croatia. It represents the first government agency responsible for funding scientific and developmental projects in addition to the MoSES which used to be the single source of financing for R&D in Croatia.

In 2003, the NZZ published the *NZZ Strategic Plan 2004 - 2008* (2003), which is based on four strategic values: people, ideas, cooperation and excellence. The Strategic Plan identified seven strategic focuses to be used as a basis for developing NZZ programs. So far, the NZZ has launched more than ten calls for project proposals, established a financial instrument to support integration into European Science Foundation programs and established an award for undergraduate and graduate students for the publication of the best scientific paper.

The NZZ consists of a Management Board of seven members approved by the Croatian Parliament, an Advisory Board, which currently has three members for different fields, and staff. The Board of the NZZ appoints an International Advisory Board as well as advisory boards for each field of strategic focus. The International Advisory Board helps the NZZ to further develop, to implement European standards and to be included in the European Research Area. The International Advisory Board is made up of representatives from various European foundations.

5.4 Recent developments

One important aspect of the future development of science and technology in Croatia was the *First Congress of Croatian Scientists* organized by the MoSES in 2004. The Congress brought together more than 1,000 scientists from Croatia and abroad in order to promote mutual connections and networking. In addition, the Congress was aimed at raising the interest of Croatian scientists residing abroad to conduct research in Croatia.

Since 2004, four programs were launched to systematically build cooperation between resident and expatriate Croatian scientists by undertaking joint scientific projects and by supporting the return of Croatian scientists from abroad back into Croatia. The ultimate scope of such programs was to attract the Croatian scientists residing abroad and reverse the phenomenon of *brain drain* into a *brain gain*.

The first program was entitled Project on the Return of Croatian Scientists launched by the MoSES in 2004. This project resulted in ensuring the return of 25 Croatian scientists from abroad to Croatia, while the returning process for another 18 scientists is still in progress.

The second program launched by NZZ in 2005 was entitled *Brain Gain* was comprised four sub-programs: *Visitor, Senior, PostDoc* and *Homing Program - Attracting Researchers*. This last sub-program provides significant financial means (around 100,000 EUR) for research infrastructure. In addition to these measures, the MoSES has made it possible for Croatian scientists residing abroad to actively participate in research projects and programs performed by pubic institutes and universities in Croatia within the nation-wide MoSES program *Research Projects* (*ZProjekti*).

Following the *First Congress of Croatian Scientists* the program entitled *Unity Through Knowledge* was established by the MoSES in 2004. The program is supported by a World Bank loan of four million EUR (MoSES, 2006) for the period from 2006 to 2009. The program has the following basic goals: motivation for expatriate Croatians to undertake research in Croatia; creation of programs for short-term placements of expatriate scientists within Croatian research institutes and industry; joint appointments of expatriate scholars in Croatian scientific institutions; and intensification of the return of qualified and trained expatriates to engage them in entrepreneurial activities.

The next important contribution to the science community in Croatia was made by launching the Croatian Scientific Portal (www.znanstvenici.hr) in 2005. The Portal is the first Internet service for scientists in Croatia and hosts several initiatives: a database of Croatian scientific bibliography; a *who's who* in Croatian Science; on-line access to Croatian scientific publications; and the *Open Access/Archives* initiative. The Portal is aimed at the popularization of science by providing public forums, short news and expert opinions.

5.5 Policies and funding programs to encourage cooperative research between tertiary education and industry

During the 1990's, the relationship between science and technology became more intertwined than ever before, resulting in a growing demand for closer cooperation between academic science and industry in order to accelerate technological change and competitive innovation. The strategic goals established by the Lisbon European Council in 2000 and the Barcelona Council in 2002 seek to transform Europe into a knowledge-based economy that assumes that not only 3% of the GDP will be spent on research by 2010, but also that two-thirds will be spent by the business sector. These goals virtually became a "manifesto" for all countries

eager to integrate into the new Europe of Knowledge. It is not surprising, therefore, that the link between universities and industry has become a crucial political issue that goes beyond standard science policy and that is in fact shifting the strategic focus from research policy to innovation policy. Innovation policy has "recently emerged as an amalgam of science and technology and industrial policy" (OECD-EUROSTAT, 1997) and its aim is not only to create and distribute knowledge, but also to appropriate and commercialize it.

The first policy program for innovation that is targeted at encouraging the commercialization of academic research results as well as science-industry cooperation is the *Croatian Program for Innovative Technological Development (HITRA)*.

The program was adopted by the Government of Croatia in 2001[33] and provides a framework for direct cooperation between entrepreneurs/industry and Croatian TE and research institutions. Its strategic goal is to initiate a national innovation system and includes the following long-term goals: (1) fostering science-industry cooperation; (2) revitalizing industrial R&D; and (3) encouraging the commercialization of research results. The implementation of the strategic tasks includes three main activities: policy measures, mechanisms and programs; technological and institutional infrastructure; and control mechanisms for innovation and technology policy.

The cooperation of the research sector, including TE, with private businesses and entrepreneurs is organized and financed by two complementary programs that are currently aimed at the four policy targets: the TEST program and RAZUM program (Table 5.9). The basic idea behind TEST and RAZUM is to create an institutional, administrative and financial framework for entrepreneurs and SMEs to develop their commercial ideas using national research resources. Entrepreneurs, other individuals (e.g. innovators) as well as companies with commercial and technically viable ideas are therefore all eligible to apply for technology projects. However, research and development should be performed in cooperation with researchers from research institutes or institutions of TE that are qualified for the research work.

Within the TEST program, a total of 482 project applications have been received. Of these, 252 projects have been selected for financial support: 222 technology projects; 25 collaborative technology projects; and 3 Nucleus projects. A total of 150 projects have already been completed while remaining 102 projects are still in progress. Although 30% of the projects are implemented in cooperation with research institutes and the private sector, the direct financial contribution from the private sector is still modest. The participation of companies mainly consists of in-kind resources such as equipment, production supplies, etc.

Although technology projects cover all fields of science and technology, almost half of them (48%) are engineering-related, while 40% are biotechnical and biomedical. The remaining projects represent the natural and social sciences. Although certain projects are immature regarding market exploitation, there are a number of projects with significant commercial potential. Such projects include, for example: optical treatment of cancer; neurosurgical ultrasonic equipment; immunology treatments and new vaccines; wind and solar energy; ecological

33 The following acts and Government decisions create a legal framework for the current technology and innovation policy under the responsibility of MoSES:

1. *Croatian Program for Innovative Technological Development* (HITRA), adopted by the Government of the Republic of Croatia on April 5, 2001;
2. *Guidelines for the Implementation of the HITRA Program Involving the Potential for National Scientific Research*, adopted by the Government of the Republic of Croatia on April 5, 2001;
3. *Regulation on the Procedure for the Implementation of the Program for Development of Knowledge-Based Companies*, Official Gazette of the RH, No. 33/2001;
4. *Foundation of the Interdisciplinary Control Group for the realization of the Croatian Program for Innovative Technological Development* (HITRA), Official Gazette of the RH, No. 108/2001.

breeding of sheep; founding a center for standardizing psychometric methods; and water purification. Several projects succeeded in the transition to the RAZUM program and the results were financially rewarding, e.g. the production of a low-calorie fruit-jam and the production of extruded wheat flour.

The RAZUM program was initiated as a pilot program and was the first in the country to provide direct support for increasing the competitive advantage of firms through investment in R&D and technology in cooperation with TE and research institutions. The Business and Innovation Centre of Croatia (BICRO) manages the program, but technology centers are responsible for evaluating the business plans and monitoring the project development. In the last three years, BICRO has analyzed 120 business plans, of which 38 projects were selected for financing. A total of 22 projects relate to start-up companies and 16 relate to the expansion of the existing companies. The entrepreneurial projects vary in the scope of business activities, the scale of investment and even in the research intensity. While some projects are research spin-offs – such as the chiral method in pharmacology (Ruđer Bošković Institute) or the low-calorie fruit-jams (Faculty of Food Technology and Biotechnology) – others are more oriented towards mass-market products such as digital CD postcards or wastewater filtration systems.

Within the RAZUM program, the financial support for technology-based companies has involved a number of instruments of the Croatian innovation policy. It consists of a mixture of the following instruments: grants for research and development (30% of the total project value); favorable commercial loans; and conditional loans for high-risk but promising projects or academic entrepreneurship. RAZUM also includes assistance to companies in order to identify research teams at HE institutions and public institutes for research required by the companies. Assistance is also available for the organization and monitoring of services provided.

As a proportion of the total expenditures of MoSES in the period 2001 and 2005, the spending share for technology development within the HITRA program (which includes the programs TEST and RAZUM as well as support for infrastructural institutions - technology centers) constituted less than 2.5 % of the total MoSES budget (Table 5.10). Nevertheless, these resources have reached in 2003 almost half of the Ministry expenditure for scientific projects (Table 5.8). As a consequence, HITRA projects deliver, for many research groups, important additional funding for scientific equipment, operational costs for commercially oriented projects and experimental work. For certain industrial research units, TEST literally enables them to survive.

The HITRA program also initiates institutional infrastructure for science-industry cooperation and for fostering technology-based companies such as technology and innovation centers[34]. TE institutions also contribute to establishing the technology infrastructure, usually by taking the role of the principal founder (owner) of the center, co-founders with other stakeholders or by serving on the supervisory and management boards.

The Business and Innovation Centre of Croatia (BICRO) was established in 1998 to develop the national financial system for fostering innovative and technologically advanced businesses.

According to the most recent developments (MoSES, 2006), the new RAZUM program has initiated a program entitled the *Innovation Commercialization Program***.** The program differentiates between two types of projects: pre-commercial projects where activities focus on R&D, and commercial projects that take place at the stage of investing into production or service capacities.

The objectives of BICRO shall be realized through four new programs supported by the World Bank within the project entitled *Science and Technology Project*. The project includes the following sub-projects: (1) TehCro - Technology Infrastructure Development Program, (2) VenCro - Risk Capital Industry Development Program,

34 The following centers are presently functioning: Research and Development Center for Mariculture in, Dubrovnik (founded in 2001), Center for Technology Transfer in Zagreb (founded in 1996), Technology Center in Split (founded in 1997), Center for Innovative Technology Rijeka (founded in 1997) and Technology and Innovation Center in Osijek (founded in 2003).

(3) IRCro - Sponsored Research and Development (demand for R&D services), and (4) KonCro - Business Competitiveness Upgrading Program.

In 2006, the Government of the Republic of Croatia founded the Croatian Institute of Technology (HIT) under the jurisdiction of the MoSES. The ultimate scope of the Institute is to become a leading national institution for promotion and strengthening the knowledge-based economy/society in Croatia. The main activities of the Institute are concerned with the development of a national technology infrastructure, technology transfer, technology foresight programs, business intelligence etc. The TEST Program, which was until now managed by MoSES, was entrusted to HIT.

5.6 Innovation and knowledge transfer between researchers and industry

The role of TE institutions in innovation and knowledge transfer has so far been limited. The problems that can be identified in this area occur both in the flow of commercially viable projects (i.e. the supply-side) and in the industrial structure as well as the entrepreneurship and business strategies of companies that could potentially seek partnerships with academic institutions (i.e. the demand-side). Consequently, serious policy challenges lie ahead.

Firstly, most TE institutions primarily function as teaching institutions, with their research assuming a secondary position. This prioritization occurs despite research being the key criterion for the promotion of academic staff. Consequently, even when it comes to generating additional revenues, TE institutions tend to rely on educational programs with market potential and/or on consulting projects that mostly use pre-existing knowledge. TE institutions neglect more ambitious research projects that may eventually lead to commercialization and innovation and the incentives to engage in such research commercialization are poor. This is reinforced by the general lack of cooperation (including a "culture gap") between academic and business sectors. On the one hand, researchers believe that Croatian enterprises are not particularly interested in cooperation on research, development and innovation (among other reasons, due to the lack of qualified staff). On the other hand, business people often question the capabilities of researchers to fulfill the needs of the business sector (Radas, 2002; Račić, 2005). Such conditions reduce the communication and cooperation opportunities that could generate ideas or research projects to provide a basis for innovation and knowledge transfer. Furthermore, there is little tradition or support for the exchange of personnel between academic institutions (including TE institutions) and companies. Such exchange could bring both actors closer together through stronger social networks.

Secondly, the organizational structure of universities, as crucial TE institutions, also plays a hindering role regarding innovation and knowledge transfer. Due to the operational autonomy of university departments (rather than of the university itself acting as a functionally integrated whole), a unified university-level infrastructure that could facilitate innovation and knowledge transfer between universities and their environments has not been built. Consequently, standard channels of technology transfers between TE institutions and industry (technology licensing and academic entrepreneurship) operate only sporadically. Universities have not set up business incubators, entrepreneurship centers or technology transfer offices that could educate potential academic (or student) entrepreneurs and/or assist them in marketing their ideas. Only some pioneering projects at particular university departments have been recorded (e.g. the Faculty of Electrical Engineering and Computing in Zagreb has been active in this regard). Moreover, there are insufficient contacts with and poor utilization of the existing external institutions that support entrepreneurship and innovation (see above).

Concerning cooperation related to business innovation, the results of the pilot *Community Innovation Survey* undertaken in Croatia indicate that academic institutions are the second most frequent partner of business

enterprises (after suppliers). However, the overall level of cooperation is rather low and lags behind the EU level. Moreover, cooperation between academic and business entities tends to be shallow. Both researchers and business people believe that the impetus for cooperation should come from the business sector, but the structure of the Croatian economy and dominant business strategies (in which innovation plays a secondary role) discourage stronger and more effective relationships.

Larger firms with significant R&D potential are rare – most of them are older firms that have actually downsized their R&D activities during the transition years. Furthermore, there is also weak demand for research services on the part of the industry sector. Few R&D-oriented firms have increased their output and competitiveness, and most of them have done so due to export orientation facilitated occasionally by foreign ownership (e.g. Ericsson, Nikola Tesla, and Siemens).

On the other hand, newly emerging SMEs mostly have poor technology capability. The low frequency of innovative SMEs that generate and market new knowledge is a problem observed across Central and Eastern Europe. In addition to providing a facilitating environment to establish spin-offs, TE institutions could seek partnerships with existing SMEs to operate in their areas of research competence. TE institutions should be further assisted by BICRO and technology centers in order to facilitate collaboration on knowledge transfer and innovation.

5.7 The national legal framework for intellectual property rights (IPR) and the role of HE in research and innovation

Intellectual property protection and patents, which are regulated by the *Act on Patents* and related Acts[35], fall under the responsibility of the Croatian State Intellectual Property Office (CSIPO). In spite of the significant efforts of CSIPO and around 60 patent agents registered at CSIPO, assistance in managing and counseling for the commercializing of research results (particularly patents in the scientific and academic community) has not been developed in Croatia.

Within the private research sectors, only two companies in Croatia currently have full-fledged intellectual property departments.

The basic legal regulations covering the field of intellectual property rights (IPR), refers primarily to inventions and relations between inventors (employee) and employers as stipulated by the *Labor Act*[36]. The Act gives the rights of appropriation to the employers. This basic principle extends in practice to other areas including research and HE institutions by providing those institutions with free disposition of the IPR. Despite this, the research community in Croatia does not seem to have a high awareness of the important role that IPR plays in a modern R&D system and economy. The Croatian Government did not set any IPR priorities in the academic sphere, nor did it announce any clear outline regarding the protection, appropriation or encouragement of IPR.

The research community in Croatia therefore has only a modest capability regarding IPR and requires a systematic approach to develop the strategy and policy in this matter. First steps could be taken in establishing the legal framework for IPR among different stakeholders – HE, individual researchers and

35 Intellectual property legislation: *Act on Patents* (OG 78/99), *Act on Industrial Designs* (OG 78/99), *Copyright Act* (OG 9/99, 76/99, 127/99, 69/01), *Act on the Protection of Semiconductor Products* (OG 78/99), *Trademark Act* (OG 78/99), *Act on Indications of Origin of Products and Services* (OG 78/99).

36 OG 38/95

external companies. Such steps are being taken by implementing technology projects (HITRA-TEST) that are focused on research with commercial potential.

The experience gained from this program has helped the MoSES to recognize that the absence of an IPR strategy and legal framework is a seriously limiting factor in commercializing research results, increasing academic entrepreneurship, and fostering public-private partnerships in general. In addition, the lack of regulations makes room for individual researchers to deal with patent rights by avoiding arrangements made with the employer (university department). Therefore, the CARDS project for establishing the IPR infrastructure and strategy entitled *Intellectual Property Infrastructure for the R&D Sector* has been proposed by the MoSES and was recently approved by the European Commission. Due to this project, a unit for IPR in the academic sphere was established in 2005 within the MoSES with the main aim to develop a system of property rights at universities and research institutes.

5.8 Conclusions

During the last 15 years of transition, the structure of the research sector in Croatia has changed. The industrial R&D sector, the driving force of modern economic development, has almost disappeared while the public R&D sector, a national pool of knowledge, has mainly been preserved yet has stagnated. Since 2000, the R&D sector has experienced a recovery due to the growth of some important categories such as the number of researchers, the total investments in R&D, scientific publishing, etc. Nevertheless, the Croatian R&D system still suffers from a serious structural problem due to the domination of the public R&D sector over research supported by a technologically weak private sector. In developed countries, the industry and business sector largely overshadows the public sector in both research work force and investment. In Croatia, however, the situation is the opposite. For example, Croatian industry employed around 15.5% of researchers in 2003 and invested 0.44% of the GDP in R&D. Meanwhile, industries in European countries (EU 15) employed an average of 50% of researchers (USA 80%) and invested 1.27% of the GDP in R&D (Finland 2.45% and Sweden 2.95%).

The vast majority of R&D potential in Croatia therefore depends heavily on scarce budget resources, which amount to 0.70% of the GDP in 2003.

However, this resource is insufficient. For example, in 2001 Croatia spent five times less per researcher in the TE sector (22,000 EUR) than average European country. This speaks in favor of reforming the R&D sector primarily in terms of strengthening industrial R&D and the absorption capacity of companies for R&D results and innovations.

CHAPTER 6

ACHIEVING EQUALITY IN AND THROUGH TERTIARY EDUCATION

6.1 Access to tertiary education

6.1.1 ENTRY INTO TERTIARY EDUCATION

Until 2003, enrollment policy in Croatia was centralized at the state level. The state managed the number of students enrolled in the first year of studies as well as the allocation of funds to users (institutions). The right to enroll in undergraduate studies was realized by applicants who completed a relevant secondary school program lasting at least four years. TE institutions determined the secondary schools that were qualified and the enrolling conditions for those applicants without a relevant secondary school.

TE institutions[37] enroll students according to their capacities and pursuant to an enrollment decision. A university, polytechnic or school of professional higher education makes the enrollment decision. The Minister of Science, Education and Sports gives prior approval regarding the number of students who would study with the support of the MoSES. Institution and the MoSES determine the capacity of a TE institution. The enrollment decision determines the following: the number of full-time students who will study with the support of the MoSES; the number of full-time students who will pay for their studies themselves; and the number of part-time students.

The *Act on Scientific Activity and Higher Education* from July 2003 stipulated that enrollment policy and enrollment management must be decentralized[38], whereby the structure and realization of enrollment are the responsibilities of specific public universities, polytechnics or schools of professional higher education.

37 Articles 58-59 of the *Act on Higher Education Institutions*

38 Articles 77-82 of the *Act on Scientific Activity and Higher Education* outline the provisions for enrollment into an educational program, its organization and implementation. Articles 83-90 of the Act prescribe the provisions that apply to students and their graduation requirements.

The Act[39] mandates the provisions regulating the entry requirements and enrollment conditions for the system of TE. The provisions regulate the right to equal access to TE for all applicants who have completed a relevant secondary school. TE institutions themselves determine the procedure for selecting candidates in a manner that guaranties equality for all candidates regardless of their race, gender, language, religion, political or other beliefs, national or social origin, assets, birth, social status, disability, sexual orientation and age. Enrollment in an educational program is based on a public competition announced by the TE institution that offers the study program, which includes the acceptance process for students during the academic year, entry conditions, application procedures, selection criteria and the number of students who can be enrolled.

The right to apply to university studies and/or professional studies is maintained by all individuals who have completed a four-year secondary school and who have passed the final secondary school exam[40]. All individuals who pass the class exam and meet all the other conditions prescribed by the institution have the right to enroll. The right to enroll in undergraduate studies can also be realized by applicants who did not complete a relevant secondary school. The TE institution determined the registration conditions for those applicants.

Foreign citizens may enroll in a program under the same conditions as citizens of Croatia but they are obliged to obtain recognition of their secondary school diploma by the MoSES. However, according to a decision by the relevant state authority or a TE institution, they may be required to pay a portion or the full price of their program. Access may be limited or denied to foreign citizens in cases of military or police education or in case of another course of study with national security interests.

Enrollment policy and enrollment procedures for private TE education institutions are the responsibility of the founders of the private institutions. The right to apply is the same as for public TE institutions.

6.1.2 ENROLMENT TRENDS

Almost three-quarters of young people who successfully complete secondary school enter TE.

Among them, there are more females than males (126 females to 100 males). The share of secondary school students (Table 6.1) who enroll in university studies is continually increasing. From 1995 to 2003, this number has increased from 52.6% to 73%, which is almost the total number of students who complete four-year secondary school programs (grammar schools and technical/professional schools). For the total population aged 18, the percentage of those who enrolled in the first year of studies for the first time is continually increasing, from 37% to 59% (generational share) during the 1995–2003 periods.

The total number of enrolled students in TE over the last 10 years has been continuously growing. It increased by 57% between 1993 and 2003 (Table 6.2). In this period, there was a continuous decline in the proportion of enrolled students studying full-time: such students made up 88.2% of all students enrolled in 1993 and only 73.7% of those enrolled in 2003. On the other hand, whereas part-time students made up only 11.7% of those enrolled in 1993, in 2003 they represented 26.3% of the student population. At the same time, the number of students studying part-time more than tripled from 9,483 to 31,831.

From 1991 to 2003, the number of students who enrolled in the first year of studies for the first time increased from 23,400 to 35,100 (by 50%), while the growth in university studies was smaller than the

39 Article 77 of the *Act on Scientific Activity and Higher Education* (NN, No. 123/03., to 2003 Art. 59 of *the Act on Higher Education Institutions*)

40 Final secondary school exam, international final secondary school exam, certificate on the final exam

growth in professional studies (Table 6.3). These changes correlate to the enlargement and re-organization of TE institutions, primarily establishment of polytechnics and schools of professional higher education. Organizational restructuring began in 1997, which resulted in constant increase in the number of students enrolled in polytechnics and schools of professional higher education (their share grew from 8.1% in 1997 to 23% in 2003; Tables 6.8 and 6.9) with a simultaneous reduction in the share of students enrolled at universities (from 94.5% in 1993 to 76.1% in 2003).

Since 1997, a number of private TE institutions have been established in Croatia.

These institutions have increased the availability of TE and improved the diversification of TE by introducing non-university programs and shorter professional undergraduate programs. The increased availability has affected changes in the structure of enrolled students according to program and payment choices (Table 6.4 and Table 6.7).

According to the number of enrolled students by subject area[41] during the period from 1999 to 2003 (Tables 6.8, and 6.9), the largest number of students are enrolled in the following areas: teacher education and training, business and administration, art, social education, information technology, mathematics and statistics, health, journalism and information, natural sciences, and environmental protection[42]. Out of the total number of enrolled students by subject area during the same period, one-quarter of the students (24.5%) enrolled in natural sciences and physics, mathematics and IT, engineering, and manufacturing and civil engineering. Only 14% of the students in the aforementioned fields were female students.

Sex/gender inequality has been decreasing in TE as more women than men now enroll in TE (Tables 6.2 and 6.8). The share of women out of the total number of those enrolled in the 1993–2003 period increased from 47.5% to 55.8%. The percentage growth of women in TE can be observed in all types of study programs, although women concentrate on the traditionally female professions such as education, humanities and art, social sciences, business and law, and health protection and social services. For every 100 male students enrolled in 2003, there were 116 enrolled women.

There are great regional differences regarding the participation of citizens in TE (see chapter 4).

In the last decade, most students have enrolled in TE institutions in Zagreb (around 59%), Split (around 16%), Rijeka (13%), Osijek (10%) and Zadar (around 2%).

Higher enrollment rates in the area of Zagreb, as opposed to other industrial centers, have continued for several years.

Statistical data from the CBS regarding the nationality of students (Table 6.11) demonstrate that Croatian students represent the majority of students enrolled in TE – more than 96%. The remaining 4% of enrolled students are those students who stated during enrollment that they belong to some other nationality or minority. The share of students from EU countries out of the total number of enrolled students during the period 1999–2003 was constant (around 0.6%).

41 Central Bureau of Statistics, in its official statistic overviews, shows/classifies the data showing the number of enrolled/graduated students in higher education according to the scientific areas instead for the ISCED educational programs. It is the result of the practice of the Ministry to classify higher education institutions and curricula by sciences, and of the discrepancy between the valid NSKO and the statistic displays on the national level according to areas of education.

42 *DZS Manual*, Eurostat 1999, Fields of Education and Training

6.1.3 GRADUATE STUDENTS

The number of graduates in TE over the last 10 years has been constantly increasing (Tables 6.14 - 6.18). A vast majority of students has finished undergraduate programs (on average 92.3%), whereas 7.7% students finished postgraduate studies (5.3% Master of Science degree and 2.4% Doctoral degree).

The proportion of Master of Science graduates has been almost the same since 1996.

At the same time, the proportion of Doctors of Science graduates fell from 2.8% to 1.9%.

According to CBS reports for undergraduate studies (ISCED5A/5B) for period 1998–2003, the portion of graduates that were full-time students declined, reflecting trends of increase enrolments of part-time students (Tables 6.2, 6.4). Similarly, the share of the full-time students who studied with the support of the MoSES fell (from 88.5% in 1998 to 77.2% in 2003) and the share of full-time students who paid for their own studies rose (from 11.5% in 1997 to 28.2% in 2003). As expected, increased enrolment of students in non-university TE institutions resulted in decreased share of graduates from university (the percentage of university graduates fell from 88.0% in 1998 to 69.0% in 2003).

More than 50% of graduates are women (Table 6.18). The share of women graduates out of the total number of graduates is larger than the share of men. The share of women keeps growing (during the 1998-2003 period it rose from 55.2% to 57.8% in 2003), mirroring the trend of more enrolled women.

Regarding age, during the 1998-2003 periods, an average of only 2.5% students graduated before the age of 21. Most students graduated from the age group of 21 to 26. However, the share of graduate students in that age group has fallen gradually and consistently. In the 1998-2003 periods, it fell from 75.2% to 70.0%. An average of 11.0% of the students graduated from the age group of 27 to 29, and around 13.5% of the students graduated from the age group of 30 or more. The number of those who graduate after the age of 27 has been constantly growing.

The number of level ISCED 5+6 students who graduated in the area of Science and Technology (ISCED educational areas 4 and 5) per 1,000 inhabitants from the 20-29 age group decreased from 5.1 graduates in 1999 to 4.2 graduates in 2003. At the same time, the number of enrolled students per 1,000 inhabitants from the 20-29 age group increased from 35.5 enrollments in 1999/2000 to 46.3 enrollments in 2003/2004 (Table 6.20). Most students graduated from social sciences, humanities and technical sciences programs (around 80-85%), while only 15-20% graduated from natural, biotechnical and biomedical science programs (Tables 6.15 and 6.16).

The average proportion of graduates in natural sciences was only 4% (Table 6.15) and has been constantly decreasing since 1997 (from 4.9% to 2.9% in 2003).

Similarly, the proportion of graduates in biotechnical sciences (5.6%) and in biomedical sciences (11.1%) has been constantly decreasing. The reduction in the number of graduates from natural, medical and biotechnical sciences programs corresponds to the decrease in the number of enrolled students for these educational study programs (see statistical annex for chapter 6).

A vast majority of Master of Science degrees were obtained at the University of Zagreb (88.0%) and the rest at other Croatian universities. The share of women with a Master's degree varied, but the average was 46.0%. A majority of Master of Science degrees were obtained in social sciences (27.5%) and medical sciences (22.5%), whereas the least Master of Science degrees were obtained in biotechnical sciences (7.4%), corresponding to the trends in student enrollment (Table 6.17). The average age of those with a Master's degree was 35.5 years, while the modal group (highest frequency) was between 30 to 34 years of age. Most Master's of Science graduates during the 1998-2003 period worked in education (around

32.0%), health protection and social services (around 22.0%), and research and development (12.0%). In the educational professions, more than 85.0% Master's of Science worked in TE institutions.

Out of the total number of graduates, the percentage of students who graduate within the prescribed term for undergraduate studies is around 14% (Table 6.16).

This rate is very low compared to the number of enrolled students and the total number of graduate students. Most students repeating a year register for technical and social sciences and humanities courses, both in university and professional studies programs.

It is difficult to estimate how many students leave during their programs, since there is no statistical data to measure that information and there is no expert and systematic analysis explaining the poor efficiency of education programs. Moreover, there are no permanent analyses or external evaluations of the work of teachers or TE institutions. In practice, the current system of control and laws governing the work of educational institutions and teachers does not include a system of objective external evaluation and quality control, or the opportunity for student users to evaluate the quality of the services they receive. Based on the changes in the number of enrolled students, teachers and newly opened TE institutions (public and private), it can be assumed that these changes affected the efficiency of studying as measured by the rate of graduation within the prescribed term and the total graduation rate.

6.2 Central policies and programs to encourage the tertiary education system to advance equality goals

Croatia signed and ratified a large number of international and European legal agreements that are significant for promoting upbringing and education for democratic citizenship and the management of diversity. These agreements include the *European Framework Convention for the Protection of National Minorities* and the *Convention on the Elimination of All Forms of Racial Discrimination*[43].

Articles 65 and 66 of the *Constitution of the Republic of Croatia* set the basic principles regarding upbringing and education. The Constitution stipulates that elementary school is obligatory and free, while secondary education and TE are available to anyone under equal conditions and in accordance with one's abilities. If appropriate laws are respected, it is possible to found private schools and educational institutions. Furthermore, Article 67 guarantees the autonomy of universities and, in accordance with the law, the independence of universities when deciding on their structure and activities.

Over the last couple of years, the state[44] has used various programs, projects and financial initiatives to stimulate and support the education and training of different social groups. The goal of these initiatives is to improve the educational opportunities of adults participating in the labor market. However, very little of these support reflects on tertiary education.

43 http://right-to-education.org/content/rights_and_remedies/croatia.html, Accessed: January 12, 2007.

44 www.vlada.hr; www.hzz.hr

6.2.1 LIFELONG LEARNING

In all documents related to education that the Croatian Government passed during the last couple of years, there is the strong belief that education is a crucial element in the process of democratizing society. In the early 1990's, the adult education system went through a significant period of changes. Adult education began to be viewed through the lens of lifelong education, but it was usually linked to the elementary and secondary education policies.

In general, very little of lifelong education has been linked to the tertiary education with exception of formal postgraduate education.

The *Act on Adult Education Centers*[45] from 1997 created the potential for diversified adult education programs. The network of adult education institutions with approved programs includes secondary schools for adults, adult education centers, private schools for adults and other institutions implementing similar programs.

The *White Paper on Croatian Education*, which is part of the larger study entitled *Croatia in the 21st Century*, contains a large chapter on adult education, which specifies many recommendations for revitalizing adult education[46]. The following documents are those in which lifelong education is recognized as the central strategy of education: *Education Development Strategy* (2001), *Adult Education Strategy and Action Plan for Implementing Adult Education Strategy* (November 2004) and *Education Development Plan 2005 - 2010* (2005). By creating adult education strategy, the Republic of Croatia began developing adult education as a constituent part of the entire educational system based on the concept of lifelong learning.

It is expected that passing the *Adult Education Strategy* and the *Adult Education Act* will assist the further systematic development of adult education by improving current best practices and applying modern (especially European) trends. As part of the *Action Plan in 2005,* Croatia began to draft the first Act on adult education, introducing statistical monitoring of adult education, developing communication (info-points) and promoting learning and raising public awareness (Lifelong Learning Week), and developing the competencies of andragogic workers.

6.3 Requirements for entry into tertiary education and selection criteria

Over the last 10 years, the minimum requirements to be met by each candidate are proof of a completed secondary school education and an adequate final exam certificate. This requirement applies to both public and private TE institutions. Aside from a secondary school certificate, the candidate must pass the obligatory entrance exam according to the prescribed content and within the given deadlines.

The total number of places for full-time university and non-university programs and for specific public institutions is planned centrally at the state level (pursuant to the agreement between the MoSES and public TE institutions).

TE institutions themselves prescribe criteria for candidate selection. Institutions establish entry criteria, which include not only the secondary school certificate, but also the entrance exam and a minimum number of points for entry that must be achieved by the candidate at the entrance exam. TE institutions also prescribe additional criteria for candidate selection (such as an additional number of points for knowledge of specific

45 *Act on Adult Education Centers* (Official Gazette 54/97)

46 ETF. October 2003. *Analysis of the situation of adult education*.

subjects attained during secondary school, for successes at national and international competitions of academics or sports, for children of Croatian citizens abroad, for children of war veterans, etc.). The list of additional criteria depends on the entry policy of each institution in the system. After the entrance exam, which is the main requirement for entry because it covers the largest number of points out of the total prescribed score, student candidates for a public TE institution will be placed on a candidate chart marked with the number of points for all basic and additional criteria. This chart is publicly displayed and is the basis for entry into the full-time first-year program.

The number of students who will enter the first year of studies does not depend directly on the needs of the labor market, nor is there any policy of reconciling the demand in the labor market with planning the number of available spots in the TE system.

There are no expert analyses or studies measuring the links between the labor market and new and departing students. In the changing labor market, however, employers are increasingly concerned with the diploma of a TE institution and the candidates' specific professional profiles and market qualifications. This indicates that private TE institutions are more flexible, because they tend to offer educational programs tailored to the needs of the labor market. The choice of study programs and entry to academic programs is still the individual's personal choice, which usually depends on the financial capabilities of the family of the first-year candidate.

The right to enter study programs as a full-time student with the support of the MoSES is established at the national level for different social groups. Croatian citizens and Croatian nationals residing outside of the Republic of Croatia, and foreign citizens and non-citizens with permanent residence in the Republic of Croatia are eligible, if they meet all the requirements for entry to TE institutions. Croatian Homeland War veterans, children of soldiers killed in the Homeland War, veterans disabled in the Homeland War and children of disabled veterans of the Homeland War all immediately enter TE institutions, providing they pass the entrance exam (they are not included in the common score list). Persons with a disability of 60% or more are eligible, based on an adequate disability ruling by the competent institution of the state administration, provided they pass the entrance exam. Croatian candidates coming from abroad are eligible, provided they pass the entrance exam. Foreign citizens who received grants from the Republic of Croatia and non-citizens without permanent residence in Croatia pursuant to agreements between countries are eligible.

In accordance with their abilities, students with disabilities have the opportunity of entering study programs after completing a secondary school education. According to the available statistical data, a small number of disabled persons enroll in study programs. According to MoSES data, the total number of enrolled students with special needs during the academic year 2003/04 was 254 students, of which 207 were in Zagreb. There are 35 public TE institutions in Zagreb, of which only three TE institutions are equipped to instruct disabled persons. Six institutions are partially adapted. Statistical data on disabled persons who apply and those who enter studies are incomplete.

6.4 Financial assistance to students

For TE institutions established by the state, financing is provided from the budget of the central state authority. At the same time, public tertiary institutions receive additional financing from tuition fees and registration fees paid by students who enter as full-time students or part-time students. Public TE institutions receive additional sources of financing through funding instruments developed for scientific activities, income generated on the market and donations. Regarding private TE institutions, their operations are wholly covered by their founders and by tuition fees paid by students.

6.4.1 TUITION FEES AND REGISTRATION FEES

In the TE system, there are three basic groups of costs paid by students: obligatory tuition fees, start-up fees and charges when entering the initial or subsequent academic year (registration fees), and costs of attaining the final diploma (other costs).

The annual amount of tuition fees at public TE institutions for full-time undergraduate students who pay for their own studies, as well as for part-time students and foreign citizens is established by the Rectors' Conference and/or CPSPHE. When deciding on the amount of tuition fees, each public TE institution is obliged to stay within the range of tuition fees determined by the MoSES. The annual tuition fees for university or professional studies are arranged in three basic categories: (1) 5,000 HRK (661 EUR[47]) for studies in social sciences, humanities and mathematics; (2) 6,700 HRK (886 EUR) for studies of physics, and technical and biotechnical fields; and (3) 8,400 HRK (1,110 EUR) for studies of art an studies in the fields of biomedical and natural sciences.

Students who are foreign citizens (if not determined otherwise by a supranational agreement) and full-time students are required to pay annual tuition fees not more than three times the price of Croatian full-time students.

Part-time students pay tuition fees, with special deductions for entry costs, as follows: tuition fees not exceeding 60% of the maximum amount of participation fees (see above) are paid by part-time students if studies are completed at a TE institution, or 70% if studies are organized at a place up to 60 km away from the TE institution. If part-time studies are organized at a place more than 60 km away, the amount of tuition fees may be higher, but may not exceed the maximum amount of participation fees determined for appropriate full-time studies. Special tuition fee groups are *part-time students* who are Homeland War veterans, children of killed, deceased, imprisoned or missing Homeland War soldiers, Homeland War disabled veterans and children of the disabled Homeland War veterans. These students pay 50% or less of the tuition fees in order to enter the first year of studies.

Candidates who wish to enter a TE program, along with the obligatory annual tuition fees, must also pay additional fees and charges when entering an educational institution (500 HRK in average, 68 EUR). These include the application fee, the entrance exam fee, and the registration charge after passing the entrance exam and obtaining enough points to enter the desired program/institution (costs for the matriculation pass and other entry documents).

During the academic program, students have the obligation to pay the fee for semester certification and registration for the following year, and the commission exam fee after taking an exam three or more times. This fee varies depending on the institution. Upon finishing their studies, students pay a fee for the printing of the graduation certificate, which varies from 200 HRK to 700 HRK (from 27 to 95 EUR on average), depending on the TE institution.

6.4.2 STUDY SUPPORT PROGRAMS

The availability of TE and the provision of study opportunities to full-time students in the Republic of Croatia have broadened and increased for students of different social levels through various financial aid programs. These programs include cash support through state grants, support covering meal costs, support covering student accommodation costs at student dormitories or private accommodation, support for public city

47 Average exchange rate in 2003: 1 EUR = 7,5642 HRK (see Table 1 in statistical annex).

transportation, financing the procurement of books and deductions from registration fees for special students, and financing the work of student associations and their programs in order to improve the standard of living of the students during their studies.

Annual state grants. Such grants have been awarded to full-time students at public TE institutions since the academic year 1996/97. Table 6.12 shows the total number of state grants by categories of grants awarded to full-time students by year. Rules and criteria for providing state grants are determined based on the *Regulations on Provision of State Grants*[48] and are published on the MoSES website[49]. State grants are awarded to full-time students in undergraduate and postgraduate studies who study at public or private TE institutions with the support of the Ministry or who pay for their own studies. Part-time students who pay for their own studies have no right to state grants. Cash payments covering a part of the costs for full-time students are awarded in the amounts of 500 HRK, 700 HRK and 800 HRK. During the period from 1996 to 2005, the number of grants increased by more than 3.5 times. In the period from 1996 to 2001, state grants were awarded to full-time students in four categories (A, B, C, D) in which the main criterion for awarding grants was the total point score indicating success in studies (or success at secondary school for first year students). In 2002, the number of state grants significantly increased and an additional category of grants was introduced (category E, for students with a lower socio-economic status). In 2003, grant categories were again broadened (category G, for students who used to live in social welfare institutions or with adoptive families), and in 2004, two new categories were introduced: D-1 (children of military and civil victims of war during peacetime) and I (for disabled students studying full-time).

In accordance with the *Regulations on Awarding State Grants* and helping undergraduate, postgraduate and post-doctoral students, grants are awarded to disabled students and Croatian Homeland War veterans (directly awarded grants if they prove their veteran status). According to the *Act on Rights of Croatian Homeland War Veterans and Their Family Members*, the Croatian veterans, the Homeland War disabled veterans and their children, as well as the children of killed, deceased, imprisoned or missing Croatian veterans are entitled to free books for regular schooling at TE institutions. The costs of procuring these books are refunded by the MoSES to TE institutions, pursuant to the submitted request of the TE institutions.

Support for meal costs. The MoSES[50] determines the criteria and the method of providing support for the costs of student meals. Those entitled to this support are full-time undergraduate students who study at public TE institutions. Foreign citizens are entitled to student meals under the same terms if they are so designated by an international agreement or a special decision of the MoSES. The MoSES determines the amount and duration of meal support for the beneficiaries (full-time students) in the TE system. On the other hand, TE institutions determine the level and the scope of support. The amount of support for all students is 73.65% of the clearing price and includes the meal costs paid by the MoSES and the part paid by the full-time student. The beneficiary's rights to meal costs begin when the beneficiary becomes a year-long or semester-long student. The commencement of a study year or semester is recorded in the database of the TE institution and the beneficiary's data includes rights to meal support.

Support for accommodation costs. An important element in balancing educational opportunities is student dormitory accommodations and lodging support for students in student dormitories or private accommodations. However, the number of student dormitories and the accommodation capacities of the

48 *Regulations on Awarding State Grants to Full-Time Undergraduate Students and Compensating a Part of Tuition Fee Costs to Postgraduate Students* (Official Gazette 151/02)

49 www.mzos.hr

50 Regulations, OG 151/02

public sector (Table 6.13) are not meeting student demand. Zagreb has the largest number of student dormitories/accommodations (5). However, the increase in the number of registered students has not been equaled by the growth in accommodations, both in Zagreb and in other regional study areas.

Both grants and accommodations are allocated primarily according to study performance (along with the refugee/displaced/veteran status, which is becoming increasingly less present and relevant as a group each year). Grants available to students do not distinguish between needs-based and merit-based criteria, so successful students (who usually do *not* come from poor families) may also be granted.

Yearly changes in the number of grants and dormitory capacities indicate an imbalance. Separate from tuition fees, the cash support for education (meals, accommodation, and transportation) covers a significantly smaller share of students. For example, regarding student accommodation, most students who study outside of their place of residence must cope with a non-subsidized market. This creates inequalities and poor housing choices for students who come from their place of residence to study in larger industrial centers or regional university centers and, of course, for students from poor economic backgrounds.

According to the criteria of the MoSES, places in student dormitories are directly available to groups such as: students whose parents have both died, went missing or are unknown; students whose parents divorced and the parent who received custodial rights by the court died; students whose parent, adoptive parent or person who was legally obliged to care for them was killed or went missing in the war as a member of the Croatian army, police, reserve army forces or was a civilian war casualty; disabled students, etc. Additional points are awarded based on the student's social status. The *criteria for the allocation of places to* undergraduate *students in student dormitories* for each academic year state that disabled students whose disability category is between one and five shall *immediately* get a place in a dormitory. An additional number of points based on social status are given to students who are children of disabled veterans and disabled students.

Support for transportation costs. The Ministry refunds a part of price for public transportation to all full-time students at the Universities of Zagreb, Osijek, Split and Rijeka. The price of monthly transportation for students is determined by the amount used for social welfare categories of the population.

Student programs. Based on the *Act on Scientific Activity and Higher Education,* Article 88, paragraph 1, students are entitled to participate in student organizations. Students participate in student unions, branches of student unions, and student associations. The *Student Union Act* regulates the position, organization and bodies of the student union, the sources of financing for the program work of student unions, the legal status of unions, the methods of selection of student representatives in the administrative entities of TE institutions, or institutions that work to ensure the integrity and necessary standards of the TE system. According to the provisions of the above Act, one of the duties of the student union is to take care of the organization and realization of student programs in TE, science, culture, sport, technology and other areas of interest to students. Pursuant to Article 16 of the *Student Union Act,* the student union receives funds to perform its work from the TE institution to which it belongs, from funds provided in the budget of the Republic of Croatia for TE and scientific work, as well as from special programs proposed by union branches. TE institutions also finance the costs of student union programs and international exchange.

Gifted students. During 2004, the MoSES made a *Framework Program for the National Strategy of Care for Gifted Pupils and Students*. The basic goals and objectives of the program are: early identification of the gifted students in the educational system so they can get timely education in line with their individual needs; teacher and mentor training for working with gifted students; promoting creative thinking; applying various teaching strategies so that every child can fully realize his/her potential; and developing cooperation with the parents of gifted pupils and students. All the above forms of financial aid apply to a minority of students and have only marginal application to poorer students.

6.4.3 DEVELOPMENT OF STUDENT FINANCIAL SUPPORT

It is necessary to establish a new system of financing TE that will replace the existing, inherited system of direct state administration of financial support to universities. At present, the amount of funding for a particular institution of TE is allocated according to its enrollment numbers, employer's salaries and other operational costs. As of 2006, the funding allocation policy will be changed, enabling universities to begin functioning as integrated institutions that will be able to decide on their own financial policies.

A model for student scholarships needs to be developed between 2005 and 2010. This model will address the needs of students and society for specific occupations and human resources throughout Croatia. Introducing a new "lump sum" model for TE financing by 2006 and increasing private expenditure in TE by 2010 are the main targets in financing TE.

6.5 Contribution that tertiary education makes to social mobility

6.5.1 DATA ON THE NATIONAL LEVEL

Statistical data on the mobility of Croatian students who study at TE institutions abroad and foreign students who come to study in Croatia are incomplete. Most students residing in Croatia attend TE in Croatia. On the other hand, there is no detailed data on the number of Croatian students who study abroad. Such data is not monitored by the official statistics from the CBS, which collects and processes data from educational surveys, or by the MoSES. According to some partial estimates, only around 0.02% of Croatian students out of the total number of students studies at TE institutions abroad. More detailed data on Croatian students who study abroad are available for students from Croatia studying in the USA[51].

The CBS collects data on the number of foreign students per country of origin and on the educational institutions in which they are studying.

According to the CBS data for the last five years, the share of international students studying in Croatia is only 2.6% of the total number of students. Most international students who study in Croatia originate from the countries of former Yugoslavia (2.2%), from the EU countries (0.14%) and the rest of the world (0.16%).

There are no expert analyses examining the reasons for the lack of interest for studying in Croatia. However, the following reasons could certainly be considered as possible factors: the procedure of registering foreign student residents; their accommodation in student dormitories; the lack of attractive educational programs conducted in a foreign language, etc.

According to data from the Croatian ENIC/NARIC office dating from July 2004, 700 requests for foreign diploma certifications were submitted for pursuing studies in Croatia.

Regarding mobility of Croatian students within Croatia, according to CBS data most students studying outside their region of residence enroll in TE institutions in the Zagreb region, then in the Split region, the Rijeka region, the Osijek region and in the regions of Zadar and Dubrovnik. There is data on the number of students who change the type of study and the number for students who change their place of study. Such data is monitored neither by the CBS data on students in TE nor by the MoSES.

51 Institute for the Development of Education (www.iro.hr); and on the web link of IIE locator report: statistics on Croatian students in the USA www.iie.org. Accessed: January 12, 2007.

6.5.2 FREEDOM OF MOVEMENT FOR STUDENTS AND WORKERS

The new *Act on the Recognition of Foreign Educational Qualifications*, implemented in July 2004, for the first time differentiates between academic recognition for pursuing studies and professional recognition for the purpose of employment. Moreover, the Act incorporates the principles of the Bologna process and stipulates recognition based on learning outcomes and competencies, rather than on comparing curricula.

In accordance with this Act, the National ENIC/NARIC Office (Information Center on Academic Mobility and Recognition of Higher Education Qualifications) was established in July 2004. The MoSES ensured all the conditions for the enforcement of this Act, most notably the elaboration of *Criteria for Evaluation of Foreign Higher Education Qualifications*. Based on these criteria, the Committee for Recognition of Foreign Higher Education Qualifications, appointed by the Rectors' Conference, has evaluated all recognition cases submitted to the National ENIC/NARIC Office.

In March 2005, after the ASHE became operational, the National ENIC/NARIC Office was transferred from the MoSES to the Agency, as stipulated by the *Act on Scientific Activity and Higher Education* and the *Act on the Recognition of Foreign Educational Qualifications*. According to the latter Act, the Agency, based on the prior evaluation and on the recommendation of the National ENIC/NARIC office, carries out the professional and academic recognition of foreign TE qualifications.

The stakeholders and the public have perceived the enforcement of the new legislation as a major achievement in recognizing TE qualifications. The process has also received valuable support from the CARDS 2003 project, *Higher Education Mobility: Diploma Recognition Policy and Legislation*. Since July 2004, the ENIC Office has received 700 requests for the recognition of foreign qualifications. 550 requests were evaluated by the Rectors' Conference Committee and processed by the ENIC office. Until now, the Agency issued 480 positive statements, out of which 95% are for professional purposes. The strengthening of the institutional capacity of the ENIC/NARIC office and its integration into the ENIC/NARIC network has also been progressing successfully. Moreover, the extension and fine-tuning of a database of conducted recognition cases foreseen in the *National Program for the Integration of the Republic of Croatia into the European Union 2005* have to a large extent already been achieved.

6.5.3 INTERNATIONAL PROGRAMS FOR PROMOTING STUDENT MOBILITY

The MoSES administers a program aimed at encouraging the international exchange of students (The National Scheme for Co-financing International Cooperation of Universities). Each university receives an annual lump sum for several eligible programs. Universities spend the majority of their resources on promoting the mobility of professors and students according to international inter-university agreements. In addition, the EU program TEMPUS has been used for the limited exchange of students within the Joint European Projects. The above programs prepare Croatian TE systems for participation in the EU mobility program *SOCRATES-ERASMUS*. Croatia has had access to TEMPUS funding since 2000. Until now, over 15.5 million EUR had been used for TEMPUS projects geared towards the preparation and the implementation of the reform. Croatian TE institutions had been granted with 36 Joint European Projects aimed at institution building, curriculum development and university management.

6.5.4 LIMITATIONS ON STUDENT MOBILITY TO/FROM CROATIA

There are still insufficient exchange programs allowing student mobility, both on the national and institutional levels (i.e. grants). Therefore, student mobility often depends upon individual financial capacities of students and their families. In order to increase incoming mobility, it is necessary to eliminate barriers such as the limited number of study programs carried out in foreign languages, and the limited accommodations for foreign students. Meanwhile, the full implementation of ECTS must be carried out and student support services (International Relations Offices at universities) must be enhanced. The complex residence permit requirements (valid for foreign students staying in Croatia longer than three months) must also be addressed.

CHAPTER 7

RESOURCING THE TERTIARY EDUCATION SYSTEM

7.1 Staff

The overall number of staff employed at TE institutions in Croatia has been increasing over the last 10 years, despite the restrictive policy on employment in the public sector. Almost two-thirds of employed persons are academic staff and one-third administrative and technical staff (Figure 7.1).

7.1.1 ACADEMIC STAFF

The total number of academic staff at TE institutions has risen considerably in the last 10 years. Even though the annual increases within this period vary – with certain years experiencing negative growth – the overall increase in academic staff has been 38.6% (Figure 7.1, and Tables 7.1 to 7.5).

The overall picture on the number of employed academic staff can be complete only by comparing the total number of academic staff with the total number of academic staff involved in full-time teaching (Figure 7.1 and Tables 7.4 and 7.5). In the academic year 1995/96, almost 86% of the total number of employed academic staff was employed full-time. During the next five years, this share fell considerably and reached 68.4% in the academic year 2000/01 after which a gradual increase of full-time academic staff can be noticed, finally reaching 74.1% in the academic year 2004/05 (Figure 7.2).

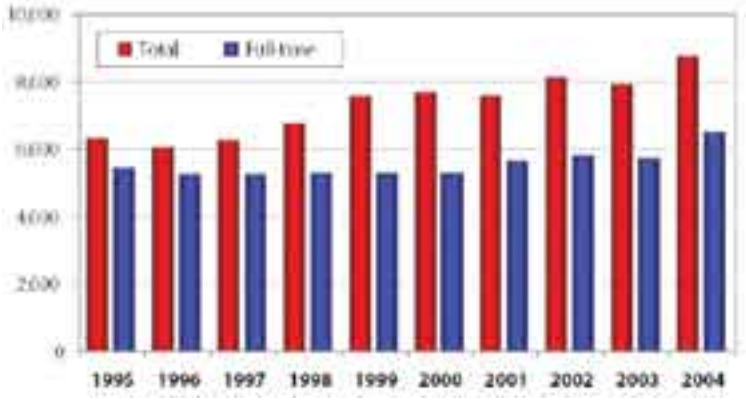

Figure 7.1 Academic staff in tertiary education institutions employed in full-time and/or part-time teaching *(Source: CBS)*

Figure 7.2 shows the structure of employed academic staff according to academic grades by grouping these in four categories: scientific/teaching grade, teaching grade, associate grade and professional grade. The data points to a gradual and almost continuous growth trend of employed academic staff in the scientific/ teaching grade and teaching grade, as opposed to associate grade where the increase can only be observed in the last year. The dynamics of increase and decrease in the total number of academic staff employed in professional grade fluctuates in the period in question (1995 - 2004).

Analyzing the structure of academic staff by academic grades employed full-time in relation to the total number of academic staff employed in those grades, it is notable that that the percentage of these that are employed full-time is 77% in the scientific/teaching grade, 60.4% in the teaching grade, 81.8% in the associate grade and 56.2% of in the professional grade. The lowest share of full-time employed is among teaching staff at schools of professional higher education and among lecturers.

In general, the TE system does experience problems in ensuring adequate academic staffing, although there is a considerable imbalance between different TE institutions. A proportion of public TE institutions, particularly outside the Zagreb area, do not have adequate academic staff for teaching certain curricula, so there is a need to hire additional academic staff. The problem is that there was a provision between 1990 and 2002 forbidding the hiring of new academic staff in the public sector in general, as well as in the TE system. This restriction made it possible to hire TE staff only with the approval of the relevant ministry. Some TE institutions dealt with the lack of adequate academic staff by bringing in guest professors employed at other TE institutions, lecturers invited from abroad or lecturers from the business sector.

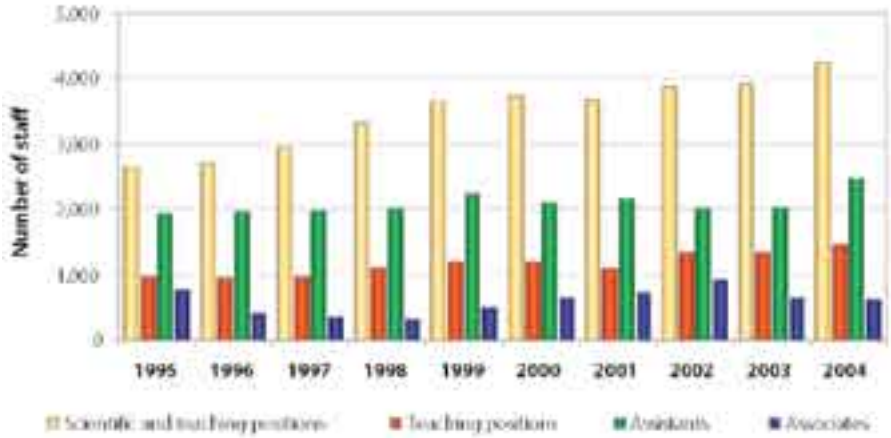

Figure 7.2 Structure of academic staff (full-time and part-time) employed at tertiary education institutions *(Source: CBS)*

The policy of hiring academic staff at public TE institutions was greatly affected by the hiring of early stage researchers[52]. The task of early stage researchers at TE institutions is primarily to actively participate in scientific activities and to a lesser degree in teaching activities. They are obliged to undergo doctoral studies and to prepare and defend their doctoral theses within the legally prescribed period.

The structure of academic staff in Croatia has undergone considerable changes over the last 10 years. The number of academic staff in scientific/teaching positions (Full Professor, Associate Professor, Assistant Professor, Professor at a Polytechnic, and Senior Lecturer) experienced stable and predictable annual increase, which is a result of the promotion policy established by the *Act on Higher Education Institutions* from 1994/96. The Act guaranteed promotion in public TE institutions irrespective of the number of positions provided for by the budget of such institutions. However, in contrast, the number of associates at TE institutions did not grow consistently, primarily due to the changes in the policy of associate staffing as most assistant positions were connected to the early stage researcher's policy. In general, there is imbalance between senior positions and assistants positions – the total number of assistants/early stage researchers is too low to maintain the research base of universities.

In the TE system, the number of employed academic staff has changed over the past years, but has not paralleled the increase in the number of students (Figure 7.3). In order to ensure the necessary increase in quality standards at TE institutions, the ministries responsible for TE in 2003 and 2005 (Ministry of Science and Technology and the MoSES) provided additional financial resources in order to ensure new academic positions for science and TE institutions (300 new positions in 2003 and 400 new positions in 2005). New positions could relieve the current pressure on academic staff and reduce the professor/student ratio.

52 According to the *Act on Scientific Research Activities* the Ministry of Science and Technology approved the decision on financing research assistants in the system of higher education and science. At higher education institutions, research assistants who obtained the associate grade of assistant or senior assistant participate in teaching as a part of their working hours.

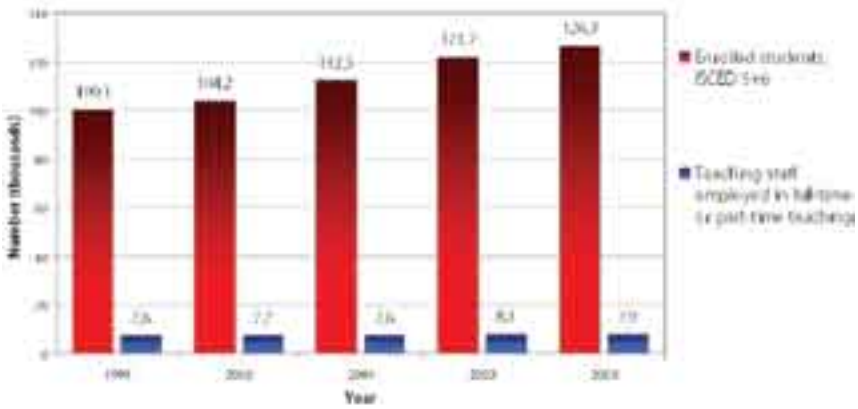

Figure 7.3 Enrolled students compared to teaching staff employed in full-time or part-time teaching
(Source: CBS)

Although the current legal provisions mandate a public competition when academic staff is hired at TE institutions, competitions usually center on a relatively narrow circle of potential employees from the local area. Croatia should accept the well-known practice of establishing employment competitions on the national level and, in accordance with the *Science & Technology Policy of the Republic of Croatia 2006 - 2010* and the *Education Sector Development Plan 2005 - 2010*, use additional measures to promote regional development.

A major problem is to provide sufficient funding to ensure an adequate academic staff at polytechnics and schools of professional higher education. A large part of the academic staff at independent polytechnics and schools of professional higher education works at other TE institutions, public scientific institutes or in industry. Their work at colleges and polytechnic schools is regulated by special contracts, which are usually agreements on author's fees or a temporary employment contract for implementing a specific curriculum. The above contract includes all other teaching obligations of academic staff when implementing the curriculum (exams, seminar papers, practical teaching, diploma theses, etc.).

It can be expected that hiring academic staff for independent polytechnics and schools of professional higher education will remain an open issue in the near future. One aspect of the issue is the limited MoSES budget for salaries for newly hired academic staff in the Croatian TE system[53]. The other aspect is related to the diversification and differentiation of the Croatian TE institutions.

There is also a special aspect that relates to hiring of academic staff at private TE institutions. According to publicly available data and information, the problems of implementing curricula at private TE institutions are addressed in much the same way as at public polytechnics and schools of professional higher education. The public in general believes that private TE institutions do not have enough academic staff. Many also believe that curricula at those institutions are implemented by temporary or contracted academic staff working at public TE institutions, public scientific institutions or in the industrial sector. In such a case the academic staff that is permanently employed by those private TE institutions would carry out only a minor part of the

53 Additional funds were provided in the 2004 state budget for new employment in the system of higher education and science.

instruction[54]. Based on the latest data for academic staff in the academic year 2004/05, a total of 479 people are involved in teaching at 12 private schools of professional higher education. Of these, only 44 are full-time professors, 11 associate professors, 28 assistant professors, while most lecturers (82%) are assistants, senior associates and advisors.

A potential problem that can arise when researchers are hired from the public or private sectors to work at private TE institutions is the inability of the researchers to be fully engaged for their students and the curriculum because of the time spent on their basic or primary employment.

One of the ways to promote the employment of adequate academic staff at private TE institutions (when submitting the approval request for work at a TE institution, in accordance with the *Act on Scientific Activity and Higher Education*) is to ensure the necessary number of academic staff to manage the curriculum. Such institutions must not simply meet the minimum requirements by stating the intention of hiring specific lecturers to realize the curricula.

7.1.2 ACADEMIC SALARIES

The salaries of the academic staff at TE are in accordance with the following provisions: (1) *Labor Act*[55]; (2) *Act on Salaries for State Jobs*[56]*; (3) Collective Agreement for Science and Higher Education*[57]*; (4) Provision of the Government of the Republic of Croatia on Job Titles and Complexity Coefficients of State Jobs*[58]*;* and (5) the *Provision on Changes and Amendments to the Provision on Job Titles and Complexity Coefficients of State Jobs*[59].

The *Labor Act* regulates general labor relations, while the *Act on Salaries for Public Jobs* prescribes the method of calculating salaries and other compensations for state employees, including the academic staff at TE institutions.

The salary of academic staff employed at TE institutions is obtained by multiplying the coefficient of job complexity[60] and the basis for salary calculation[61] increased by 0.5% for each completed year of service. The starting point for determining the basis for salary calculation is the draft budget for the next year, the agreement on salary policy, and the average gross monthly salary of the employed citizens in the Republic of Croatia during the previous year, which is determined by the Central Bureau of Statistics and published in the Official Gazette.

54 As part of the official statistical research that is carried out through the National program of statistical research of the CBS, research is conducted on teaching staff according to groups, title and place of higher education institution and academic grades, and includes the teaching staff of private higher education institutions.

55 OG 38/95, 54/95, 65/95, 17/01, 82/01

56 OG 27/01

57 OG 101/02, 81/03, 203/03

58 OG 38/2001, 112/2001, 62/2002

59 Pursuant to Article 6, paragraph 2, and Article 7, paragraph 2, of the *Act on Salaries for State Jobs* (OG 27/01), at its session held in April 2001, the Croatian Government passed the Provision on Job Titles and Job Complexity Coefficients in State Jobs. That Provision was changed and amended by the Croatian Government at its session of 19 December 2003, and the changed and amended Provision is still in force.

60 For jobs in higher education, coefficients have been established in the range of 1.25 to 3.50.

61 According to the statement of the CBS, the basis for salary calculations for the fiscal year 2004 was HRK 5,599.00, because that was the average gross salary of legal employees in the Republic of Croatia who worked for all twelve months of 2003.

Frame 1 Ability of collecting information on salaries according to occupations

The average salaries according to occupation are not published by the Central Bureau of Statistics (in the *Statistical Yearbook, Monthly Statistical Reports*, or other publications).

Through a special analysis of individual data from the Labor Force Survey, which is conducted biannually by the Central Bureau of Statistics, it is possible to find information on the average monthly net salary according to occupation. Occupations are classified according to the National Classification of Occupations, which is comparable to the International Standard Classification of Occupations ISCO-88. Because of the relatively small sample of the Survey, it is possible to get satisfactory representative data for only ten major groups of occupations:

- Legislators, senior officials and managers
- Professionals and scientists
- Engineers and technicians
- Office clerks
- Service workers and shop and market sales workers
- Skilled agricultural and fishery workers
- Craft and related trades workers
- Plant and machine operators and assemblers
- Elementary occupations
- Armed forces.

This data can be further separated into occupations in the public and private sectors. Below are average monthly salaries expressed hourly in the private and public sectors for the second part of 2003 (companies that are in majority state ownership are classified under the heading "public sector"). A more comprehensive, but technically more demanding analysis of salaries in Croatia, based on the Labor Force Survey, was published by Nestić (2005).

Average hourly salaries in the private and public sectors by occupation, in HRK, second part of 2003.

Occupation	**Private sector**	**Public sector**
Elementary occupations	14.18	15.45
Machine operators	16.50	19.51
Craft and related trades workers	19.26	20.86
Agricultural workers	11.52	17.80
Services and sales	14.54	19.73
Office clerks	18.76	21.61
Engineers and technicians	26.25	25.74
Professionals and scientists	**31.93**	**33.56**
Officials and managers	49.42	45.36
Armed forces	-	27.46

Source: CBS, 2004, Labor Force Survey

The *Collective Agreement for Science and Higher Education* determines the basis for salary calculation. The collective agreement, made between Trade union for science and higher education and the Government, also determines jobs with special work conditions and the potential for special bonuses for public and state employees doing such jobs. Bonuses for jobs with special work conditions are included in the salary. Employees are assigned to their grade pursuant to the *Decree of the Government of the Republic of Croatia on Job Titles and Coefficients of Complexity of Public Jobs* (relating to the section on science and higher education). If a TE institution earns income from conducting its programs, the employees are entitled to an appropriate salary increase. The method of income allocation and payment is regulated by the *Annex to the Collective Agreement*, or by the collective agreement of the institution or by the regulations of the institution.

The *Decree of the Government of the Republic of Croatia on Changes and Amendments of the Provision on Job Titles and Coefficients of Complexity of Public Jobs* determines job titles, coefficients of complexity for such jobs, and job coefficient values (Table 7.4). The average monthly salary for an assistant, as the lowest rank of the academic grades, is only slightly higher than the average monthly salary in Croatia (by 3.9%). When analyzing data on salaries according to professions it should be noticed that the average salaries in certain professions are significantly higher than a salary for an assistant at a higher education institution (real-estate; other service professions; mining; energy, gas and water supply; public administration; health care and social welfare; transport and finances), with average salaries in the financial sector higher by 40%[62]. Additional explanation and comparisons of salaries in different sectors can be seen in Frame 1 (page 89).

7.1.3 SELECTION OF ACADEMIC STAFF

There are specific criteria used to select academic staff. The criteria are set by the *Act on Scientific Activity and Higher Education*. There are different selection criteria for different parts of the TE system. Two types of grading are required for universities: first, an appropriate scientific grade, which is obtained upon meeting the requirements set up by the National Council for Science (NCS) at the national level; second, a scientific/teaching grade, which relates to the teaching position at a university and an appointment is made autonomously by a university through a public competition procedure.

Professional salary grades for science, art and education. Salary grades for science and art instruction are: Assistant Professor, Associate Professor and Full Professor. Other salary grades are: Lecturer, Senior Lecturer, College Professor, Foreign Language Instructor, Senior Foreign Language Instructor, Associate for Arts and Senior Associate for Arts. Associate grades are: Assistant and Senior Assistant. Professional grades are: Associate, Senior Associate and Adviser.

University salary grades and corresponding jobs. The university is where appointments are made for science, art and associate salary grades, as well as for the grades of Lecturer, Senior Lecturer, Foreign-Language Instructor, Senior Foreign-Language Instructor, Associate for Arts and Senior Associate for Arts, and the professional grades. When a university carries out a professional studies program, it can appoint teachers for all teaching grades. Universities advertise public competitions[63] to hire teachers, and they conclude employment contracts with the selected candidates.

62 As data on average salaries in the private sector are not publicly available, it is not possible to compare average salaries of teaching staff at higher education institutions with those employed in the public sector.

63 Although there is the usual practice of announcing public competitions, there is no competition in the real sense as usually just one candidate applies for the announced vacancy.

A person meeting the requirements for appointment to an appropriate scientific, artistic, associate or other teaching grade can be appointed to that grade without concluding an employment contract. A contract is not necessary if that person is participating in or will be participating in the partial or full instruction of a specific course (this is called a "nominal grade") at a TE institution. A TE institution can assign up to one-third of a course load to teachers, scientists, artists or experts without the obligation to conclude an employment contract. This assignment is pursuant to the provisions of the statutes and does not guarantee a scientific teaching grade (they are called visiting professors or teachers). In this case, persons appointed to scientific, artistic or other teaching grades must teach the rest of the course. Under the terms stipulated by the university statute, a prominent foreign professor or a distinguished expert can teach a particular course without the scientific teaching grade for no longer than two consecutive academic years.

Postgraduate students can participate in teaching undergraduate and graduate subjects at the university according to the curricula of the postgraduate university program.

Requirements for appointment to scientific/teaching grades. A person can be appointed to a scientific/teaching grade if that person has been entered into the Register of Scientists with a scientific grade attained in the relevant field. This grade can also be attained if that person meets the requirements for acquiring that scientific grade in terms of educational, teaching and professional work prescribed by the Rectors' Conference. If that person has the required psychological/physical characteristics, as well as other prerequisites prescribed by the University Statute, he/she may also attain the salary grade. A candidate can be appointed to a scientific/teaching grade if they meet the requirements for scientific qualifications, as follows: Assistant Professor at least level of Research Associate, Associate Professor at least level of Senior Research Associate and Full Professor level of Scientific Adviser. The requirements set forth at the Rectors' Conference are published in the state Official Gazette. The method of verifying whether one meets these conditions and has the necessary psychological/physical characteristics is outlined in the university statute or other organizational documents.

Requirements for appointment to artistic teaching grades. Art teachers can be appointed to artistic teaching grades and to corresponding positions if they have achieved artistic results that are important enough to meet the requirements for appointment to scientific/teaching positions. Artistic/teaching positions are equivalent to scientific/teaching positions, and the provisions of the *Act on Scientific Activity and Higher Education* referring to scientific/teaching positions should be applicable to artistic/teaching positions as well. The Rector's Conference determines in more detail the requirements for appointing teachers in artistic fields.

Appointment procedures for scientific and artistic teaching grades and corresponding positions. The appointment procedure for scientific and artistic teaching grades and corresponding positions is conducted by a university through a public competition published in the state Official Gazette, daily newspapers and the official web pages of the TE institution.

Honorary title. An honorary scientific or artistic title is Professor Emeritus, awarded by the university (without a public competition) to deserving retired full professors whose scientific or artistic work has gained international reputation. The appointment procedure and the rights of Professor Emeritus are elaborated in detail by university statute.

Associate titles and corresponding positions at the university. Associate titles and corresponding positions at the university are Assistant and Senior Assistant. Assistants and Senior Assistants are selected from among the ranks of the most successful students. Assistants and Senior Assistants help in implementing a part of the teaching process, as well as the scientific, artistic and professional activities of the TE institution. Associates at the university are appointed according to the statute of the TE institution and the regulations provided by the MoSES.

Teaching and professional grades at universities, polytechnics and schools of professional higher education, as well as corresponding positions. At polytechnics and schools of professional higher education, teachers are appointed to teaching grades and the positions corresponding to those grades. Polytechnics and schools of professional higher education do not have positions corresponding to scientific teaching grades. However, teachers appointed to scientific/teaching or nominal grades at the university are able to conduct this type of instruction.

At the university, faculty or academy of arts, teaching positions are appointed according to their statutes, for professional studies as well as for courses that do not require a scientific approach. Teaching positions are also given at the academy of arts, for the purpose of rehearsal and other aspects of assistance in the educational process.

Those eligible for the position of Lecturer are persons who have completed a graduate program or professional specialist program, have met the necessary requirements prescribed by the Rectors' Conference or the CPSPHE, respectively, have at least three years of work experience in their profession, have made a well-received inaugural lecture before teachers and students, are being appointed for a teaching position for the first time, and have met the conditions stipulated by the statute of the TE institution.

Those eligible for the teaching position of Senior Lecturer are persons who have completed a graduate program or professional and specialist program, have met the necessary conditions prescribed by the Rectors' Conference or the CPSPHE, respectively, have published professional articles, have at least five years of work experience in their profession, have made a well-received inaugural lecture before teachers and students, are being appointed for a teaching position for the first time, and have met the conditions stipulated by the statute of the TE institution.

Those eligible for a Professorship at a school of professional TE, as well as a corresponding position at a polytechnic or a school of professional TE, are persons who hold a doctoral degree, have met the necessary conditions prescribed by the CPSPHE, have participated in significant projects, have published articles that significantly contributed to their field of work, or have published new articles after being appointed to the position of Senior Lecturer, have at least eight years of work experience in their profession, have made a well-received inaugural lecture before teachers and students, are being appointed for a teaching position for the first time, and have met the conditions stipulated by the statute of the polytechnic or school of professional higher education.

Those eligible for a Foreign Language Instructor position are persons who have completed a graduate program, have met the necessary conditions prescribed by the Rectors' Conference or the CPSPHE, have published expert studies, have at least three years of work experience in their profession, and have met the conditions stipulated by the statute of the TE institution.

Those eligible for a Senior Foreign Language Instructor position are persons who have completed a graduate program, have met the necessary conditions prescribed by the Rectors' Conference or the CPSPHE, respectively, have published expert studies, have at least five years of work experience in their profession, and have met the conditions stipulated by the statute of the TE institution.

Those eligible for an Associate in Arts position are persons who have completed a graduate program in the arts, have met the necessary conditions prescribed by the Rectors' Conference or the CPSPHE, respectively, have proven artistic talent, have at least five years of work experience in their profession, and have met the conditions stipulated by the statute of the TE institution.

Those eligible for a Senior Associate in Arts position are persons who have completed a graduate program in the arts, have met the necessary conditions prescribed by the Rectors' Conference or the CPSPHE,

respectively, have proven artistic talent, have at least 10 years of work experience in their profession, and have met the conditions stipulated by the statute of the TE institution.

Associate grades and corresponding positions at polytechnics and schools of professional higher education. The associate position at polytechnics and schools of professional higher education is the position of Assistant. In their statutes, polytechnics and schools of professional higher education prescribe the requirements for an appointment to the associate grade of Assistant.

Professional positions at TE institutions. Appointment to professional positions at TE institutions can be carried out to implement scientific and professional projects according to the requirements and procedures prescribed by the statute of the TE institution.

Appointment procedure for teaching and professional grades at TE institutions. The appointment procedure for teaching and professional positions is carried out by a TE institution pursuant to the statute, based on a public competition announced in the state Official Gazette, daily newspapers and the official web page of the TE institution.

Employment contracts for scientific teaching, artistic teaching, teaching and professional positions. Persons appointed to scientific teaching, artistic teaching, teaching and professional positions conclude a permanent employment contract, which includes an obligation to seek re-appointment or advancement every five years. The obligation to seek re-appointment ends with the person's second appointment to the position of a full professor or a teaching post of a college professor (permanent grade). An employee can be appointed only twice to the position of an Assistant Professor or as an Associate Professor, a Lecturer and Senior Lecturer.

7.1.4 PROMOTION OF ACADEMIC STAFF

The *Act on Scientific Activity and Higher Education* establishes that the National Council for Science (NCS) and the National Council for Higher Education (NCHE) are the highest professional entities within higher education, with the basic goal of taking care of the development and quality of the entire higher education system in the Republic of Croatia. The NCS defines minimal standards for promotion based on scientific achievements, primarily based on scientific publications. The NCHE approves the conditions of the Rectors' Conference and the CPSPHE for awarding scientific teaching, artistic teaching and education teaching positions[64].

The Rectors Conference, with the approval of the NCHE, determines the general criteria (a positive evaluation of the initial lecture in front of teachers and students, positive results of the evaluation of the quality of teaching or positive student evaluations) and additional criteria, depending on the scientific/teaching grades (required number of teaching hours at a higher education institution, presentations of scientific work at scientific conferences, mentorship, scientific specialization and development, member of an editorial board of a scientific magazine, lead scientist on a project, evaluator of an academic study program and other criteria) for election into scientific/teaching grades.

There are a lack of clear provisions in Croatia indicating the necessity of including the scientific/teaching staff in scientific activities, or in cooperation with the business sector or local community. Along with teaching duties, the scientific/teaching staff can freely decide on its degree of participation in scientific research and cooperation with the business world.

64 OG 129/05

The only provisions that indirectly obligated participation in scientific activities were the *Regulations on Conditions for the Selection of Scientific Grades*[65]. These regulations prescribed for each scientific area, the selection requirements for scientific grades and the obligation to publish scientific works in order to advance[66].

7.1.5 POLICIES AND PROGRAMS FOR IMPROVING THE QUALITY OF TERTIARY EDUCATION STAFF

Currently, Croatia has no systematic policies or programs that would additionally improve the quality of education for scientific/teaching staff employed in the TE system (in teaching, science, administrative skills, and leadership techniques and skills). There are a number of uncoordinated initiatives at the level of tertiary institutions. In addition, a number of academics in Croatia were involved in TEMPUS programs with the aim of improving the quality of educational provisions at tertiary institutions.[67]

One of the reasons for the insufficient attention given to the development of management and administration skills in Croatia is the financing policy of the TE system. TE institutions are usually financed in such a way that the staff is provided with salary expenditures from the state budget, and institutions with a part of the current and capital expenditures.

In order to improve the quality of teaching and scientific activities at TE institutions, it is necessary to improve institutional administration and develop skills and administrative knowledge to support the scientific work at TE institutions. The development of the administration should follow the development and needs of the scientific/teaching staff.

7.2 Financing

7.2.1 MAJOR CHARACTERISTICS AND PLANNED ACTIVITIES

In 2004, 0.867% of the GDP was directly allocated for TE from the state budget (Table 7.5). However, it is difficult to estimate the overall allocation for TE, primarily due to the lack of methodology for calculation. A number of other budgetary items within the MoSES budget are also spent on TE, but there is no calculation of TE participation in these items. For instance, ICT and Science items (Table 7.5) are also spent on TE. Thus, our further discussion about resources for TE will be based on clear budgetary items.

In addition to allocation from the state budget, approximately 900 million HRK (around 120 million EUR) is obtained as own income of TE institutions.

This means that almost one third of the TE institutions' expenditure comes from non-budgetary sources (Table 7.6).

A significant portion of this income comes from student participation, as tuition fees.

65 OG 38/97

66 Along with the aforementioned Regulations, it is necessary to mention the *Regulations on Measures for Valuating Journals and Publications with Internationally Recognized Review, and the Journals and Publications with Equivalent Quality* (OG 2/97).

67 *Strategic Management of Staff Development at the University* project at the University of Zagreb (July 2004-October 2005) whose objective was to offer to three participating Croatian universities a broad overview of different approaches of EU partner institutions to the conceptualization, strategic management and implementation of staff development.

An overall estimate of expenditure for TE is even more complex since a significant amount of expenditure relates to the scientific activities of TE institutions. For example, scientific projects and programs, as well as financing for early stage researchers, are included within the Science item even though they directly contribute to the activities of TE institutions. In addition to their engagement in research activities, early stage researchers participate in teaching activities and are counted as teaching staff. This is even more significant if one considers research activities at universities as a part of TE, within the third cycle study programs (doctoral studies).

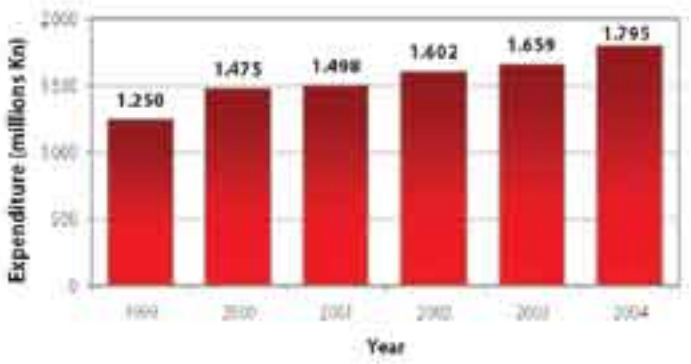

Figure 7.4 Total expenditure on tertiary education from the state budget (in mil. HRK)
(Source: MoSES)

Overall funding of TE has increased considerably during the last 10 years, both from the state budget and from own income of TE institutions (Figure 7.4 and Tables 7.11 to 7.14). In addition to these resources, approximately 2 billion HRK (approx. 600 millions EUR) will be spent over the next five years as loans from commercial banks for capital investments and loans from the World Bank and EBRD.

The major challenges of financing TE are: under-funding, the lack of equity and transparency in budgetary allocation, an unbalanced education budget, both in terms of expenditures and the sources of funds, and the lack of synergy (legislative, professional and institutional) for system change. The allocation mechanisms are rigid and based on incremental budgets with allocations from previous years. These mechanisms lack medium and long-term planning and strategic investment targets. Control is usually exercised at the central level and is based on inputs[68]. Because of the restrictive *Act on Budget Execution*, and the inadequate planning of expenditures, there are no mechanisms in place to reallocate money from one budget activity or project to another activity or project.

The present allocation of the budget for TE institutions is currently somewhat rigid and imbalanced. Around 65% of planned spending on TE in the MoSES budget is expenditures for salaries, and this spending is focused on recurring expenditures. Capital expenditures represent a sensitive area because they are covered by the state budget, but frequently local budgets and the revenues of TE institutions must also be used. The budgetary allocation mechanisms, through which the resources are assigned, are rigid and outdated. No alternative or incentive-based mechanisms have been attempted.

68 In MoSES, as in other ministries, the Internal Controlling Department has been created in line with the *Strategy for Internal Controlling in the Public Sector*. Its implementation should result in the better management and use of public budget funds and European Union funds, and in the monitoring, compliance and strategy measures for focused spending of budget funds.

According to the *Educational Sector Development Plan 2005 – 2010* adopted by the Croatian Government, it is necessary to establish a new system of financing TE, which will replace the existing, inherited system of direct state control of financial resources.

The transfer of financial support directly to universities (lump sum allocation) started in 2006.

This process will give universities a real chance to develop their strategies for the first time, in accordance with their own as well as national priorities, strategies and the principle of polycentric development.

Efforts to increase state budget provisions for TE are based on realistic plans. Thus, major efforts focus on increasing financing from other sources. Other sources of financing are most important for programs for which all employment needs are going to be insured from other sources rather than from the state budget.

Croatian TE institutions will be encouraged to compete for financial support intended for scientific research projects and study programs.

A model for student scholarships, which is planned to be developed during the 2006 to 2010 period, should address the needs of students and society for providing access to specific occupations.

7.2.2 THE ROLE OF THE MINISTRY OF SCIENCE, EDUCATION AND SPORTS IN FINANCING TERTIARY EDUCATION

The MoSES receives almost all funds allocated to TE from the state budget (public funds). The share of TE expenditures in terms of GDP is around 0.85%, and it remains well under the European average.

The MoSES presently compensates the majority of academic staff for expenditures on wage and employer contributions (the rest of the expenditures for staff, if exist, is covered by TE institutions from their own revenues).

The role of the MoSES is also to provide funds for financing capital investments in TE. The infrastructure of TE institutions needs to be improved as the maintenance of buildings was neglected during previous times. Some institutions[69] suffered serious damage during the war. At the central level, no adequate management information system exists to assist in developing an appropriate investment strategy. Some institutions lack space and others make inefficient use of the space they have. The conditions differ widely from one institution to another, but education facilities are often inadequate. Beginning with a thorough analysis of the status of buildings and facilities, including conducting an inventory[70], a list of sensible priorities could be drawn up. In the absence of additional support from the private sector, many institutions will find it difficult to provide high quality standards in education.

Over the last several years the MoSES has provided many necessary resources for the procurement of new scientific equipment for various scientific and TE institutions. It appears that TE institutions do not lack the resources for such capital equipment.

At present, there are no incentives for private and other non-state sources of financing. There is a great need to increase and diversify the available resources. No fiscal or tax incentives are available for employers to encourage broader participation in financially supporting TE institutions.

69 The University of Osijek is an example of an institution that suffered serious damage during the war.

70 MoSES has been preparing a national inventory of capital equipment for all scientific and TE institutions.

7.2.2.1 Financing of employee compensation

The Government provides funds for salaries and indirect labor costs. The state budget provides around 85% of the total funds needed for employees at TE institutions (the rest is provided by the income of TE institutions). The above funds are intended for salary payments, allowances and compensation for most employees at TE institutions.

Tertiary education institutions, from which salary funds are provided from the state budget, represent 63.8% of employees that work in scientific/teaching grades. Of these, around 19% of the employees are full professors and 19% are assistant professors (Tables 7.3).

7.2.2.2 Financing early stage researchers

For its part of the state budget, the MoSES ensures the payment of salaries (Table 7.11), allowances and compensation for early stage researchers. Out of the total budget of the MoSES, the expenditures for early stage researchers amounted to a significant 5% (Table 7.10). The candidates for early stage researchers are selected from among 10% of the most successful graduate students for working on scientific research projects and themes.

Early stage researchers must complete a Master's of Sciences degree within four years, and a Doctorate of Sciences degree within another four years. If an early stage researcher obtains a Doctorate of Sciences within the set period they can be chosen for a Senior Assistant position and receive limited-period employment to work on a project or theme, for example as a post-doc with a three-year contract.

7.2.2.3 Financing of tertiary education institutions

Sources of funds for financing TE institutions are determined by the *Act on Scientific Activity and Higher Education*.

Frame 2 Sources of funds for financing TE institutions

- Founders' funds
- State budget of the Republic of Croatia
- Budgets of counties, cities and municipalities
- Funds of the National Foundation for Science, Higher Education and Technology Development in the Republic of Croatia
- Institutional income based on tuition fees, research, artistic and professional projects, studies, expert analyses, publishing and other activities
- Funds from universities and other foundations, profits from companies and other legal entities
- Funds from the direct investments of individuals, companies and other legal persons
- Funds from donations; and other sources.

Public universities, polytechnics and schools of professional higher education are financed from the state budget, taking into account the capacities of specific TE institutions and the cost of specific programs (different fields of science). The state budget can also be used to finance private TE institutions according to

rules determined by the NCHE, taking into account the available funds and the quality of such educational institutions. Such support also takes into account whether their capacities are in line with the educational needs in a specific scientific, artistic or professional area.

In its budget, the MoSES ensure funds for capital projects in the TE system (Table 7.12). For example, the MoSES secured funding for the reconstruction and construction of new campuses at several universities. The MoSES also provided funding for Internet access in more than 50% of student dormitories. The completion of this project is planned for the end of the year 2006. The establishment of the giga-based academic and research network is underway.

The future role of the MoSES in financing TE institution will be different. Funds from the state budget intended for universities, polytechnics and schools of professional higher education will be allocated to them as lump sums, starting from 2006. In turn, they break down their budgets to individual cost items, in accordance with the statutes and decisions of their administrations. The senate passes the university budget on the recommendation of the university council, while the budget of polytechnics and schools of professional higher education is passed by the professional council on the recommendation of the dean.

7.2.2.4 Subsidizing expenditures for student housing and board

The MoSES also concern itself with the construction of student residence halls. The MoSES subsidizes room and board for students residing in such facilities.

In accordance with the *Regulations on Support for Student Meal Costs*[71], the MoSES covers a part of the meal costs for full-time students (Table 7.13). The amount used to cover meal costs depends on, among other criteria, whether or not the student is studying in his/her place of residence, and whether the student lives in a student dormitory or private accommodation.

In accordance with the Minister of Science, Education and Sports' decisions on supporting accommodation costs of full-time students, the MoSES covers part of student accommodation costs (Table 7.13). The amount used to cover student accommodation costs depends on whether the student lives in a student dormitory or in private accommodations.

7.2.2.5 State maintenance awards for university students

State maintenance awards[72] are provided for university students who otherwise could not afford to remain in school, even though they have exhibited academic success and the aptitude suitable to the chosen educational program. The state provides funds for a small number of the best students from Croatian TE institutions. The MoSES has been providing state maintenance awards for 11,000 students (currently 7,500 students are studying at higher levels of their universities and 3,500 students are in the first year of their universities). There are three different monthly amounts of state awards - 500 HRK, 700 HRK and 800 HRK. The criteria for state awards include academic success and the social status of the students.

71 OG 51/02

72 In this document the term "state scholarship" means maintenance award because "scholarship" defined as competition according to academic merit does not exist in Croatia.

A model for student scholarships needs to be developed during the period 2005-2010. This model will address the needs of students and society in providing access to specific occupations and human resources throughout Croatia[73].

7.2.2.6 Financial support and scholarships for students applying to study abroad

The MoSES provides scholarship funds for students applying to study abroad. In its budget, the MoSES provides for grants or scholarships for studying and training, as well as support for accommodation, travel and other expenditures during the study abroad program. In the academic year 2004/05, 117 one-time cash payments were approved for training abroad, in amounts of 5,000 EUR or less. Additionally, nine payments of EUR 1,000 or less was given for student travel costs for postgraduate and doctor training abroad. The criteria for awarding this kind of support should be much more transparent. Furthermore, it is necessary to devise a comprehensive program of offering state support to students based on the strategic program of science development and the priorities of science development in Croatia.

Along with the support for study grants, the MoSES also coordinates around 160 bilateral scientific research projects in all areas of science[74]. The MoSES covers only the travel and accommodation costs abroad that are related to the research work on the project. This kind of support has been around 1,500 EUR per project.

Besides the MoSES, the National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ) gives financial support for scholarships[75].

7.2.3 CONTRIBUTIONS OF STUDENTS AND THEIR FAMILIES

Students are charged no tuition for undergraduate studies at state TE institutions. Still, more and more undergraduate students are paying part of their study costs. This applies to students who enroll in public TE institutions that are above the enrollment quota prescribed by the MoSES. However, undergraduates enrolled in private institutions pay for their studies, as do all part-time students, and postgraduate students.

7.2.4 CONTRIBUTION OF EMPLOYERS

The contribution of employers is based on the scholarship system. To attract potential future employees, companies and employers award company scholarships. In Croatia, several leading companies provide their employees or future employees with funds to cover study costs. A contract between the company and the employee or future employee determines the type of assistance, and the rights and obligations of both interested parties[76].

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73 According to the document *Modernization of the Education and Training Systems towards the 2010 Common Goals. National Contributions to the 2006 Joint Council/Commission Report for Croatia*.

74 To receive this type of assistance, those who apply to the open competition of MoSES are scientists employed in public scientific institutes, as well as the scientific teaching staff working at higher education institutions.

75 The Program *Brain Gain* of the Foundation finances the monthly costs of accommodation and travel abroad for post-docs for training outside the areas in which they obtained their degrees.

76 The latest example of specific companies providing support to students is the project called *Top stipendije (Top Grants)*, where several leading Croatian companies give financial support to 100 selected students by paying monthly amounts of HRK 4,000.

7.2.5 CONTRIBUTION OF PRIVATE CAPITAL MARKETS AND THE STUDENT LOANS SYSTEM

Student loans are a new form of financial assistance that helps students to cover tuition costs. Their purpose is to assist students who are not eligible for other forms of financial assistance and thus enable a larger number of young people to continue their studies. The state is involved in student loan schemes primarily by assuring equal conditions for all applicants, providing the legal framework for these conditions, and granting concessions to the banks providing such loans. However, the state does not subsidize the real interest rate, so each student must negotiate this rate with the bank, delaying the repayment of the loan.

7.2.6 OTHER SOURCES OF FUNDS

Out of the total income, TE institutions realize around 30% of their own income (Table 7.14), while the remaining funds are provided by the state budget. TE institutions earn their own income mostly from undergraduate and postgraduate tuition fees, scientific and professional projects, income from rent, organizing conferences and other activities.

7.2.7 MECHANISMS FOR ALLOCATING GOVERNMENT FUNDS TO INSTITUTIONS

The method of allocating state funds for the financing of current and capital expenditures at TE institutions is defined in the *Act on Scientific Activity and Higher Education*.

The creation of the *Proposal for Budget Funds and their Allocation* is the task of the Council for Financing Scientific Activity and Higher Education (CFSAHE). The CFSAHE makes criteria for allocating budget funds for scientific activity and TE, and proposes them to the NCS and the NCHE, which then determines the final criteria. The MoSES collects draft budgets from scientific organizations and universities, polytechnics and schools of professional higher education, and makes a draft budget for financing science and TE. The MoSES then delivers this proposal to the CFSAHE, which considers the draft budget and delivers it to the NCS and the NCHE together with its opinion. These groups approve the final proposal for the allocation of funds and deliver it to the Minister. The proposal includes total amounts for specific universities, polytechnics, schools of professional higher education, scientific institutes and other scientific organizations, as well as amounts for financing scientific projects, collaborative scientific programs, and associate work positions. The proposal also includes money for the procurement of scientific equipment and the operating costs of the NCS, the NCHE, the Agency, and other entities.

Funds in the total amount of up to 10% of the total budget for scientific activity and TE are allocated for the development of science and TE, scientific publishing, scientific conferences, and scientific and scientific-professional associations. These funds are allocated by the Minister pursuant to a public tender and the opinion of the appropriate commissions of the NCS and the NCHE.

The minimum salaries of participants in science and TE are determined by a collective agreement in line with the law.

The method of allocating funds from the state budget for financing TE institutions did not change significantly during the 2001-2004 period. The TE authority should deliver the table with funds for salaries and material costs per institution for the 2001-2004 period. The criteria for cost allocation include the number and structure of employees per TE institution, and the estimate of current material costs for implementing the curricula. This criteria is mostly based on estimates of stated needs over the past years, which are corrected in accordance with the funds provided from the MoSES budget.

The actual estimate of the costs of implementing specific curricula, and a comprehensive study of the costs of conducting TE, is lacking. In the near future, one can expect significant efforts in planning budgets based on measurable indicators, costs and performance metrics.

7.2.8 PROBLEMS AND PRESSURES IN FUNDING TERTIARY EDUCATION

Part of the problem in the TE system comes from deeply ingrained problems within the MoSES itself. Primarily, they concern the disorderly MoSES databases, which are a growing obstacle to making high-quality decisions. For the successful organization of MoSES operations, database access must be broad and open, both for databases necessary for the operation of TE institutions and for databases relating to the operation of the MoSES itself. Despite great individual efforts, there is no comprehensive public list of all databases within the MoSES (one part is available on the Intranet, and another is posted on the public Internet page of the MoSES).

No less important for the efficiency of MoSES operations than the lack of a database list, is the inadequate maintenance of important databases used for making decisions (registers, address books, address books with lists of leaders of institutions financed by the MoSES, etc.). These problems contribute to officers and employees in the MoSES losing time that could otherwise be used for collecting basic information. This problem is considered an increasingly serious restriction on the successful performance of state services.

The lack of ambition of a great majority of state administration employees, relatively high frequency of quality staff leaving state administration jobs, inadequate decisions on the realization of salaries (the coefficient system), a non merit-based salary system, strict hierarchical organization that almost completely stifles creativity, and the virtual impossibility of implementing a system of high performance rewards contributes to inefficient public government and administration.

The method of selecting resources for state administration jobs is of very low quality. There is usually no stress on fluency in foreign languages, no requirements for specific specialized knowledge, no verification of psychological/physical prerequisites for working in the state administration, no requirements for teamwork skills and creativity, and no demands for recommendations from former employers. Emphasis is given mostly to formal diplomas and verbal recommendations. Because of the above factors, good, high quality, well-educated, young candidates are not joining the state administration. Alternatively, they “desert” as soon as they have the opportunity to do so. The same situation (or much worse) is also present in the MoSES.

A specific problem related to the creation of a successful and high-quality organization in the system of science and TE is the inadequate educational background of MoSES employees, and the inadequate qualification structure of administrative-technical staff. There is also a lack of interest in lifelong learning and low and/or absence of interest in professional education, since these do not bring any special benefits or bonuses.

In order to ensure that work conditions in the state administration are based on the principle of efficiency in providing public services, it is important to follow the model of Western developed states by establishing school for public administration on all levels (from ministers to the lowest administrator) in Croatia. For an efficient state administration, it is necessary to learn continuously, and professional seminars are needed for each position. Formal knowledge obtained when preparing for the government exam, which is a legal necessity for working in the state administration, is currently insufficient for efficient and high-quality work. Furthermore, the exam is taken only once, so there is no consistent care given to gain new knowledge and skills necessary for working in new conditions.

Finally, there is a lack of creativity and initiative at all levels of the state administration, which can be briefly described as a system in which employees wait for their superior's orders.

7.3 Recommendations for further analysis

The above analysis indicates the need for several important activities that the MoSES should initiate.

State subsidies of interest on student loans. In order to participate more actively in providing educational support, the state can participate in subsidizing interest on student loans. This kind of state aid is used in the developed world due to several advantages. Primarily, it is based on the principle of transparency and providing the maximum incentive to increase study efficiency and promote better student achievement. There are special additional incentives for the best students (i.e. prolonging the loan period until employment begins, writing off a part of the loan, or even paying off the loan entirely).

Research on household expenditures for education. According to available data from the Central Bureau of Statistics, the number of students paying their own enrollment costs at TE institutions has been increasing each year. However, the existing *Survey on Household Expenditure* does not provide data on how much households spend on education. It is proposed that a new research study be conducted that will clearly indicate the data on household spending for education.

New model of TE financing. In the area of TE financing, there are several areas of improvement. One of them certainly is the setting up of a new model of TE financing, and an increase in private expenditures for TE. Based on the new model of TE financing, it can be expected that the state budget will give funds for: (1) financing the basic functions of TE (financing universities through a *lump sum*); (2) financing specific development projects in TE; and (3) providing additional funds from the budget on the basis of results (performance-based funding).

The aim of the new model of financing of TE is to ensure that the state budget for education as a percentage of the GDP moves closer to international standards. Special attention should be given to financing education in economically repressed regions as well as minority education, especially for those who are insufficiently integrated into society. Within budget limits, state support should be extended to ensure statutory support for adults who wish to complete their primary or secondary education or progress to higher levels of education. Student financial support will be developed to give incentives for study. According to their personal career plans, individuals can receive funding for additional training in order to improve their employability.

As for the financing of TE, it is necessary to establish a new system of financing that will replace the existing, inherited system of direct state financing of the universities. At present, the amount of funding for a particular institution of TE is allocated according to its enrollment numbers, employers' salaries and other operational costs. As of 2006, the funding allocation policy will be changed, enabling universities to start functioning as integrated institutions that will be able to decide on their own financial policies. This novel approach represents the financial integration of universities, and it will allow centralized financial management and planning. The legal integration of universities is planned for the end of 2007. Universities have harmonized their normative acts with the *Act on Scientific Activity and Higher Education*, which stipulates the integration of universities. The current level of integration varies. Transition to a fully integrated university is rather smooth at recently established universities in Zadar and Dubrovnik. Although it is a far more demanding goal for the well-established universities, however they are also making notable progress.

Financing the basic functions of TE or financing universities through a lump sum should ensure that universities realize their own development policy in accordance with national priorities, science development strategy and

the polycentric development principle. Introducing a new lump sum model for TE financing by 2006 and increasing private expenditures in TE by 2010 are the main targets in financing TE[77].

Financing specific development projects in TE should ensure the additional funds necessary for reforms in TE, especially to allow the continuous education of scientific teaching staff, international cooperation, and development of IT networks and distance learning.

The TE financing system should gradually introduce a system in which, initially, *additional merit-based funds* are provided from the budget (performance-based funding). Such a system is being introduced in TE financing pursuant to general criteria such as efficiency, cost-efficiency, significance, international activities, etc.

77 According to the document *Modernization of the Education and Training Systems towards the 2010 Common Goals. National Contributions to the 2006 Joint Council/Commission Report for Croatia.*

CHAPTER 8

PLANNING, GOVERNING AND REGULATING THE SYSTEM

8.1 Legal regulations and competence

The basic principles and guidelines of TE policy are determined by the Croatian Parliament, which regulates them through laws, legal enactments and provisions. The current legal framework is based on the *Act on Scientific Activity and Higher Education*. The administrative procedures required of TE institutions and institutions with scientific activity are regulated by the *Act on Institutions*. The *Act on Institutions* (adopted in 1993) defines by whom and how a public institution can be founded, what the *Act of Incorporation* must contain, and it defines the activities, constitution and bodies that manage the institution, general enactments, conditions for the merging of more institutions into one and separating one institution into several new ones.

The system of TE and science is under the responsibility of the MoSES. In its current form, the Ministry was founded in 2004. Prior to its formation, there were two ministries: the Ministry of Education and Sports and the Ministry of Science and Technology. Higher education fell within the scope of the Ministry of Science and Technology and had no contact with the Ministry of Education and Sports, which was responsible only for elementary and secondary education. That resulted in little connection between all levels of education and the lack of a common development strategy. The merging of the two ministries created a framework for better educational links on all levels and for the creation of a common strategy of development, expansion, and direction, etc.

The main responsibility for the development and quality of the entire scientific arena, as well as the entire TE system, is assumed by the National Council for Science (NCS) and the National Council for Higher Education (NCHE).

The NCHE is the highest expert body that proposes and promotes measures for improving TE in the Republic of Croatia. The Council approves the requirements of the Rector's Conference and the CPSPHE for the awarding of academic teaching grades, provides the Minister with prior opinions about regulations on measurements and criteria for the founding and evaluation of TE institutions and curricula, appointing reviewers and providing opinions on the foundation of new TE institutions and curricula, evaluating TE institutions and curricula, and proposing approvals to the Minister.

The common tasks of the NCS and the NCHE are to provide the Croatian Government with proposed criteria and recommendations on allocating budget funds for scientific research and TE, to discuss issues related to the polycentric system of scientific activity and TE in Croatia, and to propose and promote measures for its development.

The councils are also tasked with proposing measures for the participation of other entities, especially other entities of the state administration, of local and regional self-government units, and of economic entities involved in scientific activity and TE. Their task is also to promote the achievement and progress of young people in science and teaching.

The Agency for Science and Higher Education (ASHE), an independent institution founded by the Government, performs administrative and professional work for the NCS and the NCHE. It performs expert work in issuing approvals to TE institutions, evaluating scientific organizations and TE institutions, evaluating study programs of TE institutions, evaluating systems for promoting and guaranteeing quality of TE institutions, acknowledging foreign educational qualifications, integrating science and TE into the international system, connecting with the European network for ensuring the quality of TE (ENQA) and the European network of information centers (ENIC/NARIC), and creating and maintaining national databases relating to scientific activity and TE.

8.2 Determining goals and programs, priorities and strategies for education and research

Laws and legal acts determine the basic principles and goals of science and TE. However, the specific goals of TE in different areas are determined by each specific element within the system - from universities, polytechnics and schools of professional higher education to their components (faculties, staff and university departments, academies of art, research institutes, TE institutions, etc.), their statutes, regulations and provisions.

The content of the curricula, the type of education, its processes, exam rules, and graduation procedures are prepared and proposed, in line with the law, by universities, polytechnics and schools of professional higher education. The NCHE, with the expert help of the ASHE, receives proposed study programs, makes decisions on reviewers (from Croatia and abroad), performs the evaluation procedure, sends evaluated programs and any necessary revisions, informs the university senates, polytechnics and the teaching councils of schools of professional higher education, and lastly proposes to the Minister to approve the positively evaluated study programs.

Research priorities were stated in the *Science & Technology Policy of the Republic of Croatia 2006 - 2010*. They determine the scientific areas that should be specially developed, because of the internationally recognized quality by which they contribute to the reputation of Croatian science. Research priorities also point to the scientific areas in the Republic of Croatia that are insufficiently developed or not at all. The program also determines priorities in scientific research, and investments in the scientific research of individuals, a program for the systematic education of scientists and researchers, a program for developing scientific information systems, and the publication of scientific achievements.

The Education Sector Development Plan 2005 - 2010 defines priorities in the area of education and training. For the same purpose, the Act has foreseen the opening of Scientific Centers of Excellence. They would be small scientific organizations or groups of scientists who would generate original, significant and modern research results making them among the best organizations or groups in the world within their scientific discipline. They would also be considered as the best students who would receive optimal study conditions (grants, publications, computer equipment) and accomplished mentors.

In 2003, the Croatian Development Strategy Office created the strategic document *Croatia in the 21st Century – Science*, where it indicated the main direction of the development of science and higher education in the 21st century and approved an operating plan.

It is necessary, however, that specific TE institutions foresee their own priorities in accordance with national interests and global trends. One example is the declaration Iskorak 2001, which defined the development strategy of the University of Zagreb, pursuant to a thorough analysis of the situation and a preliminary design for developing the international evaluation of the European Rectors' Conference (CRE) and the Salzburg Seminar, both realized in 2000. This document determines the specific tasks of the University, as well as specific areas of strategic planning: university education, the application of information technologies, teaching and students, research and development, quality assurance, as well as the models of financing and the relationships of universities with their surroundings.

8.3 Independence/dependence or autonomy of tertiary education institutions

Tertiary education institutions are independent when hiring professional, teaching and scientific staff. However, such hiring was impossible to implement in practice over the last 10 years, because of the Government's provision that prevented hiring. In accordance with the reform of higher education and the principles of the Bologna process, the Government has been gradually making decisions regarding the creation new jobs in the TE system. Without these jobs, it would be impossible to implement the reform of the TE system. Over the last two years, funds have been provided for employing 800 early stage researchers in TE institutions and 400 new teachers.

The autonomy of higher education institutions is guaranteed by law and includes the right to study, as well as the registration of students, the selection of heads and teachers, and the management of resources used by TE institutions. The autonomy of universities legally includes the structuring of internal organizations, the determining of educational, scientific, artistic and professional programs, and deciding on accepting projects and international cooperation, as well as financial autonomy. This last item, however, usually only exists on paper. For those purposes, the new Act provides more authority to universities by introducing the "lump sum" financing model.

The autonomy of higher education institutions, proclaimed by law and statutes on the one hand, and transparent decision-making and responsibilities of those institutions on the other hand, cannot be reviewed for now. This is a matter of some controversy, and it has not been solved by the current financing system that covers salary costs for employees in the system from the state budget. The solution is to have an inflow and attract new money into the system, which would enable the creation of new and different TE structures. Some of the financial improvements could also come from local self-government, as local administrations could be interested in improving at least those parts of TE that are especially favorable for the development of the region.

The national TE policy promotes the autonomy of institutions, but in reality there are no efficient incentives because of the current financing system. The Government's role in that segment is still too prominent and decisive.

One of the fundamental goals in improving TE is the legal and functional integration of the university. The transformation into a totally integrated university will be easier to achieve for newly founded universities than for universities with a longer tradition. It will be especially hard to implement at the University of Zagreb, which is enormous in size. An important goal is also the construction of a binary system in which professional studies are provided by polytechnics and schools of professional higher education, while university studies

are provided by universities. Accordingly, the priority is the strengthening of professional (polytechnic) studies, which would be fully transferred to polytechnics and schools of professional higher education after a transfer period (when such programs can be provided by universities too - the period will last until 2010).

8.4 Managing tertiary education institutions

The fundamental framework and the basis for managing TE institutions are determined by national legislation, i.e. by laws (*Act on Scientific Activity and Higher Education*, *Act on Institutions*) and other legal acts. However, they are described in more detail in statutes, regulations and the provisions of specific universities, polytechnics, schools of professional higher education and their constituent parts. The Rector, Senate, University Council and the Rectors' Conference, which can create expert and advisory entities to help them to perform specific tasks, lead universities. For instance, Statute of the University of Zagreb foresees, in cases of certain decisions, participation of the area councils (expert councils in adequate scientific or artistic areas, consisting of employee representatives from the scientific teaching, artistic teaching and teaching grades, representatives of students from all three levels of TE, and the employees in the associate grade).

Faculties and academies are governed by the Faculty (Academy) Council and managed by the Dean. The Council consists of employees with the scientific/teaching or artistic/teaching grades, associates, and student representatives. Its constitution is defined precisely by a faculty statute. Organizational units of faculties and academies (departments, divisions, chairs, regional centers, clinics, clinical divisions, centers, pharmacies, laboratories, collections, etc.) also have their councils consisting of employees and student representatives. The growing significance of including students into all segments of TE can also be seen by the fact that the university statute determines the issues of special interest for students, especially those related to changes in the education system, quality assurance, design of curricula and annual teaching plans, and the student standard of living. These can be vetoed or suspended by student representatives in the governing body. In accordance with this legal provision, some elements of the university have already involved students in preparing curricula, while the practice of periodic student surveys has taken root in most faculties.

The faculty councils or councils of university departments are independent to a certain degree when selecting the dean, usually in anonymous voting procedure. In fact, they call for the submission of proposals, and when they accept some, they send them to the university senate. The senate then approves the submitted requests.

Dean, professional council and the Governing Board manage polytechnics and schools of professional higher education. The professional council of a polytechnic or school of professional higher education consists of teachers, associates and students. Deans of polytechnics and schools of professional higher education are chosen by professional councils as determined by the statute of that polytechnics or schools of professional higher education, while their administrative council confirms the selection.

There is currently no central policy on the national level to improve institutional management and fiscal management.

Some common measures of assessing the value of the entire TE system in Croatia are lacking. For example, these measures could rank the graduates of various institutions. Such a common evaluation system should definitely be introduced. It would take into account a larger number of factors (published works, academic performance, larger percentage of graduates, etc.). Pursuant to such evaluation, the implementation of a more adequate allocation of funds is necessary in order to encourage better quality. Some development strategies propose the introduction of a State Exam, at least for some professions, which would allocate licenses for performing work of general interest. However, the exam would also be an external evaluation or

quality control tool, i.e. a measure of the knowledge and skills of new graduate experts, and the institutions that educated them.

8.5 Connections within the tertiary education system and with previous education

The connections between TE institutions have not been openly visible over the past 10 years. However, they were formally stated in different official documents. The optional nature of curricula and courses in TE has been promoted over the last 10 years, but this is still not operational. Some curricula apply it, but it is usually provided only within an institution. Student mobility by switching curricula and institutions occurs most frequently when students choose institutions in different towns or regions that have the same curricula. The institutions themselves, or their organizational units, prescribe mechanisms and conditions that make such changes possible. Such transfers take place due to a student's personal reasons and needs, often quite private. There is still no systematic monitoring of such changes. However, since Croatia signed the Bologna Declaration in 2001, which stipulates that one of the important assumptions is student mobility achieved through the ECTS, new curricula are designed precisely on such principles. These principles contain the possibilities for unhindered changes in curricula or institutions, even beyond the Croatian TE system.

The link between final secondary education and TE was certainly strengthened by the integration of two different ministries that were responsible for those two levels of education. However, regarding new programs for final secondary education, there have been no important changes yet in their links with TE, except that their formation and evaluation was done with the participation of specific experts from the TE system. Still, certain progress was made by the introduction of optional subjects, especially in the final years of secondary school, which should prepare pupils for certain areas of TE. There are also special, short-term preparatory programs for enrolling in specific curricula, but they are most often organized and implemented by non-university institutions such as adult education centers, among others.

Acknowledging earlier study programs, or success in earlier studies, as a foundation for accessing TE programs, is part of the criteria (along with the classification exam or some other exam, and special knowledge, skills and abilities), which is the basis for the classification and selection of candidates for specific curricula programs. This takes into account both general results, and results in specific relevant subjects. The marks/grades for prior knowledge could bring as much as 40% of the entrance points. In certain cases when some curricula did not draw much interest, these marks/grades were the only criteria for ranking and enrolling candidates.

8.6 Diversity

Diversity within the TE system was promoted by founding professional studies, schools of professional higher education, private institutions, short-term education programs and lifelong learning programs. However, these were established in a chaotic and reckless manner over the last 10 years, with poor institutional management and insufficient control by the state. The proliferation of professional studies, which were moved from faculties in 1996 and 1997 to newly founded polytechnics, schools of professional higher education and even universities, offered programs that did not significantly differ from existing ones, thus creating quite an intolerant atmosphere. Pressure by local governments and political structures, as well as the lack of efficient and precise legal regulations regarding the establishment of new study programs, caused an unchecked expansion of various forms of TE. In this rapid expansion, the new institutions did not meet even the most

basic conditions for their realization – that is, sufficient hiring of expert and scientific staff and providing adequate conditions and equipment.

On the other hand, traditional institutions, very often afraid of seeing their competencies reduced, strongly opposed the establishment of new educational structures, sometimes with justification.

These traditional institutions pointed out the lack of conditions for achieving a sufficient quality standard.

Diversity in the TE system is definitely needed, but it must be accompanied by much stronger legal regulations and control. Regulators will evaluate their achievements after a certain period of their implementation, and only then provide approval for their further operation. The same context should be used for private initiatives in the educational sphere, which are still believed to be disloyal and low-quality competitors to the public sector. The private sector, however, could provide new financing sources, and if that happens the core of the problem would then focus on adequate regulations that must not "discriminate" against private initiatives, but be equally rigorous in the private and public sectors. That will certainly be one of the important tasks of the newly founded the ASHE.

Over the last 10 years, many adult education centers, business schools, various short-term education programs, employer-based training programs and similar courses were founded, but most often as private initiatives or with the support of specific companies. There are still no strong bonds between such educational programs and the existing system of TE. The existing universities should be encouraged to offer such programs, which would be targeted at addressing unemployment, the needs of certain areas, and national policy.

One of the priorities is the long awaited realization of the concept of lifelong learning, which is not unknown in Croatia, but has not been adequately operationalized, nor has there been a strong implementation strategy at all educational levels.

Until the academic year, 2005/2006 the vast majority of study programs at Croatian higher education institutions did not use the credit transfer system, with the exception of some study programs at the postgraduate level. It is currently being implemented on all levels of TE (undergraduate, graduate and postgraduate) by applying the Bologna process. In fact, when Croatia joined the Bologna process in 2001, it assumed all the obligations of implementing that process and its priority goals. ECTS has become an obligation in the academic year 2005/2006, when more than 800 positively assessed new or revised curricula, made in accordance with the Bologna process, were implemented.

8.7 Disseminating information

Future students have several ways of obtaining information on enrollment options, curricula, the awarding of diplomas, etc. Along with the usual information obtained through various publications produced by universities (*Guide for Future Students*) and web pages, increasingly present are annual university presentations and open-door events sponsored by specific faculties, polytechnics and schools of professional higher education. At such events, future candidates are given lectures, presented with exhibitions, and participate in real and virtual tours of institutions in order to learn about the educational programs, their courses, premises, the teaching and professional lecturing staff, opportunities for transfer, program combination options or cross-discipline studies, etc. *The Festival of Knowledge*, organized by scientific research institutes, and *Career Day*, organized by various companies for students approaching graduation, presents students with employment opportunities. Others organize workshops teaching students how to present themselves to future employers when searching for jobs, how to write CVs, etc.

CHAPTER 9

ASSURING AND IMPROVING THE QUALITY OF TERTIARY EDUCATION

9.1 Quality assessment and assurance in tertiary education before the new Act (2003) on higher education

9.1.1 A NATIONAL SYSTEM OF QUALITY ASSURANCE IN TERTIARY EDUCATION

The *Act on Higher Education Institutions* (1993), amended in 1996 and 2000, introduced a national system of quality assurance, and defined the responsibilities and tasks of the Ministry of Science and Technology, which was responsible also for TE, the National Council for Higher Education (NCHE), and TE institutions. The NCHE was established by Parliament as an advisory body to the Government, universities and others, with the aim to develop evaluation procedures and recommendations for quality improvement. Two separate aspects to the national quality assurance system were introduced: **accreditation**, which is a legal process and the responsibility of the MoSES to approve or disapprove of institutions (i.e. universities and faculties), and **quality assessment,** which was the responsibility of the NCHE. The NCHE was expected to advise TE institutions about the quality of their programs.

The NCHE used the conventional approach of self-assessment, peer review and site visits, and initiated an external evaluation of institutions (faculties) by an expert team, usually consisting of one member from abroad. The external evaluation was preceded by a serious and extensive self-evaluation prepared by the institution, which already altered and improved institutional policy. After the site-visit, the expert team prepared its peer review report. However, the report was not appropriately used for institutional accreditation and thus, in many cases, legal consequences were avoided. In addition, the NCHE developed certain procedures that are linked to the accreditation of study programs and a set of recommendations for quality improvements at the national level. These recommendations were used in developing study programs and evaluation procedures, but these were not systematically implemented in all institutions. Therefore, they did not result in a clearly recognized and official policy both at the national and at the university level.

A major reason for such inefficiency in the development of institutional quality assurance policy lies in the structure of the university, which is fragmented into faculties as legal entities.

Furthermore, the model of state governance in TE is tied to the lack of university autonomy in a number of areas. In addition, the NCHE was not allotted the appropriate resources (human and financial) and was not able to organize as an independent competent body.

9.1.2 EXTERNAL EVALUATION BY INTERNATIONAL INSTITUTIONS

Given that the 1993 Act and central policy regarding quality did not foster adequate changes in TE institutions, which led to the extensive centralization of TE governance, Croatian universities recognized the need for an external evaluation as a driving force for initiating institutional quality improvements and changes. An external evaluation was initiated by the University of Zagreb (CRE in 2000) followed by one or two visits from expert teams from the Salzburg Seminar (*Universities Project Visiting Advisors Program*) to the Universities of Osijek (1999), Zagreb (in 2000 and 2004) and Rijeka (in 2001 and 2003). Osijek and Split invited experts, and finally an EUA evaluation of the University of Split took place in 2004. These visits were preceded by serious and extensive self-evaluations, which helped and encouraged all Croatian universities to reform and improve their quality policy.

9.1.3 INSTITUTIONAL APPROACHES TO QUALITY ASSURANCE

Despite the national approaches, little evidence of a systematic quality assurance system within the TE institutions could be found by the international reviews.

At the university level there was neither a quality assurance committee nor an office responsible for quality control.

The University of Rijeka was the first institution to establish a quality promotion office in 2003, but the system and systematic application of quality procedures is still difficult to recognize.

During the last decade a number of faculties within Croatian universities, as well as other non-university institutions, introduced student evaluations as an instrument for monitoring quality and quality improvement. In many cases, these evaluations were left to the initiative of an individual department, and even to the individual professor. Usually, the questionnaires and surveys were focused on student perceptions of teaching performance and teaching load, and very often did not take into consideration learning, the student's workload and outcomes from learning. In most cases, the results were not used for creating institutional policy and were not presented to students.

Several faculties of Croatian universities introduced ISO standards and issued the ISO certification. This approach helped in improving the quality of institutional organization, efficiency and in some aspects, the teaching process.

Approaches at the university level could be recognized at the University of Rijeka, which initiated an internal evaluation at the university level in 2001 and a follow-up in 2004. The project, *How Do I See My Study*, was an extensive self-evaluation questionnaire applied to 1,661 students of the University of Rijeka (approximately 15% of student body). The same questionnaire was applied at the University of Osijek in 2003. The questionnaire measured quality and efficiency indicators by examining student engagement in studies. The results of the evaluation revealed a large variability among faculties. A relatively high level of motivation for study was evidenced for the first-year students, which declined with time and often resulted in dropout. A low motivational level was related to inadequate communication with teachers and insufficient study engagement. More than half of the students have never discussed homework assignments, exams or grades, and one-third of the students never asked questions in class or joined in-group discussions. The

students' level of knowledge regarding study programs, work content, responsibilities and obligations was rather low. An attitude of helplessness existed among a large number of students, which was the result of both a lack of communication with faculty members and the students' poor participation in decision-making. In particular, students exerted little influence on the course of study and curriculum content and coherence. A similar approach was repeated in 2004, but the self-evaluation questionnaire was applied to students and teachers concurrently. The results of the surveys were discussed at all faculty councils and resulted in recommendations for the improvement and development of educational quality, and the improvement of student standards. Feedback gained from faculties has shown that the survey encouraged faculty leadership to develop measures for improvement. The University of Rijeka and Osijek created a number of measures for quality improvement that were applied, mostly to improve the teaching process.

The second project was the evaluation of the library and information system within the University of Rijeka. The project was structured (first) by self-evaluation reports performed by the University Library in Rijeka and by the librarians at faculties throughout the University, and (second) by an extensive survey of 4,225 students at the entire University. The results of the self-evaluations and surveys indicated a number of problems in the library and information system of the University, including tremendous fragmentation, lack of communication, deficient in infrastructure, inconsistent policy within faculties, lack of student influence, etc. The outcome of the project and its discussion in the Senate resulted in 14 policy measures that were implemented during the years 2002 and 2003, or are still in the process of implementation.

9.1.4 OBSTACLES AND CONSTRAINS TO THE DEVELOPMENT OF QUALITY ASSURANCE

Several external evaluations, performed over the last five years at Croatian TE institutions, focused to a great extent on quality enhancements and quality assurance (see references).

The adopted quality assurance system was, in many aspects, inadequate and inefficient.

It did not reflect the actual needs of TE. The main problems in quality assurance in TE in Croatia were already identified in the first external evaluation performed by CRE in 2000, and they can be summarized as follows:

- **Lack of appropriate legislation** at the national level and a **lack of regulations and rules** at TE institutions, particularly given that universities were not recognized as integrated institutions. Legislative deficiency at the national level, therefore, did not require an institutional approach to quality assessment at the faculty level.
- **The NCHE** was in charge of the quality assessment of study programs and TE institutions, but it developed complex and time-consuming procedures, which were not supported by adequate financial and human resources. In many cases, feedback was provided in time, but its reports were not discussed at the university level (due to the non-integrated structure of the university). Therefore, no integrated central university policy could be created.

- Quality indicators have neither been systematically collected, nor adequately used. In some cases in which quality indicators were collected and interpreted correctly, recommendations for improvement actions were not implemented.

- **The concepts of accountability and self-evaluation were not familiar to members of the Croatian academic community.** Croatian universities and other tertiary institutions did not develop a system of internal quality assurance, and mostly relied on an external body (NCHE) for its quality assurance.

- The **awareness of universities** that maintaining and improving quality is their own responsibility is still not developed to the extent that a robust and adequately resourced system of quality management could be instituted.

It is additionally not clear to most members of the university staff that the maintenance and improvement of quality should cover all aspects of the university's work (teaching and learning, research, institutional management, relations with the community, etc.) and there is lack of collective responsibility for the totality of the institution's functions.

- Quality culture in Croatian universities is underdeveloped, and there is a lack of, and **resistance to, academic self-evaluation**. Even if it is present, it is not sufficiently critical, and it is not based on a methodology of **strategic planning**.

When most of the academic staff discuss quality, they focus their attention on teaching, a teacher's workload and a teacher's performance rather than learning, a student's workload and the competencies acquired by the students.

There are only a small number of examples that can be documented institutionally, for staff development policy, performance, planning, and transparency to students and to the local community.

- To most of the members of a university, it is not clear to them that, in addition to teaching and learning, a **university has a mission** to perform high quality research and to serve the community. The main approach to evaluate teaching (learning) is based on the use of student questionnaires – there was no widespread use of other methods of collecting evidence for self-evaluation. Organized communication with stakeholders is not developed and service at a TE institution is very often seen as public service in the state administration.
- Self-evaluation and **reporting** at all levels is not developed, and if exists, it is usually not considered as a serious basis for further development and decision-making.

There is a lack of reporting at the faculty level, at the university level and at the national level.

- **Internal quality measures** were never successfully implemented**.** There were several attempts for an introduction of an internal evaluation made by students, partly to fulfill an obligation based on the Senate decision (University of Zagreb, University of Rijeka). Faculties accepted the initiatives and even introduced some elements of internal evaluation, however no feedback was made available to the teaching staff, students, and to the public. A number of factors complicated the successful and functional application of internal quality assurance instruments at universities.
- Lack of experience and tradition in evaluations, and underdeveloped quality culture lead to **doubt from faculty members and students** that questionnaires and surveys could have any positive effect. Strong skepticism regarding their effect is a major obstacle for serious discussion at the institutional level.
- **The goals of evaluation are often misunderstood, misinterpreted and misused**. Quality assurance is still not understood as being only one of the indicators of a teacher's success and as a tool for improvement and corrections, but rather as a control instrument (this results in mixing terms "quality control" and "quality assurance"). Academic members of universities often believe that it is possible to manipulate the results, and they fear that the results will be misused. Negative attitudes towards evaluation by students were prevalent. Finally, great differences exist among faculties: some carefully evaluate their work and have been applying their own internal quality assurance instrument for some time, while others find it superfluous or consider it an attack on their autonomy.

- **Information and promotion policy**, as well as communication, was inefficient at all levels: at the faculty level, university level, and at the national level. The implementation of new rules for the improved operation of the university faces barriers and resistance from the academic community, mostly due to the lack of information or the fear of change.

Public relations and communications with the students was underdeveloped.

- **Resistance of the higher education staff to change** was a result of an undeveloped system for staff appraisal. Teaching staff are not institutionally motivated to improve teaching methods.

Teaching processes were not evaluated, and if they were, they mostly went without any significant consequences.

- **Incentive policies at the institutional levels and staff promotion.** No standardized and effective mechanism exists for recognizing and rewarding excellence and quality at universities. This is a serious constraint for efficient quality management.
- **Staff appointment and management of human resources** was not based on long-term strategic planning, particularly not at the university level, and was hampered by the restrictions on employment in the public sector**.** In general, staff engagement was based on the teaching needs of tertiary institutions, but not on research and development needs. In addition to an inadequate human resources policy, in the 90's there were additional problems such as low income and low social status, poor conditions for research, the lack of scientific equipment and unstable financial support, and the social rating of the scientific profession. Human resource policy was not created at the university level, but rather in direct negotiations between faculties and the Ministry, and the real decision-maker on human resources policy was the Ministry, as they are responsible for approving or disapproving any vacancy. Therefore, universities did not have programs for staff development and were not able to support new and more active approaches to teaching and learning.
- Insufficient discussion and definition of the **enrollment policies** significantly influenced the performance and quality of TE. Student enrollment was based on high school grades, entrance exams, and the *numerus clausus* fixed by the Ministry. However, the *numerus clausus* has never been adequately estimated based on the real capacity of the faculty, study costs, quality of education outcomes, and the needs of employers, the public sector and the local community. Competencies of the graduates and their relevance for the labor market were never systematically evaluated, and in the public's perception they are considered insufficient.

There have been a number of documents over the past decade that do mention the transformation and modernization of teaching and the improvement of quality and development of research. However, most of these documents were **never defined as a strategic plan** developed on the basis of participation of all stakeholders, and were never preceded with **action plans** that were implemented. A number of proposals for changes and reforms were never fully implemented in practice, primarily due to the lack of "political" will, at both the national and institutional levels. All of this resulted in the academic community, aware that all of the proposals for reform had failed, no longer believing in the possibility of change. Moreover, a belief was created that it suited state and institutional politics to have such proposals without commitments. Documents are routinely accepted, at both the national and institutional levels, only to fulfill regular procedures, without considering their implementation.

Another serious constraint for the development of quality assurance policies was the **misinterpretation of institutional autonomy.**

Universities did not have a strategic plan or any clear process for strategic planning, they did not function as integrated institutions, and they did not decide on the establishment or closure of faculties or programs.

These decisions were made at the faculty level and at the Ministry. The structure, focus and number of study programs are still under the complete control of a faculty, and teaching approaches are at the discretion of the professor (total academic freedom without control or supervision). Individuals and groups of scientists apply for scientific and developmental projects directly to the Ministry, which creates a situation where universities, and even individual faculties, do not strategically plan their research. On the other hand, quality assurance, accountability, organization and management is entirely within the competence of particular faculties and, in many cases, even more under the control of the dean and their own regulations. The funding system of TE was a reflection of governance and management over tertiary institutions – the Ministry provided funds to the faculties (not to the university), which was inflexible and restricted development.

9.2 Quality assessment of research

In the national research program of 1996 - 2000 a basic set of principles were established on the development of, and excellence in, research, as well as research evaluation. However, the policy of individual scientific projects resulted in the fragmentation of research activities which were never evaluated. The evaluation procedure of scientific projects was based on a peer review system, but was fragmented into a number of scientific fields in which there was often a conflict of interest. Thus, the usual outcome of the evaluation was a 85 to 90% acceptance of the proposals. The National Council for Science (NCS) was never empowered to take over the responsibility of developing scientific policy, and in 2000, it practically ceased to operate. The Ministry became the major decision-maker regarding the allocation funds for research activities, scientific equipment and infrastructure.

A major constraint for research funding and quality assessment was the inappropriate evaluation procedure and the follow-up. Research outcomes were usually measured through scientific publications, without any insight into project proposals. Significant improvement in the evaluation and follow-up procedures were made for technology projects organized by the Ministry and the Technological Council. However, these approaches were not implemented into the basic approach to research funding, and technological projects were shifted for immediate application.

Research activities were never evaluated at the faculty or university levels.

Within the overall policy of each individual faculty, research activities were often considered as the responsibility of the individual researcher. There is very little evidence of an institutional approach to stimulate the development of research capacities, to support or give incentives to successful researchers, to support collaborative activities and to develop joint infrastructure. In some periods in the 1990's, often the primary mission of a university professor was teaching, and research activities were considered secondary.

The Ministry provided funds directly for particular research projects within faculties. As with teaching, the university has some information regarding the flow of money for research, but no control or influence over it. Universities have no insight into the allocation of government research funds. Thus, the universities, and the scientific community as a whole, have very limited opportunities to discuss Government spending in this area.

In 2001, the Croatian Parliament founded the National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ). During 2002 and 2003, the NZZ was in the process of establishment, and the collecting of 100 million HRK of initial capital. In 2004, they became operational and they developed a strategic plan and regulations, including evaluation procedures, and launched their first programs. In order to accelerate and standardize the evaluation procedure, NZZ is working to develop an on-line evaluation procedure through a protected web portal. This type of evaluation process will enable foreign experts to take part in evaluations. The evaluation procedure conducted by NZZ consists

of two phases: an Evaluation committee that consists of three members, named by the Board, conducts the first phase. They evaluate project proposals based on defined criteria and grade each criteria from 1-10. After a discussion on grades, they offer recommendations on which projects should be accepted. The Board gives the final decision on acceptation/rejection. In the second phase, independent reviewers in a standard peer review procedure conduct an evaluation. This phase is conducted for projects that should receive substantial financial support. The Executive Board is currently working on procedures of internal quality assessment, which will include the assessment of NZZ programs, especially in the context of NZZ's strategic goals and values. All evaluation results are public, except for the names of the evaluators. The previously described evaluation procedure aims to select the best 25% of projects that will be financed by NZZ.

9.3 Quality assurance according to the new Act on Scientific Activity and Higher Education – the Bologna process

9.3.1 THE AGENCY FOR SCIENCE AND HIGHER EDUCATION (ASHE)

The ASHE is a specialized institution established by Government decree (at the end of 2004) in order to evaluate scientific research and higher education and carry out activities connected with the recognition of diplomas and qualifications.

ASHE is expected to organize quality indicators for TE institutions and the evaluation of study programs (related to the accreditation procedure), and to support institutional quality assurance systems.

ASHE is also expected to organize expert analysis in the evaluation of scientific organizations, TE institutions, applications for scientific projects and collaborative scientific programs submitted to the MoSES upon calls for proposals, and the rational utilization of scientific equipment.

The ASHE is governed by the Governing Board, appointed by the MoSES, and acts under the supervision of the NCHE. It still does not have an independent budget and action plan. The Minister of Science, Education and Sports or the NCHE prescribe most of the regulations for the Agency. The Agency reports to the NCS and the NCHE on their activities and results. The Councils make appropriate decisions based on ASHE reports.

The objective of establishing a QA system is not to establish measures for quality control of TE institutions and study programs, but rather to stimulate and support the establishment of mechanisms for continual improvement in an ever changing context. Therefore, within the framework of the development of quality culture, the entire system is focused on institutions that provide TE and on each individual, while the Agency is the central body that provides logistical-administrative support and organizes expertise for establishing the network and the functioning of the system.

9.3.2 EVALUATION OF PUBLIC SCIENTIFIC INSTITUTES AND TERTIARY EDUCATION INSTITUTIONS

The *Act on Scientific Activity and Higher Education* (2003) requires the evaluation of public scientific institutes and TE institutions, as well as their constituent units, at least every five years. The private scientific institutes are to be evaluated via financial support from the state budget. The evaluation of quality and efficiency of public scientific institutes and TE institutions shall be conducted based on the regulations, which will be enacted by the Minister at the recommendation of the NCS and the NCHE. For the evaluation of quality and efficiency at public scientific institutes and TE institutions, the Agency is expected to engage international

organizations and associations. The Agency shall conduct evaluations according to the annual work schedule, or at the special request of the NCHE or the NCS or the Minister. It can also conduct evaluations at the request of a TE institution or a public scientific institute.

The Agency will submit its evaluation report to the NCS and the NCHE respectively, as well as to the Minister and the individual who commissioned the evaluation. Before the NSC and NCHE discuss the evaluation and make any decisions, the Agency report will be forwarded to the public scientific institute or the TE institution to which it refers. The public scientific institute or the TE institution may lodge a complaint or submit necessary clarifications of the findings within a period of 30 days. The NCS and the NCHE will make their final assessment on the control and evaluation and forward it to the Minister and the public scientific institute or the TE institution that was evaluated. The NCS and the NCHE will inform the public about the results of the control and evaluation.

Quality and performance indicators are not yet developed, and therefore not systematically collected.

The introduction of lump sum financing should facilitate the development of the performance indicators and a central database for the systematic acquisition of data. A pilot project for the information system has been developed at the Zagreb University Computing Center (SRCE). However, the integrated information system within institutions remains poorly developed.

9.3.3 EVALUATION OF TERTIARY EDUCATION STUDY PROGRAMS

Tertiary education study programs are to be evaluated at least every five years. ASHE conducts the evaluation of study programs based on the regulations enacted by the Minister on the recommendation of the NCHE and according to the scheduled cycle determined by the NCHE. Evaluations may be conducted at the special request of the NCHE and the Minister, and may also be conducted at the request of a TE institution. The evaluation result is used for accreditation of the program.

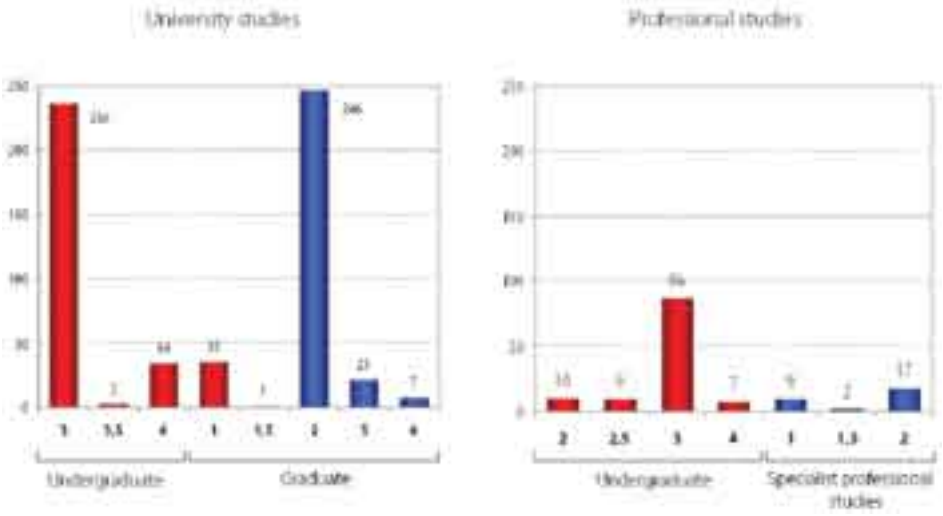

Figure 9.1 Structure of transformed study programs according to the Bologna scheme that were accredited in 2005 (Source MoSES). Shown are years of duration

The initial accreditation of all study programs that were restructured according to the Bologna process was completed in spring 2005. Focusing on the content, peers evaluated all programs, but without discussions with the institutions. Institutional resources were evaluated by the NCHE without a visit. The whole procedure was well organized and on-line in a very short period. The outcome of this evaluation is shown in Figure 9.1. However, the current system of accreditation is not sufficiently flexible, and further development will be required to enhance flexibility. It is expected that the Agency will focus on quality assurance systems and institutional accreditation based on performance and quality assurance practices.

9.3.4 APPLICATION OF THE EVALUATION RESULTS

Based on the results of the evaluation of a public scientific institute or TE institution, the NCS and the NCHE recommends to the Minister to either issue a license for the work of the institution, issue a letter of expectation or deny the license. Based on the results of the evaluation of TE programs, the NCHE recommends to the Minister to issue a license for the study (accreditation), issue a letter of expectation or deny a license for the study.

The license is a document that confirms that a public scientific institute or a TE institution meets the standards and requirements of its work or the particular study. A letter of expectation is a document by which certain shortcomings in the work of a scientific institute or a TE institution are pointed out. The expectation is that the listed shortcomings will be eliminated within a given timeframe, after which the license will be issued or denied.

If the license has been denied to a public scientific institute or a TE institution, they will be removed from the Register. The public scientific institute whose license is denied may not be financed from the state budget. In the license denial decision, the rights of students to complete their study or transfer their study to another TE institution will be specified.

9.3.5 CURRENT DEVELOPMENTS OF INSTITUTIONAL QUALITY ASSURANCE SYSTEMS

The NZZ recognized the establishment of institutional quality assurance units and mechanisms as a top priority for the further development of TE in Croatia, and for scientific activities within the third cycle of TE. Accordingly, the NZZ launched appropriate programs in order to support those institutions that are ready to create institutional quality assurance and create a model, instruments and best practices that will be used in other TE institutions. Out of 23 proposals, eight projects were accepted for financing and are currently underway. From these programs, and from the experience gained at the University of Rijeka and the University of Zagreb, a possible national model for a quality assurance network (national and institutional systems) is developing, taking into consideration current legislation, further development and financial realities.

Frame 3 Major functions of the faculty QA unit

- Establishment of dynamic quality cycles
- Organization of student surveys and questionnaires
- Development of quality indicators
- Analysis and research of successful study progressions and reasons for unsuccessful study
- Analysis of examination policy, assessment practices, and success in examinations
- Analysis of the quality and success (i.e. evaluation) of individual courses, modules, departments, and subjects
- Testing for learning outcomes
- Development and organization of self-evaluation and preparation for external evaluation
- Continuous academic discussion on the quality and dissemination of the quality culture
- Analysis of competencies of the academic staff and the development of e-learning
- Organization of training and education for academic staff, students and administration
- Implementation of ISO standards for the administrative functioning of institution.

Considering the current structure of Croatian universities (the legal organization and spatial structure) each faculty should, using the NZZ model, have a unit for quality assurance and sufficient resources to fulfill its mission. The **Quality Assurance Unit** will serve all faculty members and the **Quality Assurance Committee** of the faculty will develop institutional mechanisms for quality assurance and delegate duties. The QA units and the QA committees should establish QA cycles in a number of activities within the institution: i.e. individual modules, the entire curriculum, examinations, learning outcomes, employability, etc. Major functions of the faculty QA unit are summarized in Frame 3. At the university level, all activities should be coordinated and accredited by the **university Centre for Quality Assurance** (Frame 4).

Frame 4 A major function of the university Centre for Quality Assurance

- Organize and control a university network for quality assurance
- Support the establishment of institutional units for QA in faculties
- Organize training of QA staff and QA teams at the university
- Organize education and training of academic staff, students and administration
- Initiate and organize a continuous academic discussion on quality
- Disseminate the quality culture in the academic and nonacademic community
- Establish dynamic quality cycles at the university and develop quality indicators
- Develop self-evaluation procedures and organize external evaluations
- Organize student surveys and questionnaires
- Analyze and research the successes in student advancement
- Identify reasons for unsuccessful, inefficient and lengthy study progressions
- Identify competencies of the academic staff.

If quality assurance were considered a serious task for all TE institutions, with serious consequences for academic staff, its outcome would have a direct impact on the incentives policy of an institution and would be linked to academic promotion and staff recruitment. Inappropriate staff policy and no impact on learning outcomes are considered a serious obstacle to reforms and the development of TE in Croatia. If the institutional policy of staff recruitment and promotion is closely linked to quality assurance, then the institutions should consider the development and maintenance of the **staff portfolio**. For example, a staff portfolio, at least what can be envisioned in the current phase, should comprise the results of students' evaluations, success in examinations, learning outcomes, evidence of teaching improvements, development of e-learning, evidence of lifelong learning (continuous education), self-evaluation and a number of other factors.

At the national level, the independent **Agency for Quality Assurance (as part of the ASHE)** should develop and coordinate a National Network for Quality Assurance, and integrate this network into the European Network for Quality Assurance. The agency should evaluate university QA units and networks as well as principles and procedures. Thus, it is not expected that the agency will perform quality control, and institutional and program audits, but rather will support the development of quality assurance and quality culture within each tertiary institutions. In addition, a particular task for the agency is to develop procedures for testing learning outcomes and to link them with quality assurance.

9.4 Relationship between inputs and outputs

Institutions of TE conduct regular analysis of inputs and output. However, this data has never been systematically analyzed at the university level or at the national level. In addition, no methodology or indicators for performance analysis have been developed. From the overall statistical data (Tables for chapter 6 and Figure 9.2) of enrollment in the first academic year, and the total number of graduates over a period of 13 years, it can be roughly estimated that the dropout rate is rather high (from 62.51% to 51.77%). This indicates that a high number of graduates never finish their studies. From the official statistics, collected from TE institutions (Table 6.16), only a small proportion of students graduate in the regular time (ranging from 10.5% to 15.5%). Thus, it can be estimated that the graduation rates vary within a range of 40%, with the lowest rates during the period of 1991-1995 (during the war in Croatia).

Admission rates**,** the relationship between the number of students actually enrolled in a particular university program and the number of applicants for the same program, are also collected and analyzed by tertiary institutions. However, these rates are never systematically analyzed at the university level and at the national level, nor are they used for policy creation and strategic planning. The same would apply for the retention rate during the first year. Based on a rough analysis of the data (presented in Table 6.3) and from reports of individual institutions, it appears that the highest dropout rate is during the first academic year. Very little evidence and systematic analysis exist in order to determine the reasons for dropping out, and also little evidence exists relating to the integration and supervision of new students.

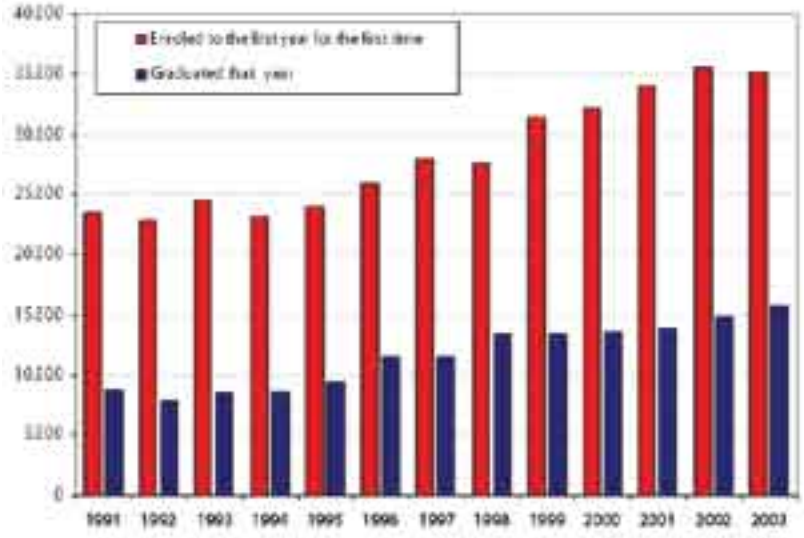

Figure 9.2 Enrolment and graduation figures in Croatian tertiary education

The average time to graduate is also not systematically estimated at the national and university level, but there are several individual and focused analyses. From the data, it appears that the average time for graduation is approximately 7.5 years for study programs, which through regularly study should last 4 to 5 years (Table 3.7). From these individual institutional analyses, it appears that there is a significant difference in the efficiency of science-related fields: the most efficient are natural and biomedical students, and the lowest level of efficiency is found in social sciences studies. All data and estimates were gathered for undergraduate students. However, it appears that the efficiency of postgraduate education is even worse; both in terms of the dropout rate and the average time it takes for graduation. The average time students take to complete their courses is a good indicator of the teaching support they receive.

There are several analyses, performed by professional associations and HE institutions, measuring the lack of some professions, particularly in the public sector and in regulated professions (medicine, dentistry, law, pharmacy). Very often these analyses were used for advertising or "political" purposes, so it is difficult to say that there is a systematic analysis of the market needs. In addition, data showing the rate of transfer to employment after graduation and opportunities for employment, as well as the needs of employers in terms of competencies, were never compiled.

Without precise statistical data for each individual institution, it is very difficult to estimate and compare graduation rates and the efficiency of students between different types of institutions. Thus, it is not known whether university institutions or non-university institutions are more efficient. In addition, it is difficult to estimate the differences between full-time students and part-time students, as well as those who pay for their studies and those who are entirely supported by the state. To address these questions, a more elaborate collection of data will be required.

Comparing a rough estimate of the total number of enrolled students and the number of graduates in each academic year may indicate differences between fields of studies and, indirectly, the efficiency of TE institutions. This type of graduation rate indicates that studies of social and behavioral sciences, business and administration, law, physics, mathematics and statistics, agriculture, forestry and fishery, as well as almost all engineering studies are below average. On the other hand, teacher training, education studies and health are

significantly above average. In general, there is no significant difference in graduation rates between male and female students. Interestingly, exceptions can be observed in computing studies, where female students are much more efficient than male students.

9.5 Policies to improve the quality of teaching and learning

The development and improvement of the teaching process was often limited by various factors and regulations, including the law. For instance, the *Act on Higher Education Institutions* (1993) required examinations to be oral or written *and* oral. At many faculties, this led to the practice of individual oral examinations in a professor's office without the presence of other students. Every student was asked different questions, and the results were determined based on an impression rather than a comparison of all the students in the class. Although a number of programs at many institutions established written examinations based on multiple choice methodology, the role prescribed by the law gave freedom to an individual professor to organize examinations at her/his convenience, and prevented the development of an institutional policy on examinations. In general, although there are a number of examples of good practices, the examination policy is a weak point in the Croatian HE system. Very few examples of systematic approaches to examinations, including the methodology, assessment of exams, outcome orientation, and analysis and comparison of results can be found. Moreover, the examination policy was not considered as one of the quality indicators.

In 2001, 2002 and 2003, the Ministry of Science and Technology decided to invest a significant amount of money into scientific equipment (approximately 240 million HRK, or 38 million EUR) based on institutional priorities.

Particular attention was paid to the regional development and the needs of regional universities.

The evaluation of students, self-evaluations made at the University of Rijeka (see above) and within faculties, the evaluation of the information and the library system, and the external evaluation by the Salzburg Seminar VAP team resulted in a series of structured discussions at the university Senate and identification of strategic priorities. The strategy was operationalized into the first investment cycle of the university. It was organized as a five-year loan supported by the Ministry, with the aim of improving working, teaching and living standards for all members of the university, particularly students. In a number of faculties, university libraries, Student Centers (providing accommodation for students) significant improvements in workplaces and classrooms were made. Special attention was focused on information and communication infrastructure. A networking project resulted in all members of the university having access to the Internet at a speed of 100 MBs. Almost all classrooms at the university were equipped with modern multimedia equipment. Similar approaches were later applied to other universities in Croatia. Although this type of program was never verified as an official policy document of the Government or the Ministry, it was applied in practice and can be considered as one of best examples of best practices in the development of TE in Croatia.

In addition to investing in working and teaching infrastructure, the leadership of the universities and the Ministry (including the commitment of the Government) recognized that without investment into the personal standards of teachers and associates, it would not be possible to gain significant motivation for structural reforms, including quality assurance. For that reason, universities and the Ministry initiated in 2003 a project of subsidized loans for all university staff in order to make personal accommodation available in the best possible conditions. The subsidy from the Ministry is based on participation in 2/3 of interest on the accepted loan (personal investment of each individual) according to predefined standards and criteria. Universities negotiated with banks for the best available conditions in issuing loans for their staff.

CHAPTER 10

INTERNATIONALIZATION AND GLOBALIZATION OF THE TERTIARY EDUCATION SYSTEM

10.1 Historical background

Discussing the role of globalization and internationalization in the development of the Croatian TE system means that Croatia's historical cultural orientation toward Central and Mediterranean Europe should be emphasized. Until the end of the First World War, Croatia was for centuries closely related with Central Europe through its political ties with Austria and Hungary, as well as with Mediterranean culture through its ties with Italy. Especially since the Renaissance period, intellectuals and artists could be described as wandering scholars who, mainly due to the lack of TE institutions at home, went to other European countries to broaden their knowledge, raise their scientific competencies and widen their cultural horizons. Such a description also fits well the founders of the Croatian academic and scientific institutions that were, in the modern sense, established at the end of the 19th century. These links, although somewhat weakened and diminished during the eighty year period of Croatian existence within Yugoslavia, were still part of the collective memory and orientation of the most prominent academic and research institutions at the beginning of 1990 when Croatia achieved its independence.

10.2 The present aspects of internationalization and globalization of Croatian tertiary education

The present internationalization and globalization of the Croatian tertiary sector is officially supported by the mechanisms delivered by the MoSES and its Office for International Relations. The process is driven by the Croatian Government's commitments and efforts to achieve standards necessary for accession to the EU. The international orientation is also seen as a major vehicle for the achievement of a higher quality of TE and its competitiveness. On the other hand, the possible costs of internationalization are mainly recognized as a *brain drain* of the more educated workforce, especially in some specific professions (IT, biomedicine), as well as the opening of foreign programs offered by foreign education institutions. It must be noted that recent analysis has shown that since the mid-nineties *brain drain* has not been as pronounced as expected, and the number of foreign accredited programs is actually very small.

Although the explicit national policy for internationalization tied to policy goals and instruments is not in place, the national orientation toward the internationalization of the TE sector can be observed indirectly through the number of state multilateral and bilateral agreements providing for educational cooperation with certain regions and the international community. In that respect, the most important event has been the signing of the Bologna Declaration at the Prague Summit in 2001. Although the Bologna process has been recognized as an important impetus for the improvement of the TE sector, the academic community has on several occasions openly declared its dissatisfaction with the lack of a clear set of strategic guidelines, as well as the infrastructural and financial resources necessary for the implementation of such a vast transformation of TE.

On the other hand, one can also observe that the most prominent academic and research institutions have stressed in their mission statements and strategic plans the importance of internationalization for their quality improvement and global recognition as early as 2001. Several aspects of internationalization have been covered: joint programs, student and professor mobility, the recognition of diplomas, quality assurance, as well as infrastructure pre-requisites for internationalization.

Each aspect will be commented on, both from the institutional and governmental point of view, by pointing out achievements and constraints.

10.3 Legislation change as a prerequisite for the Bologna process

After formally joining the Bologna process, the next major step has been the introduction of the new *Act on Scientific Activity and Higher Education* in 2003, which serves as a basis for the organizational and curricula-based transformation of the system. The main ideas from the Bologna Declaration, the Lisbon Convention and related documents are incorporated into the new Act regarding curricula transformation, the introduction of mechanisms of external quality assurance and the international recognition of diplomas. The principle of the "European cultural and democratic tradition and harmonization with the European higher education areas" is explicitly mentioned in Article 2 of the new Act. It can also be observed that most academic and research institutions have defined in their mission statements and strategic documents the importance of internationalization and the need for international cooperation and recognition.

10.4 Internationalization of study programs

The main opportunity for the internationalization of TE institutions has been through a few EU projects that Croatia has had access to (TEMPUS, *Jean Monnet*, *Marie Curie*), as well as through direct bilateral cooperation with institutions abroad. Since 2001, Croatian institutions of TE have been participating in 42 TEMPUS *Joint European Projects* aimed at institution building (4), curriculum development (30) and university management (8). Institutions are also active in 11 TEMPUS *Structural and Complimentary Measures* projects since 2003[78]. Several of the TEMPUS projects dealing with curricula development resulted in the establishment of international MA programs (in Ecology, Sustainable Development, European Studies,

78 The total number of submitted JEP TEMPUS projects from 2000 to 2004 was 112, which means that 37% (42) of the submitted projects have been accepted. Also, the total number of submitted SCM TEMPUS projects was 21, which means that 52% (11) of them were accepted. The total amount of money allocated by the EU for all TEMPUS projects in Croatia since 2000 is about 20 million EUR.

Cognitive Science and Management). They are delivered in cooperation with EU partner institutions. These programs are now striving to be recognized as fully developed collaborative programs with joint degrees. Others used the experience of international projects as a basis for upgrading their curricula according to the principles of the Bologna process.

The impact of the international experience has also led to the development of the first full program delivered in English in medical sciences at the University of Zagreb.

The program is organized with international professors and attracts international students.

The national policy did not provide special measures to ensure the sustainability of joint programs developed through the TEMPUS projects. No mention was made of the infrastructure that would support them, or grants for the domestic students who do not have the financial resources to cover the costs of international programs. The experience with the existing program has revealed that the majority of Croatian students can participate in programs delivered in English, while attempts to establish programs in some other "major" languages such as French or German soon faced a lack of student proficiency in these languages.

10.5 Student and academic mobility

Croatia has signed bilateral agreements on educational, scientific and technological cooperation with 29 third countries[79]. Cooperation in the field of education is accomplished through scholarships for Croatian students to study abroad, scholarships for foreign students to study in Croatia, support and organization of the Croatian language and Croatian cultural education in other countries and support for Croatian readers.

The provision of scholarships based on bilateral agreements encompasses the exchange of students, teachers, scientists and researchers for undergraduate, graduate and postgraduate studies, postdoctoral research, specializations, study periods, working visits and summer language courses. In 2004, the MoSES funded a total of 4,000 months of scholarships. Apart from scholarships provided through bilateral agreements, the MoSES also awards financial assistance to Croatian citizens for postgraduate and doctoral specialization abroad, and 117 scholarships up to 5,000 EUR each were awarded in 2004. In the same year, the MoSES funded a total of 205 months of study periods for 28 students from third countries and 75 months of scholarships for learning the Croatian language in Croatia. The MoSES supports 33 exchange readers in Croatian language and literature, including 2 Centers for Croatian Studies at Macquarie University, Sydney, Australia and University of Waterloo, Canada, and more than 20 independent readers around the world. There are 36 foreign readers at four Croatian Universities, most of which are engaged through bilateral agreements, and a few through direct inter-university cooperation.

The main vehicles for student and academic mobility are bilateral and multilateral inter-university agreements of cooperation in different fields.

Most Croatian universities have such agreements with neighboring and Central European countries such as Austria, Germany, Slovenia, Hungary, Italy, Slovakia, and the Czech Republic. However, cooperation also exists with the overseas universities in North and South America and Australia. This cooperation is

79 Albania, Argentina, Australia, Bosnia-Herzegovina, Bulgaria, Chile, Egypt, The Philippines, India, Indonesia, Iran, Israel, Japan, Jordan, South Africa, Canada, China, Costa Rica, Cuba, Macedonia, Malaysia, Romania, The Russian Federation, USA, Serbia and Montenegro, Vatican City, Switzerland, Turkey and Ukraine.

also related to the connections with the Diaspora in these countries. Possibilities for student and teacher exchanges at this moment are limited to only a few programs such as TEMPUS JEP (*Joint European Projects*) and TEMPUS IMG (*Individual Mobility Grants*), CEEPUS, DAAD, and Fulbright.

The TEMPUS program, which is aimed at supporting the development of the Croatian TE reform in line with the Bologna Declaration and EU policies and guidelines, is running very successfully. For this reason, it was estimated that Croatia should not apply for full membership in SOCRATES and LEONARDO before 2007. The major reason behind this decision was the lack of absorption capacity for successful simultaneous participation in TEMPUS and SOCRATES. The MoSES decided that TEMPUS is currently a priority since it has proven to be an excellent instrument for the support of TE reform. Additionally, participation in the TEMPUS program considerably intensified the mobility of university professors, which is considered good ground for subsequent enhancement of mobility within the SOCRATES framework. The strategic objective of the MoSES is to join the SOCRATES and LEONARDO programs from 2007, when these programs become part of the new integrated program of the European Union, *Integrated Lifelong Learning Program*. Discussions and consultations on the structure of the future agency, which will take over the implementation of these programs, are under way. The process of establishing a national agency for the administration of the mentioned program is planned to start in 2007.

Student international organizations such as ESIB, IAESTE, BEST, AISEC, EASA, IAAS, ELSA, IVSA, CroMSIC and others also play a very important role in the exchange of students.

Although the number of Croatian university students in exchange programs is constantly rising, it is still at the unsatisfactory yearly level of around 0.3%.

Croatia partially participates in the *Erasmus Mundus* program since Croatian universities have the status of "third country" universities, which means they cannot be equal members of the consortium, and in that capacity implement *Erasmus Mundus* postgraduate study and award *Erasmus Mundus* diplomas. However, they can send their students and professors to universities that have the *Erasmus Mundus* program certificate. Despite the promotion of this program, only two Croatian students participated in *Erasmus Mundus* programs in the academic years of 2003/2004 and 2004/2005.Croatian universities have been able to host students and professors participating in the *Erasmus Mundus* studies from the academic year 2005/2006, since Croatia has met one of the main preconditions for participation in the program: the existence of transparent mechanisms for the comparison of studying at another university, such as ECTS.

Another reason for partial participation in the program is the underdevelopment of joint studies. Joint studies have been recognized as one of the key results of the implementation of the Bologna process, and the *Act on Scientific Activity and Higher Education* from 2003 opened up the possibility for its organization for the first time. For the purpose of the development of joint studies and joint degrees, the National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ) launched in 2005 the *Development of Joint-Studies Program*. The program is aimed especially at supporting the development of joint studies in the priority areas established by the strategic plan of the NZZ. The program is designed as an instrument, which will contribute to the development of a best practice model in this area, as well as to the elimination of obstacles to the development of joint studies. Two joint studies projects have been accepted so far: joint-study postgraduate study program in neuroscience by the University of Zagreb Medical School and the Interdisciplinary graduate program in information sciences – *Digitization of Written Heritage* – by the J.J. Strossmayer University of Osijek, Faculty of Philosophy, Department of Information Sciences.

One of the main obstacles for incoming students is the language barrier, since there are few programs offered in English.

In that respect, the University of Zagreb organizes Croatian language courses for foreign and exchange students.

Students who come within bilateral agreements are given a grant to attend such courses. In order to attract international students, new study programs designed in accordance with the Bologna principles have to contain information on courses within each program that can be offered in English. The ECTS system is also being widely introduced in the TE new curricula, and in some institutions the use of *Learning Agreements* and *Transcript of Records* as a preparation for EU exchange programs are also in experimental use.

Over the past few years several activities have been taking place that are related to *Europass*, however the implementation levels of the five components of *Europass* have not yet been systematically organized. The biggest advances in implementation have been made in the following three components: *Europass CV, Europass Diploma Supplement, and Europass Language Portfolio*. Information on components of Europass are available in different levels of specificity on Internet pages of public administration institutions, educational organizations, nongovernmental and private institutions in the field of education, the Croatian Chamber of Economy as well as various local web-portals. The most relevant progress over the last two years has been the creation of a legal basis for implementing *Europass* through amendments to existing legislation and the passing of new legislation, as well as institutional and human resources development.

The mobility of university teachers is also mainly regulated through bilateral institutional agreements and direct research agreements. In that respect, the ratio of visiting outgoing to incoming professors can be roughly estimated as 2 to 1.

10.6 Internationalization of research

The internationalization in the research domain is achieved mainly through the direct cooperation of university units, departments and individuals in specific projects. Around 180 ongoing bilateral projects are registered with the MoSES, with approximately 600 Croatian researchers involved. They are rather small projects with, on average, three to four Croatian scientists per project. Exchanges of individual researchers and study programs financed by bilateral intergovernmental programs amounted to 600 research months spent outside Croatia and 400 research months spent in Croatia (Source: MoSES). Slovenia, Hungary, Austria, Germany, France, the United Kingdom and the USA are countries that most frequently participate in this type of exchange.

Recently, a special fund was established within the MoSES to financially support young researchers accepted at foreign universities for (post)doctoral studies and research.

The NZZ developed several funding instruments in order to attract successful scientists to Croatian scientific institutions who will bring with them innovation, new knowledge and technology.

The NZZ Board developed the Brain Gain program, which has three sub-programs: Visitor, Senior and Post-Doc.

The goal of the Visitor program is to enable highly qualified academics and industrial researchers, who reside outside of Croatia, to carry out research project of their own choice in Croatia. The *Senior* program enables outstanding professors and scientists, who reside outside of Croatia, to take up employment in Croatian universities and to carry out research projects. After receiving a PhD, scientists can develop an independent

research career through the *Post Doc* program, which covers travel and living expenses for periods of up to one year for Croatian scientists who go abroad, and foreign scientists who come to Croatia.

Croatia is taking part in a number of large European RTD programs, namely *Framework Programs for Research and Development*, EUREKA and COST.

Croatia started its participation in the *Framework Program for Research and Technological Development* with the *Fifth Framework Program* as a third country, and has continued to participate in the Sixth Framework Program as a third country. In March 2005, the MoSES submitted a Letter of Intent to the European Commission for full participation in the *Sixth RTD Program*. In order to change from *third country* status to *associated candidate country* status, negotiations with the European Commission were successfully concluded in July 2005 according to the rules of Participation in FP6.

A Memorandum of Understanding between the European Community and the Republic of Croatia on Croatia's association in the Sixth Framework Program of the European Community for research, technological development and demonstration, contributing to the creation of the European Research Area and to innovation (2002-2006) was signed in November 2005, and tool effect on 1 January 2006.

According data from the MoSES, Croatian scientists aided in the drafting of 417 project proposals between 2002 and 2005. 98 were approved and 47 contracts have been signed. Croatian partners in FP6 projects each received between 20,000 and 270,000 EUR – a total amount of 2.276 million EUR (Source: MoSES). Croatian partners are currently participating in over 50 COST actions, which are co-funded by the MoSES.

Table 10.1 Structure of FP6 projects with Croatian participation by thematic area

Life sciences, genomics and biotechnology for health	**5**
Information society technologies	**15**
Nanotechnologies and nanosciences	**1**
Food quality and safety	**4**
Sustainable development, global change and ecosystems	**4**
INCO - info point on international cooperation activities	**10**
Citizens and governance in a knowledge-based society	**2**
Marie Curie Actions - Human resources and mobility	**2**
Coordination of research activities	**1**
Research infrastructures	**1**
New and Emerging Science and Technology (NEST)	**1**
Development of research/innovation policies	**1**
Science and Society	**1**

Structure of FP6 projects with Croatian participation with respect to financial instruments: IP-2, NoE-6, STREP-20, CA-7, SSA-8, MC/RTN-2, GN2-2.

With its flexible bottom-up approach and work in the field of market-oriented R&D projects, EUREKA has proven to be good preparation for the *Framework Program*. Croatia gained the status of a full member of the EUREKA program in 2000. In 2004 partners from Croatia participated in 15 projects, 6 umbrellas and two-cluster project. There are currently 18 ongoing projects with Croatian participation. The MoSES co-financed 14 out of 26 EUREKA projects, which were assessed positively during the international evaluation process. These EUREKA projects were also co-financed by Croatian project partners. The overall budget of ongoing projects is over 110 million EUR, out of which Croatian partners have invested 5.83 million EUR.

The MoSES is providing 593,000 EUR. Fourteen EUREKA projects came from SMEs in the fields of biotech, environment, new materials, mechanical, civil and textile engineering and energy.

On a regional level, Croatia is taking part in the Central European Initiative (CEI), Alps-Adriatic Task Force and Adriatic-Ionian Initiative. Regional networking includes taking part in initiatives stemming from the *EU-Balkan Countries Action Plan in Science & Technology*, adopted at the Ministerial Conference in Thessaloniki on 26 – 27 June 2003. Croatia has been involved in the SEE-ERA-NET project, the objective of which is to integrate the countries of South Eastern Europe into the ERA.

Major activities in order to improve Croatian absorption capacity for *Framework* programs were undertaken during 2004 and 2005, and include disseminating information on FP6, mostly via videoconferences and workshops at universities and research institutes. In the period of October 2004 – September 2005 there were 3 videoconferences and 34 workshops on FP6. Croatia had valuable support for this from Slovenia, Austria, The Netherlands, the UK and Ireland. Slovenia, Austria, Israel, France, Greece, Norway, the Czech Republic. The UK and Ireland also supported us through SSA projects for capacity building and training. Around 40 workshops have been held as part of FP6 and other international programs within the last year on all aspects of applying for grants and management, including financial management and intellectual property rights. In addition, a dozen additional training events in international project management were held at the MoSES and at professional conferences (such as MIPRO, IIS, BPC, etc.). The EC and the MoSES financially supported these workshops. The participants at these workshops were from the academic sector, industry, SMEs and NGOs.

The MoSES also gives a financial contribution to those who have successfully applied for FP6 projects (they must pass the minimum threshold, but they do not need to actually receive FP funding). Following a positive evaluation by the EC, partners from Croatia are eligible to request the MoSES to reimburse the costs associated with drawing up a proposal. Special web sides/portals (MoSES, CARNet, University of Zagreb) were designed in order to communicate the information on FP6 and other European programs. Besides this, booklets about FP were published in 2004.

The Croatian Academy of Sciences and Arts (CASA) is a member of the European Science Foundation (ESF), and from 2005 the NZZ supports participation of Croatian scientists in programs of the ESF. In 2005, a program was launched to provide financial participation for Croatian scientists in EUROCORES collaborative programs and *a la carte* individual programs of the ESF.

10.7 International aspects of quality assurance

The role of international comparison and evaluation has been recognized as one of the most important mechanisms for the development of quality culture at the university level. Several universities have already undergone international institutional evaluations, while experience in international evaluation of study programs has been very scarce until now. The component of international benchmarking has become a part of the standard procedure for the accreditation process of new study programs. In addition, the national accreditation body has recognized the role of international reviewers. All new programs were submitted both in English and Croatian, and international teams roughly reviewed one-third of them.

10.8 Mechanisms supporting internationalization of tertiary education: strengths and weaknesses

Efforts aimed at the internationalization of TE have been directed toward the universities, since this is generally the more developed part of TE. The Government administration has introduced several important mechanisms in order to support some aspects of internationalization. The "fund for the support of international mobility", allocated each year as a "lump sum" to the universities, is one of the most important governmental tools directed toward supporting student and teacher mobility. The total sum for 2005 was 1 million Euros, but according to the analysis at some institutions of TE, this amount covers roughly 30% of the real costs that universities spend supporting mobility.

In addition, the NZZ developed several financial instruments to support the internationalization of TE and scientific activities. In 2004, the NZZ started a program initiating reform of the higher educational system in Croatia**.** The main goal of this program was to support and facilitate change in the higher education system, which institutions had to undertake in the context of the Bologna process. This program contains three strands: the development of joint study programs, the development of institutional quality assurance units, and the development of PhD programs. Through the development of PhD programs, current traditional postgraduate education is being transformed into PhD programs as a third educational cycle and closer links between the EHEA and the European Research Area (ERA) are being fostered. In 2005, the NZZ supported 9 projects in Croatian TE institutions. The development of institutional quality assurance units program supported the establishment of quality assurance units at TE institutions, as well as the development of instruments for institutional quality assurance. In 2005, the NZZ funded 8 projects in TE institutions. The development of joint-study programs supports the development of good practice when setting up joint study programs in TE institutions. Four projects are currently being funded. In 2005, the NZZ also launched a call for proposals with the aim of increasing the quality of doctoral programs. The NZZ supports the training of doctoral students in foreign institutions within the framework of accredited PhD programs, as well as supporting summer schools and training courses at the national level within accredited doctoral programs.

The international experience from the TEMPUS JEP project on international services, involving both universities and the MoSES, has been an important impetus for establishing offices for international relations at universities.

In this case, the MoSES supported opening new jobs at these new offices.

Most offices function in close cooperation with departments and faculties through the recently established network of international officers in each unit. The main role of these institutional services is to disseminate information on international opportunities throughout academic communities, as well as to prepare and disseminate information to the international public and partners.

Universities are also financially supported through the above-mentioned fund to join international associations and networks in transforming and developing TE and research.

An important aspect of enhancing international cooperation is the system of information and communication. The central MoSES office is making efforts in disseminating information on important issues concerning international opportunities regarding eligibility to obtain EU funds, international projects and individual grants through the web, media, publications and seminars. On the other hand, institutions of TE do not receive financial incentives or enough specific support, such as expert counseling or training, that would directly help them to apply for certain projects. The result is a relatively small number of both submitted and accepted proposals (e.g. TEMPUS and CARDS program).

Internationalization is seen as a very important component of TE regarding the competitiveness, mobility, recognition of degrees and quality of programs. However, some systemic weaknesses are recognized as a hindrance to the expansion of activities in this sector. A major weakness of the system, from the perspective of the academic community, is the lack of a general strategy in the sector. National policy is perceived as a set of separate and uncoordinated measures, which do not sufficiently stimulate activities directed toward international cooperation and networking. The weaknesses within the academic community illustrate the need to building up professional infrastructure to support student and teacher mobility, staffing of international offices, and better international services and facilities for foreign students and scholars.

CHAPTER 11

CONCLUSIONS

Croatia tertiary education sector was subjected to substantial changes in the last decade. The *Act on Higher Education Institutions* that was adopted in 1993 introduced several measures aimed at modernizing universities, created the basis for the establishment of the quality assurance system and initiated development of a binary system. Since then, a number of non-university tertiary education institutions have been established, leading to a diversification of programmes being offered and increased student enrolment. The increase has been substantial, especially in the category of fee paying students. Such higher enrolment was not accompanied by a corresponding increase in the hiring of academic staff, which in some fields led to dramatically high teaching loads. The deficit was partially compensated by substantial engagement of early stage researchers in teaching, even though Croatian universities have not adequately linked teaching and research activities.

During the last decade there was a substantial regional development of tertiary education. Universities in Rijeka, Osijek and Split expanded their activities, three new universities were established in Dubrovnik, Zadar and Pula and a number of polytechnics and schools of professional higher education were established outside of Zagreb. Still, more than half of tertiary education activities take place in Zagreb.

The tertiary education system was governed by the Ministry of Science until 2003 when it was merged with the Ministry for Education into the Ministry for Science, Education and Sports. This merger created some obstacles to the progression of tertiary education reforms but it also made possible the development of a comprehensive policy for the entire educational sector.

In 2001, at the Ministerial conference in Prague, Croatia co-signed the Bologna Declaration and decided to implement all action lines of the Bologna Process. Since then, specialized expert bodies for the promotion and implementation of the Bologna Process have been created at the universities' level, within the Rectors' Conference and the Ministry, and numerous seminars and workshops have been organized, partially with financial support by Tempus and CARDS projects. Several foreign evaluator committees have evaluated Croatian universities and suggested directions for future changes.

After a long series of discussions with the representatives of faculties, university senates, the Croatian Rectors' Conference, faculty councils, trade unions, the Government and the Parliamentary Committee for Education, Science and Culture, the Croatian Parliament passed the Act on Scientific Activity and Higher Education in July 2003 (and amended it in July and November 2004).

The Act introduced several changes: (a) functional and legal integration of university, (b) lump sum funding, and (c) beginning of the Bologna process with the 2005/06 academic year. Correspondingly, all Croatian tertiary education institutions developed their internal legislative framework for the implementation of the Bologna action lines.

The new Act also initiated a number of further legislative and structural changes in the tertiary education system. In 2003 the Parliament adopted the strategy for the development of science, in 2004 the Government adopted the Strategy of Adult Education and in 2005 the *Education Sector Development Plan 2005-2010*. *The Act on Recognition of Foreign Educational Qualifications*, incorporating recommendations of the Lisbon Convention, entered into force in 2004, the *Act on Adult Education* was prepared in 2006, and substantial legislative changes on students' organization is expected in 2007.

In the 2005/06 academic year, a new structure of tertiary education was introduced based on three main cycles in accordance with the principles of the Bologna Process. A majority of study programs were redesigned; two cycles structure, a system of credits (ECTS) was established which is based on student's workload, and the diploma supplement was introduced. Although a number of institutional efforts on introducing learning outcomes as a basic principle for development of study programs can be identified, their development is still at the unsatisfactory level in Croatia. It can be expected that the decision to adjust the national system of qualifications with the European Qualification Framework will foster a new cycle of curricular development in the forthcoming years.

The first round of accreditation of study programs was carried out in 2005 by the National Council for Higher Education with the support of the Agency for Science and Higher Education. Further development of accreditation system is expected in the forthcoming years, particularly its links to the quality assurance system.

Systematic approach to the development of a quality assurance system was evident in recent years at the institutional level, although the national quality assurance system is still not fully created an operative. The National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia developed several financial instruments for supporting reform activities, including the development of quality assurance units and system at the institutional level.

In 2005, the process of negotiations on the accession of the Republic of Croatia to the European Union was open, and in 2006 both the chapter on science and research and the chapter on education and culture were provisionally closed.

This progress within the negotiation process already indicates a high level of alignment of Croatian tertiary education system with the European Union policies. The overall negotiation process and the commitment to participate in European policies and join European Union programs in the field of science and education will have a significant impact on the further development of tertiary education sector.

Having in mind observations from this report, current developments in Croatia, and the shaping of the European Union policies, several challenges can be identified as key to the further development of tertiary education in Croatia in the forthcoming years:

1. Increasing the number of people with post-secondary education is a major task of the tertiary education system in Croatia. Currently, the number of people with the post-secondary education is too small (only 15% of the active population) to meet the needs of a knowledge-based economy and society. Therefore, it is necessary to open tertiary education to a larger number of individuals, to provide an opportunity of additional education to people who are already in the labor market (lifelong learning), and, especially, to provide schooling to the unemployed.

2. Increased demand for post-secondary learning will require further diversification in the provision of tertiary education, development of the lifelong learning system and establishment of flexible learning paths. Diversified education should be offered primarily by the tertiary education institutions and it should be flexible and available to all. Credits should be accumulated during the entire life of every individual. The state should invest in lifelong learning, because the flexibility in human resources can lead to increased economic activity, better organization of society, as well as recognition of education by each individual as a personal investment. In a short time span it will be necessary to provide lifelong learning to as many people as there are students enrolled in full-time education programs.

3. Implementation of the concept of learning outcomes based on key competencies, development of a new national qualification framework and adaptation of tertiary education institutions to the needs of the labor market will be a major challenge for tertiary education policy. The competitiveness of Croatian society and economy will depend on the level of education and the qualifications of the workforce, primarily their ability to adapt to employers' needs and its abilities to learn and adapt to the modern labor market and changing society.

4. Establishment of the three-cycle system and development of lifelong learning will require more resources but also increase in the efficiency of the tertiary education system. The current tertiary education system in Croatia is inefficient, with only 35 - 40% of students completing their studies, and the average duration of studies of more than 7.5 years. Limited resources and increased demands will require more accountability of TE institutions. The change in the governance and management model of these institutions is expected to be realized through strategic planning and strategic management, quality assurance and through a funding model based on quality and performance. The first step would be to fully implement lump-sum funding of institutions (autonomous budget), which means that institutions assume responsibility for their own efficiency. The second step would be to change the financing model of education that would increase the responsibility of students for their own education.

5. The application of European standards and guidelines on quality assurance and the possibility of mutual recognition of Croatian diplomas in the European Higher Education Area (EHEA) will require the creation of a robust quality assurance system, both at the national and at the institutional level. This will require significant investments in people, because the creation of a quality assurance system requires large organizational changes. The new quality assurance system would mean a transformation of the entire TE system in order to follow a dynamic and continuous cycle of changes and adaptations, which would open opportunities for realizing key objectives.

6. The development of a knowledge-based society and autonomous TE institutions cannot be managed by a state administration that does not have enough competencies itself. Therefore, it will be necessary to change the governance model by shifting from a state governance model to a state supervision model. Decentralization and the application of the autonomy principles assume much more freedom and responsibility for those who perform the work, while the state should create a set of high-quality instruments, which will make that responsibility and efficiency visible to taxpayers (accountability).

7. Developing research activities at TE institutions and connecting them to the learning activities will be a huge challenge for all universities in Croatia.

Croatia currently has 0.23% doctors of science (Ph.D.) as part of the workforce, and many of them are not sufficiently competitive in the global research and innovation market.

This can be a major obstacle for the development of a knowledge-based economy and society. In the following decade their number should significantly increase, which will require a thorough reform of doctoral level education (education related to research with the goal of developing the highest level of personal competency). Innovation requires brave ideas and creative individuals, but also a combination of resources and talent. This is why the relatively small research capacity (the number of productive researchers) should be used in the best and most efficient way. Creative individuals and groups should be provided with opportunities for unrestrained personal development. There should be more opportunities to increase the number of people with the highest education level through doctoral studies by providing them with funding and encouraging them to set up and expand centers of excellence and establish graduate schools.

8. Fragmented universities with their constituent parts as legal entities can be seen as a serious constraint for all the demanding tasks that are faced by the TE system in Croatia. Therefore, it will be necessary to integrate universities in a step-by-step, carefully planned, process that will not destabilize the entire system.

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ABBREVIATIONS OF STATISTICAL TOOLS AND OTHER CLASSIFICATIONS

-	data not available/not applicable
o/w	of which
ASHE	Agency for Science and Higher Education
BERD	Expenditure on R&D in the business enterprise sector
CASA	Croatian Academy of Sciences and Arts
CBS	Central Bureau of Statistics
CEB	Croatian Employment Bureau
CEDEFOP	European Center for Development of Vocational Training
CEEPUS	Central European Exchange Program for University Studies
CFSAHE	Council for Financing Scientific Activity and Higher Education
DAAD	German Academic Exchange Service
EC	European Commission
ECTS	European Credit Transfer System
ESF	European Science Foundation
ETF	European Training Foundation
EU	European Union
EURIDYCE	Information Network on Education in Europe
EUROSTAT	Statistical Office of the European Communities
FP	Framework Program
FT	Full-time students
FTE	Full-time equivalents
GDP	Gross Domestic Product
GERD	Gross domestic expenditures on R&D
GOVERD	Government intramural expenditure on R&D
GFS	Government Finance Statistics
HERD	Expenditure on R&D in the higher education sector
HITRA	Croatian Program for Innovative Technological Development
ICT	Information-communication technology

ILO	International Labor Organization
IPR	Intellectual property rights
ISCED	International Standard Classification for Education
LFS	Labor Force Survey
MEI	Ministry of European Integration
MFIN	Ministry of Finance
MST	Ministry of Science and Technology
MoSES	Ministry of Science, Education and Sports
NCHE	The National Council for Higher Education
NCS	The National Council for Science
NSCE	National Standard Classification for Education
NZZ	The National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia
OG	Official Gazette
QA	Quality assurance
RC	The Rectors' Conference
R&D	Research and development
SHEFC	The Science and Higher Education Funding Council
SMEs	Small-medium enterprises
SPHE	School of professional higher education
TE	Tertiary education
TEMPUS	Trans-European mobility scheme for university studies
UNESCO	United Nations Educational, Scientific and Cultural Organization

SOURCES AND METHODS OF DATA COLLECTION

Databases on tertiary education

Data on TE is collected by the Central Bureau of Statistics (CBS) and its Department for Educational Statistics through the Education Survey in accordance with the NSCE and ISCED classification. Data is collected on the national and regional level, on institutions, study programmes and fields of science. It includes employees in the education sector and all students enrolled in the TE system, with further data on freshmen and graduates. Other parameters included are the level of education, sex, age, nationality, type of program, type of study (full-time or part-time), type of institution (public or private) and areas of study.

Data on financing of TE are taken from the fiscal database of the Ministry of Finance for central and local governments as consolidated and unconsolidated data, according to the GFS Manual. Current and capital expenditures for TE are taken from the database of the MoSES.

Population database

CBS collects national demographic data on population. The estimate on the number of citizens according to age groups and overall number in each year has been made on basis of official data from the Census and data taken from the population registry. These estimates are given for mid-year (30 June).

Labor Force Survey (LFS)

The LFS is a research project on the aspects of the labor market. It is conducted in accordance with methodological rules and principles of the International Labor Organization (ILO). The survey has been conducted as a yearly survey since 1996. Since 1998, it is conducted continually.

Other sources of statistical data in this report are databases of the Ministry of Finance, Ministry of Science, Education and Sports, Croatian National Bank and Croatian Employment Bureau.[80]

80 CNB www.hnb.hr; MFIN www.mfin.hr/stat; CEB www.hzz.hr; MoSES www.mzos.hr; CBS www.dzs.hr.

STATISTICAL ANNEX

CHAPTER 1
GENERAL INFORMATION ON CROATIA

CHAPTER 2
OVERALL DESCRIPTION OF THE TERTIARY EDUCATION SYSTEM

CHAPTER 3
THE TERTIARY EDUCATION SYSTEM AND THE LABOR MARKET

CHAPTER 4
THE REGIONAL ROLE OF TERTIARY EDUCATION

CHAPTER 5
THE ROLE OF TERTIARY EDUCATION IN RESEARCH AND INNOVATION

CHAPTER 6
ACHIEVING EQUALITY IN AND THROUGH TERTIARY EDUCATION

CHAPTER 7
RESOURCING THE TERTIARY EDUCATION SYSTEM

CHAPTER 1

GENERAL INFORMATION ON CROATIA

Figure 1.1 Counties of the Republic of Croatia

I.	Zagrebačka	I.	County of Zagreb
II.	Krapinsko-zagorska	II.	County of Krapina-Zagorje
III.	Sisačko-moslavačka	III.	County of Sisak-Moslavina
IV.	Karlovačka	IV.	County of Karlovac
V.	Varaždinska	V.	County of Varaždin
VI.	Koprivničko-križevačka	VI.	County of Koprivnica-Križevci
VII.	Bjelovarsko-bilogorska	VII.	County of Bjelovar-Bilogora
VIII.	Primorsko-goranska	VIII.	County of Primorje-Gorski Kotar
IX.	Ličko-senjska	IX.	County of Lika-Senj
X.	Virovitičko-podravska	X.	County of Virovitica-Podravina
XI.	Požeško-slavonska	XI.	County of Požega-Slavonia
XII.	Brodsko-posavska	XII.	County of Brod-Posavina
XIII.	Zadarska	XIII.	County of Zadar
XIV.	Osječko-baranjska	XIV.	County of Osijek-Baranja
XV.	Šibensko-kninska	XV.	County of Šibenik-Knin
XVI.	Vukovarsko-srijemska	XVI.	County of Vukovar-Srijem
XVII.	Splitsko-dalmatinska	XVII.	County of Split-Dalmatia
XVIII.	Istarska	XVIII.	County of Istria
XIX.	Dubrovačko-neretvanska	XIX.	County of Dubrovnik-Neretva
XX.	Međimurska	XX.	County of Međimurje
	Grad Zagreb		City of Zagreb

Source: CBS

Table 1.1 Macroeconomic indicators 1996-2004

Area (square km)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
56,538	56,538	56,538	56,538	56,538	56,538	56,538	56,538	56,538
Population (million)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
4,494	4,572	4,501	4,554	4,381	4,437	4,443	4,442	4,439
GDP (million HRK, current prices)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
107,981	123,811	137,604	141,579	152,519	165,639	181,232	198,422	212,827
GDP (million EUR, current prices)[a]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
15,869	17,790	19,274	18,673	19,977	22,171	24,468	26,232	28,393
GDP per capita (in EUR)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
3,531	3,891	4,282	4,100	4,560	4,997	5,507	5,905	6,396
GDP – year-on-year rate of growth (in %,constant prices)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
5.9	6.8	2.5	-0.9	2.9	4.4	5.6	5.3	3.8
Average year-on year inflation rate[b]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
3.5	3.6	5.7	4.0	4.6	3.8	1.7	1.8	2.1
Current account balance (million EUR)[c]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
-755	-2,192	-1,305	-1,312	-478	-818	-2,095	-1,866	-1,404
Current account balance (as of % GDP)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
-4.8	-12.3	-6.8	-7.0	-2.4	-3.7	-8.6	-7.1	-4.9
Export of oood and services (as of % GDP)[c]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
38.7	40.3	39.8	40.9	47.1	48.7	45.5	50.1	50.1
Import of good and services (as of % GDP)[c]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
48.0	56.8	49.1	49.3	52.3	54.6	56.4	57.9	57.0
External debt (million EUR, end of year)[d]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
4,284	6,761	9,173	10,101	12,109	13,458	15,055	19,811	22,781
External debt (as of % GDP)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
27.0	38.0	47.6	54.1	60.6	60.7	61.5	75.5	80.2
External debt (as of % goods and services)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
69.8	94.4	119.4	132.2	128.7	124.6	135.3	150.,8	160.0
Gross international reserves (million EUR, end of year)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
1,868	2,304	2,400	3,013	3,783	5,334	5,651	6,554	6,436
Gross international reserves (in months of the import of goods and services, at the end of the period)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
2.9	2.7	3.0	3.9	4.3	5.3	4.9	5.2	4.8

National currency: Croatian HRK (HRK)								
Exchange rate on 31 December (HRK:1 EUR)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
6.8636	6.9472	7.3291	7.6790	7.5983	7.3700	7.4423	7.6469	7.6712
Exchange rate on 31 December (HRK:1 USD)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
5.5396	6.3031	6.2475	7.6477	8.1553	8.3560	7.1457	6.1185	5.6369
Average exchange rate (HRK:1 EUR)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
6.8047	6.9597	7.1366	7.5821	7.6348	7.4710	7.4070	7.5642	7.4957
Average exchange rate rate (HRK:1 USD)								
1996	1997	1998	1999	2000	2001	2002	2003	2004
5.4338	6.1571	6.3623	7.1237	8.2802	8.3392	7.8725	6.7044	6.0312
Consolidated central Government (as % of GDP)[e]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
-	-	-	-6.5	-7.1	-6.7	-4.5	-4.6	-3.4
Unemployment rate (ILO definition, persons above 15 years of age)[f]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
10.0	9.9	11.4	13.6	16.1	15.8	14.8	14.3	13.8
Employment rate (ILO definition, persons above 15 years of age)[h]								
1996	1997	1998	1999	2000	2001	2002	2003	2004
50.6	49.3	47.0	44.8	42.6	41.8	43.3	43.1	43.5*

Source: CBS, MoF, CNB (Available on: http://www.hnb.hr/statistika/hstatistika.htm. Accessed: January 12, 2007)

Notes:

a. Calculated by applying the average annual exchange rate (HRK/1 EUR) to the GDP in HRK terms.
b. Inflation rate was measured by the RPI in the 1994-1998 period. From 1999 on, it is measured by the CPI.
c. Preliminary data.
d. External debt indicators for 2002 and 2003 are shown on a gross basis, while the indicators for 2001 do not include interest arrears and accrual interest, hybrid and subordinated instruments, repo transactions of banks and the CNB, deposits of international financial institutions with the CNB, and one-sided effects of the secondary bond market.
e. Includes principal payments on long-term debt net of principal payments on trade credits and direct investments as well as total interest payments net of interest payments on direct investments.
f. The data are revised due to a change in the methodology of calculation of the average exchange rate.
g. On a cash basis (GFS 1986).
h. Employment and unemployment rates as at November 1996 and as at June 1997

Table 1.2 Population according to sex and age (Census 1991 and 2001)

Age group	1991			2001		
	Total	Men	Women	Total	Men	Women
0-4	280,056	143,588	136,468	237,522	121,718	115,804
5-9	314,697	161,383	153,314	248,528	127,274	121,254
10-14	331,426	169,518	161,908	268,584	137,175	131,409
15-19	326,290	166,909	159,381	298,606	152,676	145,930
20-24	320,222	162,613	157,609	305,631	155,739	149,892
25-29	342,388	172,740	169,648	294,497	148,666	145,831
30-34	365,956	185,298	180,658	295,431	147,920	147,511
35-39	375,091	192,203	182,888	317,273	158,506	158,767
40-44	345,466	176,628	168,838	333,403	166,499	166,904
45-49	259,849	129,464	130,385	333,576	168,290	165,286
50-54	304,427	150,063	154,364	299,773	148,224	151,549
55-59	311,402	149,183	162,219	229,775	108,673	121,102
60-64	278,948	126,447	152,501	262,016	120,667	141,349
65-69	219,466	83,278	136,188	252,947	110,459	142,488
70-74	119,676	43,574	76,102	203,885	81,884	122,001
75-80	109,642	38,517	71,125	137,201	44,149	93,052
80-85	73,229	24,218	49,011	56,954	17,040	39,914
85 and above	34,027	9,652	24,375	42,553	11,576	30,977
Unknown	72,007	33,347	38,660	19,305	8,765	10,540
Total	**4,784,265**	**2,318,623**	**2,465,642**	**4,437,460**	**2,135,900**	**2,301,560**

Source: CBS

Table 1.3 Active population by age and sex (Census 2001)

Age group	Population			Economically active population*						Employed			Unemployed		
	Total	Men	Women	Total		Men		Women		Total	Men	Women	Total	Men	Women
					%**		%		%						
0-4	237,522	121,718	115,804	-	-	-	-	-	-	-	-	-	-	-	
5-9	248,528	127,274	121,254	-	-	-	-	-	-	-	-	-	-	-	
10-14	268,584	137,175	131,409	-	-	-	-	-	-	-	-	-	-	-	
15-19	298,606	152,676	145,930	54,505	18.3	29,555	19.4	24,950	17.1	18,483	9,237	9,246	36,022	20,318	15,704
20-24	305,631	155,739	149,892	200,104	65.5	108,690	69.8	91,414	61.0	120,685	64,545	56,140	79,419	44,145	35,274
25-29	294,497	148,666	145,831	249,934	84.9	133,438	89.8	116,496	79.9	189,296	103,829	85,467	60,638	29,609	31,029
30-34	295,431	147,920	147,511	258,224	87.4	138,445	93.6	119,779	81.2	208,645	115,311	93,334	49,579	23,134	26,445
35-39	317,273	158,506	158,767	276,062	87.0	147,380	93.0	128,682	81.1	229,364	124,431	104,933	46,698	22,949	23,749
40-44	333,403	166,499	166,904	283,127	84.9	151,089	90.7	132,038	79.1	239,961	128,306	111,655	43,166	22,783	20,383
45-49	333,576	168,290	165,286	265,333	79.5	146,675	87.2	118,658	71.8	224,737	124,932	99,805	40,596	21,743	18,853
50-54	299,773	148,224	151,549	196,388	65.5	119,955	80.9	76,433	50.4	168,247	102,508	65,739	28,141	17,447	10,694
55-59	229,775	108,673	121,102	85,282	37.1	59,830	55.1	25,452	21.0	74,781	51,155	23,626	10,501	8,675	1,826
60-64	262,016	120,667	141,349	39,228	15.0	26,791	22.2	12,437	8.8	36,533	24,399	12,134	2,695	2,392	303
65-69	252,947	110,459	142,488	17,604	7.0	9,833	8.9	7,771	5.5	17,278	9,575	7,703	326	258	68
70-74	203,885	81,884	122,001	11,646	5.7	5,841	7.1	5,805	4.8	11,567	5,781	5,786	79	60	19
75 and above	236,708	72,765	163,943	7,770	3.3	3,809	5.2	3,961	2.4	7,728	3,785	3,943	42	24	18
Unknown	19,305	8,765	10,540	7,412	-	3,806	-	3,606	-	6,338	3,260	3,078	1,074	546	528
Total	**4,437,460**	**2,135,900**	**2,301,560**	**1,952,619**	**44.0**	**1,085,137**	**50.8**	**867,482**	**37.7**	**1,553,643**	**871,054**	**682,589**	**398,976**	**214,083**	**184,893**

* Economically active population comprises all persons above 15 years of age who furnish the supply of labour for the production of economic goods and services (employed and unemployed, including those seeking work for the first time) during a specified time reference period.

** Percentage of economically active population within the total population of the corresponding age group.

Table 1.4 Active population by age groups (in %)

	2001/I	2001/II	2001 average	2002/I	2002/II	2002 average	2003/I
Activity rate							
15-24	39.6	41.9	40.8	37.6	39.9	38.8	37.8
25-49	82.7	82.4	82.6	83.5	83.3	83.4	82.7
50-64	37.7	40.9	39.3	40.6	43.0	41.8	43.0
65 and over	7.0	6.6	6.8	6.9	5.8	6.4	7.0
Total	49.0	50.3	49.7	50.9	50.9	50.9	50.3
15-64	61.0	62.2	61.6	62.3	62.9	62.6	62.2
Employment rate							
15-24	23.3	24.4	23.9	23.8	26.2	25.0	24.3
25-49	72.1	70.7	71.4	72.1	72.6	72.4	72.5
50-64	34.7	37.5	36.1	37.0	39.3	38.2	39.2
65 and over	6.9	6.6	6.8	6.8	5.8	6.3	7.0
Total	41.5	42.1	41.8	43.1	43.5	43.3	43.2
15-64	51.4	51.8	51.6	52.6	53.6	53.1	53.2
Unemployment rate							
15-24	41.2	41.7	41.5	36.6	34.4	35.5	35.9
25-49	12.8	14.2	13.5	13.7	12.9	13.3	12.4
50-64	7.9	8.1	8.0	8.8	8.5	8.7	8.8
65 and over	.	.	.	.	.	.	.
Total	15.3	16.3	15.8	15.2	14.4	14.8	14.1
15-64	15.8	16.8	16.3	15.6	14.8	15.2	14.5

Source: CBS, Labor Force Survey

Table 1.5 Working age population* by age and activity (in 000)

	2001/I	2001/II	2001 average	2002/I	2002/II	2002 average	2003/I
Active population or work force							
15-24	224	234	229	214	223	219	213
25-49	1,152	1,158	1,155	1,216	1,181	1,199	1,177
50-64	294	326	310	312	345	329	346
65 and above	54	49	52	50	43	47	54
Total	1,724	1,767	1,746	1,794	1,792	1,792	1,791
15-64	1,670	1,718	1,694	1,743	1,749	1,746	1,737
Employed							
15-24	132	136	134	136	146	141	137
25-49	1,004	994	999	1,050	1,028	1,039	1,032
50-64	271	299	285	285	316	301	316
65 and above	54	49	52	50	43	47	54
Total	1,460	1,478	1,470	1,521	1,534	1,527	1,538
15-64	1,407	1,429	1,418	1,471	1,491	1,481	1,484
Unemployed							
15-24	92	98	95	79	77	78	76
25-49	148	164	156	166	152	159	146
50-64	23	27	25	27	29	28	31
65 and above	,	,	,	,	,	,	,
Total	264	289	276	273	259	265	253
15-64	264	289	276	272	258	265	253
Inactive population							
15-24	341	325	333	355	336	346	351
25-49	241	247	244	241	236	239	246
50-64	486	471	479	458	458	458	458
65 and above	725	700	713	680	702	691	719
Total	1,794	1,743	1,768	1,734	1,732	1,733	1,774
15-64	1,069	1,043	1,056	1,053	1,030	1,042	1,055

Source: CBS, Labor Force Survey

* Working age population comprises all males that aged 15 – 64 and all females aged 15-59 in a given area.

Table 1.6 Percentage of work age* population by education

	2001/I	2001/II	2001 average	2002/I	2002/II	2002 average	2003/I
Employed							
Less than elementary school	6.6	5.6	6.1	5.5	4.7	5.1	5.2
Elementary school	17.3	17.6	17.5	17.0	16.1	16.6	17.8
Up to 3 years of vocational school	21.7	22.4	22.1	23.1	26.0	24.6	29.1
4-year vocational school	33.4	32.9	33.2	33.0	30.8	31.9	25.8
High school (Gymnasium)	3.0	3.5	3.3	3.4	3.1	3.3	3.0
School of higher professional education degree	7.1	6.5	6.8	6.8	7.1	7.0	6.3
University degree (including master's and doctoral degrees)	10.9	11.5	11.2	11.3	12.3	11.8	12.7
Unemployed							
Less than elementary school	3.1	3.3	3.2	1.9	2.5	2.2	3.8
Elementary school	17.0	15.8	16.4	18.4	17.0	17.7	19.6
Up to 3 years of vocational school	32.7	30.2	31.5	32.7	32.8	32.8	37.5
4-year vocational school	34.8	35.5	35.2	32.7	33.2	33.0	26.9
High school (Gymnasium)	4.5	4.9	4.7	3.8	4.9	4.4	3.0
School of higher professional education degree	3.3	4.0	3.7	4.9	4.4	4.7	3.3
University degree (including master's and doctoral degrees)	4.6	6.3	5.5	5.6	5.1	5.4	6.0
Inactive population							
Less than elementary school	29.5	28.7	29.1	26.2	25.2	25.7	24.1
Elementary school	32.4	31.8	32.1	32.9	33.9	33.4	34.8
Up to 3 years of vocational school	14.2	14.4	14.3	15.0	15.2	15.1	16.6
4-year vocational school	13.1	13.5	13.3	13.4	13.4	13.4	11.7
High school (Gymnasium)	5.6	5.9	5.8	6.5	5.9	6.2	6.4
School of higher professional education degree	3.1	2.8	3.0	3.1	2.9	3.0	3.0
University degree (including master's and doctoral degrees)	2.2	2.9	2.6	2.8	3.6	3.2	3.4

Source: CBS, LFS

* Working age population comprises all persons aged 15 years and more.

Table 1.7 Estimate of active population for 2006 according to age and sex

Age	Economically active population 2001			Economically active population 2006		
	Total	Men	Women	Total	Men	Women
15-19	54,505	29,555	24,950	-	-	-
20-24	200,104	108,690	91,414	-	-	-
25-29	249,934	133,438	116,496	200,104	108,690	91,414
30-34	258,224	138,445	119,779	249,934	133,438	116,496
35-39	276,062	147,380	128,682	258,224	138,445	119,779
40-44	283,127	151,089	132,038	276,062	147,380	128,682
45-49	265,333	146,675	118,658	283,127	151,089	132,038
50-54	196,388	119,955	76,433	265,333	146,675	118,658
55-59	85,282	59,830	25,452	196,388	119,955	76,433
60-64	39,228	26,791	12,437	85,282	59,830	25,452
65-69	17,604	9,833	7,771	39,228	26,791	12,437
70-74	11,646	5,841	5,805	17,604	9,833	7,771
75 and above	7,770	3,809	3,961	11,646	5,841	5,805
Unknown	7,412	3,806	3,606	7,400	3,800	3,600
Total	**1,952,619**	**1,085,137**	**867,482**	**1,890,332**	**1,051,767**	**838,565**

Source: CBS

Table 1.8 Indicators of economic activity

	2000	2001	2002	2003	2004
Real GDP (% change, yoy*)	3.7	3.8	5.2	4.3	3.8
Real private consumption (% change, yoy)	4.1	4.6	6.6	4.1	3.9
Real Government consumption (% change, yoy)	-0.7	-4.3	-1.8	-0.3	-0.3
Real investment (% change, yoy)	-3.5	9.7	10.1	16.8	4.4
Industrial output (% change, yoy)	1.7	6.0	5.4	4.1	3.7
Unemployment rate (registered, %, per annum)	21.3	22.0	22.3	19.1	18.0
Nominal GDP (EUR million)	19,031	19,536	22,812	25,526	27,629
GDP per capita (EUR)	4,179	4,403	5,141	5,747	6,220

Sources: CBS, Croatian Economic Outlook Quarterly

* Yoy = year-on-year

Table 1.9 Gross value added, by the NCEA* activities

	Share of gross value added, 1997	Share of gross value added, 2003	Share of employment, 2003
A, B Agriculture, hunting and forestry; fishing (primary sector)	9.2	7.8	10.2
C, D, E Mining and quarrying; manufacturing; electricity, gas and water supply (secondary sector)	25.9	27.1	22.6
F Construction	7.1	6.9	7.4
G Wholesale and retail trade etc.	12.4	13.2	15.8
H Hotels and restaurants	3.1	3.5	5.3
I Transport, storage and communication	8.7	9.6	6.8
J, K Financial intermediation; real estate and business services	14.0	14.6	7.5
L, M, N, O, P Other (public) services	19.4	17.2	24.3

Source: CBS, author's calculation

* NCEA = National Classification of Economic Activities

Table 1.10 Employment rates, share of the unemployed and economically inactive working age population, by sex and age groups (2003)

	Age group			
	15-64	15-24	25-54	55-64
Employment rates, males (%)	59.9	27.7	77.1	38.1
Employment rates, females (%)	46.7	21.0	63.2	20.3
Share of the unemployed in the male population (%)	9.3	18.0	9.3	3.2
Share of the unemployed in the female population (%)	9.0	12.9	10.4	1.1
Economically inactive, males (%)	30.8	57.9	13.6	58.7
Economically inactive, females (%)	44.3	66.1	26.4	78.6

Sources: CBS, CEB (2004a)

Table 1.11 Unemployment rate by counties (end of 2004)

County	Employed	Unemployed	Unemployment rate (%)
Zagrebačka	65,647	13,378	16.9
Krapinsko-zagorska	34,894	5,974	14.6
Sisačko-moslavačka	42,125	18,795	30.9
Karlovačka	35,930	12,901	26.4
Varaždinska	59,823	10,219	14.6
Koprivničko-križevačka	38,847	7,800	16.7
Bjelovarsko-bilogorska	35,754	11,389	24.2
Primorsko-goranska	113,855	16,519	12.7
Ličko-senjska	13,040	3,611	21.7
Virovitičko-podravska	23,453	9,525	28.9
Požeško-slavonska	20,659	5,170	20.0
Brodsko-posavska	38,055	15,643	29.1
Zadarska	42,479	11,073	20.7
Osječko-baranjska	86,906	31,619	26.7
Šibensko-kninska	26,721	9,804	26.8
Vukovarsko-srijemska	39,267	19,261	32.9
Splitsko-dalmatinska	134,227	38,875	22.5
Istarska	79,652	5,181	6.1
Dubrovačko-neretvanska	36,809	6,965	15.9
Međimurska	38,287	7,332	16.1
City of Zagreb	453,675	38,435	7.8

Sources: Croatian Pension Insurance Institute, CEB (2004c)

Table 1.12 Unemployment rate by counties and education levels (2003)

County	Unemployment rate, by education level (%)			Workforce ratio* (2+3) / 4
	University degree (4 years or more)	Polytechnic/college degree (2 years)	High school	
Zagrebačka	9.1	11.2	18.9	39.1
Krapinsko-zagorska	3.6	7.3	13.3	37.1
Sisačko-moslavačka	8.9	15.3	25.0	42.1
Karlovačka	7.9	13.5	24.0	46.0
Varaždinska	5.1	9.0	12.3	39.7
Koprivničko-križevačka	3.1	8.6	12.7	42.7
Bjelovarsko-bilogorska	5.0	12.5	21.6	38.8
Primorsko-goranska	9.5	12.2	14.8	53.7
Ličko-senjska	6.1	12.1	15.7	31.5
Virovitičko-podravska	6.3	12.0	25.3	35.9
Požeško-slavonska	4.1	8.6	17.9	41.4
Brodsko-posavska	7.7	13.0	29.0	44.5
Zadarska	11.1	17.8	22.2	51.9
Osječko-baranjska	8.9	12.5	23.1	42.8
Šibensko-kninska	11.5	19.0	28.1	45.5
Vukovarsko-srijemska	7.7	14.0	34.3	43.2
Splitsko-dalmatinska	14.9	21.0	27.0	57.9
Istarska	5.0	6.8	8.4	52.1
Dubrovačko-neretvanska	13.0	20.4	23.3	57.6
Međimurska	5.0	8.0	15.2	40.0
City of Zagreb	5.8	8.7	10.6	66.1

Sources: CBS, CES (2004b)

* Workforce ratio is calculated as the sum of the numbers of all employed and unemployed persons with university or college degrees divided by the sum of the numbers of all employed and unemployed persons holding a high school degree.

Table 1.13 Unemployed graduates without work experience employed within 180 days (2003)

Occupation (degree subject)	Newly registered unemployed		Employed within 180 days		Ratio (%)	
	Male	Female	Male	Female	Male	Female
Economics / business	233	339	111	158	47.6	46.6
Law	173	297	89	167	51.4	56.2
Electrical engineering / computing	116	-	67	-	57.8	-
Electrical engineering*	102	-	38	-	37.3	-
Civil engineering*	75	-	50	-	66.7	-
Engineering	71	-	45	-	63.4	-
Preschool education*	-	193	-	64	-	33.2
Economics/business*	68	135	27	50	39.7	37.0
Finance	66	116	42	70	63.6	60.3
Road transportation	65	-	25	-	38.5	-
Medicine	64	115	49	96	76.6	83.5
Lower-grade teaching	-	109	-	49	-	45.0
Croatian language	-	87	-	41	-	47.1
Hotel management	-	84	-	26	-	31.0
Law*	-	79	-	23	-	29.1
Food technology	-	70	-	26	-	37.1
English language	-	57	-	35	-	61.4
Postal services	56	-	19	-	33.9	-
Civil engineering	53	-	42	-	79.2	-
Foreign trade management	-	55	-	27	-	49.1
Pharmacology	-	50	-	45	-	90.0
Veterinarian	52	-	31	-	59.6	-
Physical education	49	-	15	-	30.6	-
Engineering*	45	-	28	-	62.2	-
Journalism	-	49	-	14	-	28.6
Social work	-	49	-	11	-	22.4
Dentistry	-	45	-	32	-	71.1
Architecture	-	42	-	26	-	61.9
Information science	43	-	25	-	58.1	-
Telecommunications*	42	-	9	-	21.4	-

Source: CEB (2004b)

Note: * signifies a polytechnic/college degree

CHAPTER 2

OVERALL DESCRIPTION OF THE TERTIARY EDUCATION SYSTEM

Table 2.1 Graduated pupils and students, Masters of Science and Doctors of Science

	NSKO and ISCED '971) level	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Elementary school	2	52,285	53,839	52,982	53,368	51,211	50,088
Secondary school	3	50,928	49,081	48,203	47,057	47,092	48,548
Grammar schools		11,871	11,725	11,605	11,965	12,258	12,505
Technical, art schools and related schools		19,353	19,184	18,441	19,062	18,880	19,951
Industrial and crafts schools		19,267	17,681	17,708	15,608	15,440	15,592
Schools for handicapped children and youth		437	491	449	422	514	500
Non-university colleges	5	76	93	58	-	-	-
Polytechnics	5	134	220	542	1,238	1,641	1,542
Schools of higher learning	5	1384	1,599	2,073	2,154	3,032	3,212
Faculties, academies of art and institutions of higher religious education	5	11,721	11,598	11,137	11,476	11,089	12,637
Masters of science and specialists (M.Sc.)	5	686	679	676	777	808	760
Doctors of science (D.Sc.)	6	338	280	255	314	321	357

Source: MoSES

Note and explanation: 1) NSKO - National Standard Classification of Education, ISCED '97 - International Standard Classification of Education

List of educational levels by ISCED '97

ISCED 0 - Pre-primary level of education - Initial stage of organised instruction, designed primarily to introduce very young children to a school-type environment.

ISCED 1 - Primary level of education - Programmes normally designed to give students a sound basic education in reading, writing and mathematics.

I*SCED 2 - Lower secondary level of education (2A, 2B, 2C)* - The lower secondary level of education generally continues the basic programmes of the primary level, although teaching is typically more subject-focused, often employing more specialised teachers who conduct classes in their field of specialisation.

ISCED 3 - Upper secondary level of education (3A, 3B, 3C) - The final stage of secondary education in most countries. Instruction is often more organised along subject-matter lines than at ISCED level 2 and teachers typically need to have a higher level, or more subject-specific, qualification that at ISCED 2. There are substantial differences in the typical duration of ISCED 3 programmes both across and between countries, typically ranging from 2 to 5 years of schooling.

ISCED 4 - Post-secondary, non-tertiary education (4A, 4B, 4C) - These programmes straddle the boundary between upper secondary and post-secondary education from an international point of view, even though they might clearly be considered as upper secondary or post-secondary programmes in a national context. These programmes are often not significantly more advanced than programmes at ISCED 3 but they serve to broaden the knowledge of participants who have

already completed a program at level 3. The students are typically older than those in ISCED 3 programmes. They typically have a full-time equivalent duration of between 6 months and 2 years.

ISCED 5 - First stage of tertiary education (5A, 5B) - Programmes with an educational content more advanced than those offered at levels 3 and 4.

ISCED 5A - Programmes that are largely theoretically based and are intended to provide sufficient qualifications for gaining entry into advanced research programmes and professions with high skills requirements. Duration categories: Medium: 3 to less than 5 years; Long: 5 to 6 years; Very long: More than 6 years.

ISCED 5B - Programmes that are generally more practical/technical/occupationally specific than ISCED 5A programmes. Duration categories: Short: 2 to less than 3 years; 3 to less than 5 years; Long: 5 to 6 Years; Very long: More than 6 years.

ISCED 6 - Second stage of tertiary education (leading to an advanced research qualification) -This level is reserved for tertiary programmes that lead to the award of an advanced research qualification. The programmes are devoted to advanced study and original research.

Available on: http://europa.eu.int/estatref/info/sdds/en/educ/educ_isced_1997.htm.
Accessed, January 7, 2007.

Table 2.2 Institutions of tertiary education, student enrolment and teaching staff

	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Tertiary education institutions					
Non-university colleges	1	1	1	-	-
Polytechnics	7	7	7	7	7
Schools of professional higher education	19	18	22	24	23
Faculties, academies of art and institutions of higher religious education	66	70	72	71	72
Total	93	96	102	102	102
Students enrolled					
Non-university colleges	146	136	-	-	-
Polytechnics	12,140	18,238	16,024	17,470	13,198
Schools of professional higher education	10,093	11,549	13,038	13,981	14,595
Faculties, academies of art and institutions of higher religious education	73,597	74,245	83,475	90,271	98,529
Enrolled students per 000 inhabitants	21.07[2)]	23.78[3)]	25.36[4)]	27.40[5)]	28.44[6)]
Total	95,976	104,168	112,537	121,722	126,322
Teaching staff					
Non-university colleges	52	46	-	-	-
Polytechnics	1,041	1,137	862	863	482
Schools of professional higher education	608	534	605	794	857
Faculties, academies of art and institutions of higher religious education	5,862	5,984	6,155	6,475	6,578
Total	7,563	7,701	7,622	8,132	7,917

Source: CBS

Notes:

1) NSKO - National Standard Classification of Education, ISCED '97 - International Standard Classification of Education
2) For 1999 the population estimate was calculated by the "de facto" principle
3) Population from the First Results 2001 Census of Population
4) Population from the First Results 2001 Census of Population
5) Population 2002 mid-year estimate
6) Population 2003 mid-year estimate.

Table 2.3 Number of students (2003/04)

TE institution		Students			
		Full-time		Part-time	Total
		Full support	With participation		
Universities					
Zagreb		29,935	13,890	8,810	52,635
Split		5,596	5,624	6,071	17,291
Rijeka		6,194	4,131	3,248	13,573
Osijek		5,689	2,637	2,809	11,135
Zadar		1,725	686	369	2,780
Dubrovnik		-	-	-	-
Total – Universities		49,139	26,968	21,307	97,414
Non-university institutions					
Polytechnics		3,303	3,192	6,703	13,198
SPHE*	Public	2,086	1,403	2,653	6,142
	Private	198	2,702	1,168	4,068
Total, Polyt + SPHE		5,587	7,297	10,524	23,408
Total		**54,726**	**34,265**	**31,831**	**120,822**

* Schools of professional higher education (SPHE).

Table 2.4 Number of full-time students according to type of study (2003/04)

TE institution		Students				
		University type of study		Professional type of study		Total
		Fully supported	With participation	Fully supported	With participation	
Universities						
Zagreb		28,189	12,990	1,746	900	52,635
Split		4,320	2,420	1,276	3,204	17,291
Rijeka		4,628	3,377	1,566	754	13,573
Osijek		4,556	1,884	1,133	753	11,135
Zadar		1,490	511	235	175	2,780
Dubrovnik		-	-	-	-	0
Total – Universities		43,183	21,182	5,956	5,786	97,414
Non-university institutions						
Polytechnics				3,303	3,192	13,198
SPHE*	Public			2,086	1,403	6,142
	Private			198	2,702	4,068
Total, Polyt + SPHE				5,587	7,297	23,408
Total		**43,184**	**21,271**	**11,542**	**12,993**	**120,822**

* Schools of professional higher education

Table 3.1 Evolution of employment structure by education

	Employment (000)					Employment structure (%)			
	University/ college	Secondary	Vocational	Elementary/ unskilled	Total	University/ college	Secondary	Vocational	Elementary/ unskilled
1988	258,5	331,7	577,1	380,7	1548,1	16.7	21.4	37.3	24.6
1996	189,2	290,6	242,6	220,5	942.8	20.1	30.8	25.7	23.4
1997	189,6	292,2	223,3	204,6	909,7	20.8	32.1	24.5	22.5
1998	199,7	324,7	218,6	202,4	945,4	21.1	34.3	23.1	21.4
1999	201,8	334,4	207,8	193,6	937,6	21.5	35.7	22.2	20.7
2000	207,9	343,2	200,4	183,5	934,9	22.2	36.7	21.4	19.6
2001	213,2	352,1	185,0	175,8	926,1	23.0	38.0	20.0	19.0
2002	218,4	369,1	178,9	171,7	938,0	23.3	39.3	19.1	18.3
2003	227,5	395,1	177,0	166,6	966,3	23.5	40.9	18.3	17.2

Source: CBS

Table 3.2 Evolution of wage structure by education in Croatia and Slovenia (Secondary school = 100%)

	Croatia				Slovenia			
	University/ college	Secondary school	Vocational school	Elementary/ unskilled	University/ college	Secondary school	Vocational school	Elementary/ unskilled
2002	160.6	100.0	91.4	72.2	-	-	-	-
2001	161.8	100.0	90.8	71.5	-	-	-	-
2000	159.6	100.0	89.2	71.0	-	-	-	-
1999	158.8	100.0	93.3	71.2	-	-	-	-
1998	154.0	100.0	91.3	71.9	-	-	-	-
1997	149.1	100.0	93.5	72.1	-	-	-	-
1996	145.4	100.0	94.4	73.8	-	-	-	-
1995	144.9	100.0	94.8	74.7	-	-	-	-
1994	146.0	100.0	94.9	74.5	162.8	100.0	77.2	60.1
1993	150.7	100.0	95.0	74.8	160.2	100.0	78.1	59.8
1992	147.7	100.0	98.6	75.8	155.6	100.0	78.0	60.5
1991	150.6	100.0	93.1	70.6	151.8	100.0	79.2	62.4
1990	150.8	100.0	89.9	70.6	143.3	100.0	79.8	63.9
1988	148.6	100.0	95.2	70.9	-	-	-	-

Source: CBS

Table 3.3 Dynamics of real net wages, by education (HRK, in constant prices, year 2000)

Year	Total average	University/ college	Secondary school	Vocational school	Elementary/ unskilled
1988	3,464	5,446	3,664	3,487	2,600
2002	3,468	5,392	3,357	3,067	2,423
2002/1998	100,1%	99,0%	91,6%	88,0%	93,2%

Table 3.4 New entrants into the Croatian Employment Service (CES) register and first time job seekers employed from the register, in absolute figures

First time job-seekers employed from the CES register, by education						New entrants with no experience into the CES register, by education				
Year	Total	University/ college	Secondary school	Vocational school	Elementary/ unskilled	Total	University/ college	Secondary school	Vocational school	Elementary/ unskilled
1996	32,163	4,326	8,654	11,651	4,066	69,575	6,506	19,135	24,978	18,956
1997	32,840	4,308	8,768	12,499	3,934	71,649	6,504	20,008	24,791	20,346
1998	32,189	4,781	8,859	11,753	3,672	66,665	7,217	18,034	23,150	18,264
1999	28,490	5,073	7,782	9,699	3,160	70,002	8,715	19,937	25,042	16,308
2000	29,240	5,351	8,148	10,222	2,954	70,688	8,599	20,430	24,625	17,034
2001	36,949	6,038	10,132	13,363	3,997	76,293	8,537	21,982	26,839	18,935
2002	42,150	6,857	11,886	14,568	4,749	65,262	8,102	18,803	21,944	16,413
2003	36,847	6,272	10,403	12,061	4,468	64,445	8,255	19,205	20,957	16,028
2004	30,436	5,551	9,914	11,471	3,173	64,629	7,486	21,040	25,439	10,664
2005 I-VI	14,888	2,824	5,119	5,021	1,782	25,125	3,486	7,233	7,678	6,728

Table 3.5 Ratio of employed first time job-seekers to new entrants with no experience into the register, by ducation

Year	Total	University/ college	Secondary school	Vocational school	Elementary/ unskilled
1996.	46.2%	66.5%	45.2%	46.6%	21.4%
1997.	45.8%	66.2%	43.8%	50.4%	19.3%
1998.	48.3%	66.2%	49.1%	50.8%	20.1%
1999.	40.7%	58.2%	39.0%	38.7%	19.4%
2000.	41.4%	62.2%	39.9%	41.5%	17.3%
2001.	48.4%	70.7%	46.1%	49.8%	21.1%
2002.	64.6%	84.6%	63.2%	66.4%	28.9%
2003.	57.2%	76.0%	54.2%	57.6%	27.9%
2004.	47.1%	74.2%	47.1%	45.1%	29.8%
2005. I-VI.	59.3%	81.0%	70.8%	65.4%	26.5%

Source: CBS

Table 3.6 Persons with tertiary education in total population

Tertiary education level	1971		1981		1991		2001	
	Number	% total population	Number	% total population	Number	% total population	Number	% total population
College	47,342	1.4	99,724	2.8	156,152	4	150,167	4.1
University	74,376	2.2	131,937	3.6	204,066	5.3	267,885	7.3
Total	121,718	3.6	231,661	6.4	360,218	9.3	418,052	11.4

Source: Adamović and Mežnarić (2003)

Table 3.7 Average duration of study, 2002

	Faculty	Years	Months
1	Faculty of Agriculture, Zagreb	7	2
2	Academy of Dramatic Art, Zagreb	7	2
3	Academy of Fine Arts, Zagreb	6	1
4	American College for Management and Technology, Dubrovnik	5	
5	Faculty of Architecture, Zagreb	7	1
6	Faculty of Education and Rehabilitation Sciences, Zagreb	5	10
7	Faculty of Economics, Osijek	6	3
8	Faculty of Economics, Rijeka	6	8
9	Faculty of Economics, Split	5	9
10	Faculty of Economics, Zagreb	5	8
11	Faculty of Electrical Engineering , Osijek	7	
12	Faculty of Economics and Tourism “Dr. Mijo Mirković”, Pula	6	
13	Faculty of Electrical Engineering and Computing , Zagreb	6	5
14	Faculty of Electrical Engineering and Mechanical Engineering, Split	7	6
15	Faculty of Chemical Engineering and Technology, Zagreb	6	8
16	Faculty of Organization and Informatics, Varaždin	6	4
17	Faculty of Political Science, Zagreb	6	4
18	Faculty of Natural Sciences, Mathematics and Education, Split	6	7
19	Faculty of Transport and Traffic Engineering, Zagreb	6	5
20	Faculty of Mechanical Engineering and Naval Architecture, Zagreb	8	
21	Faculty of Tourism and Hospitality Management, Opatija	6	9
22	Faculty for Tourism and Foreugn Trade, Dubrovniku	5	10
23	Faculty of Pharmacy and Biochemistry, Zagreb	6	1
24	Faculty of Philosophy, Pula	5	10

	Faculty	Years	Months
25	Faculty of Philosophy, Rijeka	6	4
26	Faculty of Philosophy, Zadar	6	9
27	Faculty of Philosophy, Zagreb	7	5
28	Catholic Theological Faculty, Split (Makarska)	7	9
29	Faculty of Geodesy, Zagreb	6	11
30	Faculty of Geotechnical Engineering, Varaždin	6	8
31	Faculty of Civil Engineering, Osijek	7	5
32	Faculty of Civil Engineering, Rijeka	6	10
33	Faculty of Civil Engineering, Split	7	9
34	Faculty of Civil Engineering, Zagreb	7	9
35	Faculty of Graphic Arts, Zagreb	6	7
36	Croatian Studies, Zagreb	5	9
37	Catholic Faculty of Theology, Split	7	9
38	Catholic Faculty of Theology, Zagreb	7	5
39	Faculty of Chemical Technology, Split	8	7
40	Faculty of Kinesiology, Zagreb	7	4
41	The University of Osijek - Department of Mathematics	7	
42	Faculty of Medicine, Osijek	7	2
43	Faculty of Medicine, Rijeka	7	2
44	Faculty of Medicine, Splitu	7	
45	Faculty of Medicine, Zagreb	7	2
46	International Centre of Croatian Universities	5	
47	Faculty of Metallurgy, Sisak	7	10
48	Police Academy, Zagreb	5	4
49	Academy of Music, Zagreb	5	9
50	Faculty of Maritime Studies, Split	6	2
51	Teacher Training College, Osijek	6	
52	Faculty of Food Technology	7	5
53	Faculty of Maritime Studies, Rijeka	6	3
54	Faculty of Law, Osijek	7	1
55	Faculty of Law, Rijeka	7	1
56	Faculty of Law, Split	6	3
57	Faculty of Law, Zagreb	6	11
58	Faculty of Food Technology and Biotechnology, Zagreb	7	
59	Faculty of Food Technology, Osijek	7	1
60	Faculty of Science, Dept. of Mathematics, Zagreb	6	11
61	Faculty of Science, Dept. of Natural Sciences, Zagreb	7	2
62	Faculty of Mining, Geology and Petroleum Engineering, Zagreb	7	11

	Faculty	Years	Months
63	School of Dental Medicine, Zagreb	7	
64	Faculty of Mechanical Engineering, Slavonski Brod	6	11
65	Faculty of Forestry, Zagreb	7	
66	Faculty of Engineering, Rijeka	7	2
67	Faculty of Textile Technology, Zagreb	6	10
68	Teacher Training Academy, Zagreb	5	11
69	Academy of Arts, Split	6	6
70	Polytechnic of Dubrovnik	5	4
71	Požega Polytechnic	5	
72	Polytechnic of Split	4	
73	Faculty of Veterinary Medicine, Zagreb	8	10
74	Faculty of Maritime Studies, Split	5	10
75	SPHE for Workplace Safety, Zagreb	5	
76	SPHE for Tourism, Šibenik	5	
77	Polytechnic SPHE, Pula	5	
78	Teacher Training College, Čakovec	5	4
79	Teacher Training College, Gospić	5	
80	Teacher Training College, Osijek	5	
81	Teacher Training College, Petrinja	5	5
82	Teacher Training College, Pula	5	
83	Teacher Training College, Rijeka	4	
84	Teacher Training College, Split	6	3
85	Teacher Training College, Zadar	5	
	Average	**6**	**6**
	Median	**6**	**8**
	Minimum	**4**	**0**
	Maximum	**8**	**10**

Source: CES, according to CBS

Table 4.1 Regional distribution of early stage researchers, 2005

University	Number of early stage researchers	PhD students	Postdoctoral
Dubrovnik	19	19	-
Osijek	188	178	10
Rijeka	247	242	5
Split	231	216	15
Zadar	56	55	1
Zagreb	1,861	1,709	148
Total	2,602	2,419	179

Source: MoSES

Table 4.2 Total capital expenditures from state budget, 1996 – 2001, by university

University	1996		1997		1998		1999	
	Amount	%	Amount	%	Amount	%	Amount	%
ZAGREB	48,054,000	77.94	50,383,000	84.79	90,700,000	82.64	97,900,000	78.82
OSIJEK	4,500,000	7.30	4,990,000	8.40	10,250,000	9.34	14,500,000	11.67
SPLIT	3,800,000	6.16	2,300,000	3.87	2,400,000	2.19	5,300,000	4.27
RIJEKA	5,300,000	8.60	1,750,000	2.94	6,400,000	5.83	6,500,000	5.23
Total	**61,654,000**		**59,423,000**		**109,750,000**		**124,200,000**	

University	2000		2001		TOTAL	
	Amount	%	Amount	%	Amount	%
ZAGREB	18,695,625	54.57	77,900,000	61.34	383,632,625	74.31
OSIJEK	4,046,250	11.81	20,500,000	16.14	58,786,250	11.39
SPLIT	7,424,625	21.67	25,100,000	19.76	46,324,625	8.97
RIJEKA	4,095,000	11.95	3,500,000	2.76	27,545,000	5.34
Total	**34,261,500**		**127,000,000**		**516,288,500**	

Source: State Budget, respected years

Table 4.3 Investments in scientific equipment

	2001	2002	2003	2004	Total
Universities	28,815,284	62,834,293	37,439,572	28,351,604	157,440,753
Public institutes	23,161,535	26,898,479	15,417,260	10,908,110	76,385,384
Other institutions	2,130,098	2,499,287	1,406,458	787,260	6,824,103
Total	**54,106,917**	**92,232,059**	**54,263,290**	**40,048,074**	**240,650,240**

Source: MoSES

Table 4.4 Scientific projects financed by MoSES, 2005 – Institutions

Type of institution	No of projects	%	Amount (HRK)	%
Universities	1,271	70.5	82,120,000	65.0
Public institutes	324	18.0	31,114,000	24.6
Other institutions	200	11.1	12,942,000	10.2
Polytechnics	8	0.4	243,000	0.2
Total	**1,803**	**100.0**	**126,419,000**	**100.0**

Source: MoSES

Table 4.5 Scientific projects financed by MoSES, 2005 – Universities

University	No of projects	%	Amount (HRK)	%
Dubrovnik	3	0.2	135,000	0.2
Osijek	110	8.7	6,186,000	7.5
Rijeka	152	12.0	8,698,000	10.6
Split	111	8.7	5,979,000	7.3
Zadar	44	3.5	1,672,000	2.0
Zagreb	851	67.0	59,450,000	72.4
Total	**1,271**	**100.0**	**82,120,000**	**100.0**

Source: MoSES

Table 4.6 Capital investments in universities, 2002 – 2004

	HRK	EUR
University of Rijeka	88,733,200	11,675,000
University of J.J. Strossmayer in Osijek	180,000,000	23,684,000
University of Split	344,999,000	45,394,000
University of Rijeka and SC Zagreb	70,000,000	9,210,000
University of Zagreb	490,000,000	64,473,000
University of Dubrovnik	24,322,000	3,200,000
Total	1,198,054,200	157,638,000
University of Rijeka 2005 - 2008	490,000,000	63,158,000
Total investments	**1,739,854,200**	**228,928,000**

Source. MoSES

CHAPTER 5

THE ROLE OF TERTIARY EDUCATION IN RESEARCH AND INNOVATION

Table 5.1 Legal entities* involved in R&D, by sector and field of science

	2000		2001		2002		2003	
	Total	%	Total	%	Total	%	Total	%
All sectors	**140**		**140**		**141**		**151**	
Business sector	**34** (24%)	**100**	**32** (23%)	**100**	**33** (23%)	**100**	**32** (22%)	**100**
Natural sciences	4	11.76	2	6.25	1	3.03	2	6.25
Technical sciences	27	79.41	27	84.38	25	75.76	23	71.8
Biomedical sciences	1	2.94	1	3.13	1	3.03	1	3.1
Biotechnological sciences	2	5.88	2	6.25	6	18.18	6	11.7
Social sciences	-	-	-	-	-	-	-	-
Humanities	-	-	-	-	-	-	-	-
Government	**46** (33%)	**100**	**47** (33%)	**100**	**47** (33%)	**100**	**53** (35%)	**100**
Natural sciences	6	13.04	6	12.77	6	12.77	6	11.32
Technical sciences	1	2.17	1	2.13	1	2.13	2	3.77
Biomedical sciences	17	36.96	18	38.30	19	40.42	22	41.5
Biotechnological sciences	5	10.87	5	10.64	4	8.51	5	9.43
Social sciences	10	21.74	10	21.28	9	19.15	9	16.98
Humanities	7	15.22	7	14.89	8	17.02	9	16.98
Tertiary education	**60** (43%)	**100**	**61** (44%)	**100**	**61** (44%)	**100**	**66** (43%)	**100**
Natural sciences	3	5	2	3.28	3	4.92	3	4.53
Technical sciences	22	36.37	20	32.79	20	32.79	20	30.3
Biomedical sciences	5	8.33	5	8.20	7	11.48	8	12.12
Biotechnological sciences	5	8.33	5	8.20	5	8.20	6	9.09
Social sciences	20	33.33	21	34.43	22	36.05	23	34.8
Humanities	5	8.33	7	11.48	4	6.56	6	9.09

Source: CBS, R&D Annual Reports

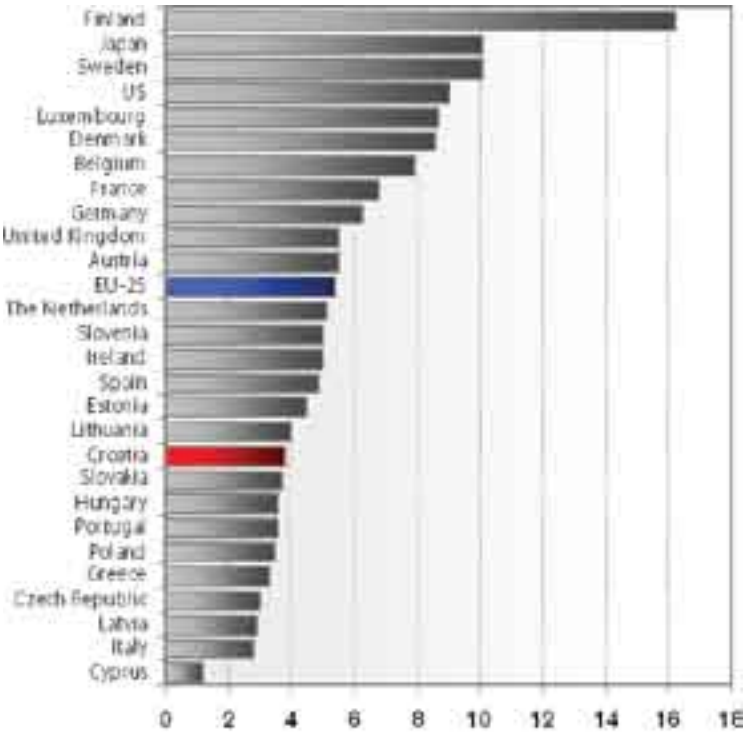
Note: According to CBS, legal entities comprise all scientific research legal entities, separate units within business enterprises as well as all institutions of higher education. Since 1997, following the Frascati Manual (OECD, 2002), the data are collected according to the sectoral principle for all legal entities and units that submit the annual report on R&D irrespective of their registration with the Register of the MoSES. The business sector comprises companies or separate units within the companies that are dealing with R&D. Government sector includes public institutes that are registered with the Register of the MoSES as well as those that are not registered. It includes also health care units and other public institutions that deal with R&D. Higher education sector includes all higher education institutions as defined by the legal acts.

Table 5.2 Number of researchers (FTE), by sector and field of science

	2000		2001		2002		2003		2004	
	Total	%	Total	%	Total	%	Total	%	Total	%
All sectors	**6,772**	**100**	**6,656**	**100**	**8,572**	**100**	**5,861**	**100**	**7,140**	**100**
Natural sciences	1,369	20.2	1,217	18.2	1,363	15.9	1,306	22.2	1,354	18.9
Technical sciences	2,106	31.0	2,086	31.3	2,628	30.6	1,272	21.7	1,709	23.9
Biomedical sciences	881	13.0	898	13.4	1,856	21.6	1,383	23.5	1,566	21.9
Biotechnological sciences	529	7.8	561	8.4	647	7.5	433	7.3	634	8.8
Social sciences	1,235	18.2	1,235	18.5	1,445	16.8	1,002	19.0	1,228	17.2
Humanities	652	9.6	659	11.5	633	7.3	465	7.9	649	9
Business sector	**1,097 (16%)**	**100**	**967 (14%)**	**100**	**1,253 (14%)**	**100**	**913 (15%)**	**100**	**1,015 (14%)**	**100**
Natural sciences	341	31	180	18.6	305	24.3	327	35.8	246	24.2
Technical sciences	717	65.3	749	75.9	862	68.7	493	53.9	549	54
Biomedical sciences	22	2	22	2.2	23	1.8	22	2.4	63	6.2
Biotechnological sciences	17	1.5	16	1.6	63	5.0	71	7.7	154	15.1
Social sciences	-		-		-	-	-		3	0.2
Humanities	-		-		-	-	-		-	
Government	**1,733 (25%)**	**100**	**1,793 (27%)**	**100**	**2,022 (23%)**	**100**	**2,158 (37%)**	**100**	**2,420 (34%)**	**100**
Natural sciences	703	40.5	716	39.9	726	35.9	712	32.9	774	31.9
Technical sciences	12	0.7	15	0.8	14	0.7	2	0.09	70	2.9
Biomedical sciences	354	20.4	215	11.9	578	28.5	719	33.3	604	24.9
Biotechnological sciences	131	7.6	152	8.4	127	6.2	125	5.7	149	6.1
Social sciences	327	18.8	376	20.9	328	16.2	352	16.3	524	21.6
Humanities	206	11.8	219	12.2	249	12.3	248	11.5	299	12.3
Tertiary education	**3,942 (58%)**	**100**	**3,896 (58%)**	**100**	**5,297 (62%)**	**100**	**2,790 (48%)**	**100**	**3,705 (52%)**	**100**
Natural sciences	325	10.7	321	8.2	332	6.2	267	9.5	334	9
Technical sciences	1,377	34.9	1,322	33.9	1,752	33.0	777	27.8	1,090	29.4
Biomedical sciences	505	12.8	561	14.3	1,255	23.6	642	23.0	899	24.2
Biotechnological sciences	381	9.6	393	10.0	457	8.6	237	8.5	331	8.9
Social sciences	908	23.0	859	22.0	1,117	21	650	23.2	701	18.9
Humanities	446	11.3	440	11.2	384	7.2	217	7.7	350	9.4

Source: CBS, Annual Reports

Figure 5.3 Number of researchers (FTE) per 000 labour force in 2003



Source: EU 25, Japan and US: Towards a European Research Area - Science, Technology and Innovation, Key, Figures 2005; Croatia: CBS Annual report (calculation by the author)

Note: Researchers are persons with postgraduate degree (doctors and masters of science) or, exceptionally, persons with bachelor's degree only who are actively engaged in the research and development. Full-time equivalent (FTE) express the number of persons who are actively involved in R&D by calculating person-years spent on R&D. For example, FTE for two persons who spend 8 month on R&D activities with 25% of their working time is calculated by the following formula: 2 x 0,66 x 0,25.[81]

The oscillations in number of researchers, especially in 2002 and 2003 are caused by the changed method of calculating FTE. In addition, the estimation of persons-years spent on R&D is made by administrators in research institutions that provide data that may cause the significant differences in calculation from year to year.

81 The example is taken from the Methodological guidelines for preparation of annual reports on R&D of CBS Croatia, Zagreb 2003

Table 5.3 Early stage researchers, 1996 - 2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
By scientific fields									
Natural sciences	290	300	343	351	400	473	501	462	537
Technical sciences	240	300	354	355	406	511	549	502	575
Biomedical sciences	142	191	233	240	266	369	391	399	470
Biotechnical sciences	63	86	99	93	134	165	178	180	225
Social sciences	88	97	138	138	208	334	379	356	406
Humanities	92	128	161	162	193	251	299	331	389
Total	**915**	**1,102**	**1,328**	**1,339**	**1,607**	**2,103**	**2,297**	**2,230**	**2,602**
By sectors									
Government (public institutes)	228	277	358	358	432	515	547	506	584
Tertiary education sector	616	724	857	861	1,037	1,429	1,590	1,573	1,862
Other research institutions (CASA, hospitals, private sector…)	71	101	113	120	138	159	160	151	156
Total	**915**	**1,102**	**1,328**	**1,339**	**1,607**	**2,103**	**2,297**	**2,230**	**2,602**

Source: CBS

Table 5.4 R&D expenditures by main sectors of performance (in million EUR)

Year	GDP	GERD		Business sector (BERD)		Higher education (HERD)		Government (GOVERD)	
		Total	% GDP	Total	% GDP	Total	% GDP	Total	% GDP
1997	17,790	140.933	**0.77**	45.762	**0.25**	47.198	**0.26**	47.973	**0.26**
1998	19,281	134.413	**0.71**	47.060	**0.25**	51.642	**0.27**	35.71	**0.19**
1999	18,679	191.474	**0.98**	80.175	**0.43**	64.45	**0.34**	39.289	**0.21**
2000	19,976	268.834	**1.23**	113.049	**0.56**	83.811	**0.41**	54.05	**0.27**
2001	22,177	243.887	**1.07**	101.351	**0.44**	87.287	**0.38**	55.248	**0.24**
2002	24,220	274.836	**1.12**	115.662	**0.47**	95.102	**0.39**	60.357	**0.24**
2003	25,526	290.693	**1.14**	113.710	**0.44**	114.439	**0.45**	63.86	**0.25**
2004	28,367	354.341	**1.24**	147.587	**0.52**	132.08	**0.46**	74.128	**0.26**

Source: CBS, Calculation by the author

Note:

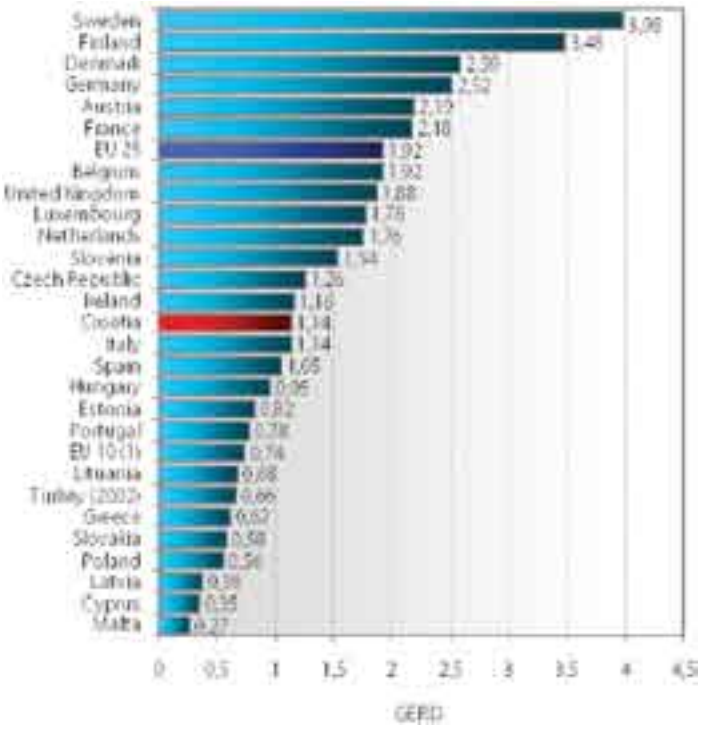
GERD – Gross domestic expenditures on R&D

BERD – Expenditure on R&D in the business enterprie sector

HERD – Expenditure on R&D in the higher education sector

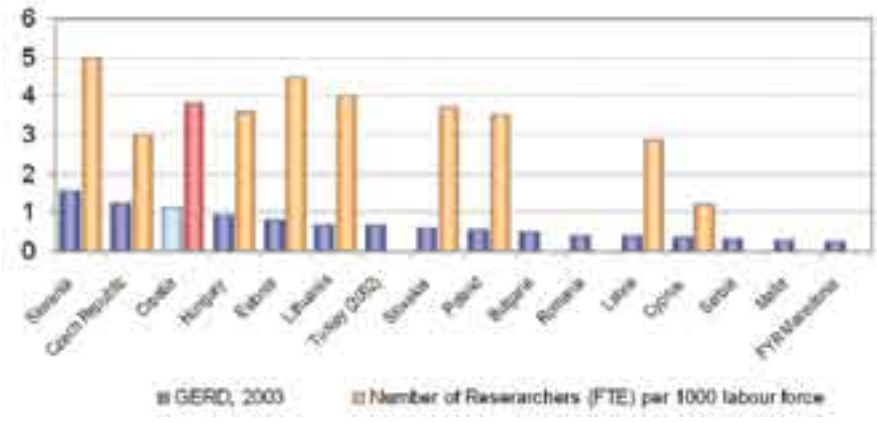
GOVERD – Government intramural expenditure on R&D

Figure 5.6 Gross domestic expenditure on R&D (GERD), 2003



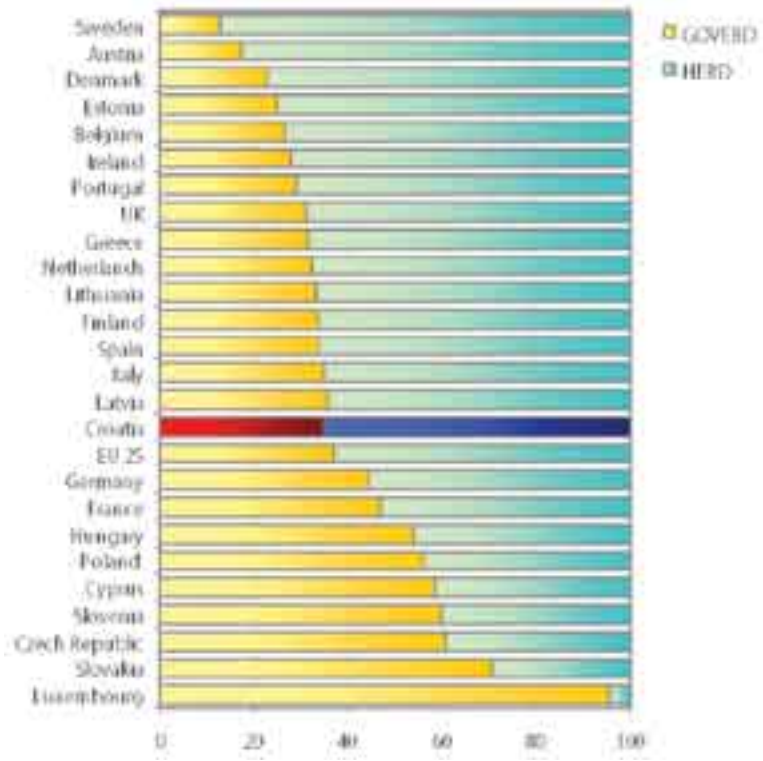
Source: Eurostat. For FYR Macedonia and Serbia: Milica Uvalić, National Systems of RTD in the Western Balkans, SEE-ERA-NET Conference, Zagreb, December 15-16, 2005. For Turkey: Main S&T indicators, OECD, 2005/2

Figure 5.7 Research intensity in Croatia and referent countries (in %), 2003



Source: Eurostat. For FYR Macedonia and Serbia: Milica Uvalić, National Systems of RTD in the Western Balkans, SEE-ERA-NET Conference, Zagreb, December 15-16, 2005

Figure 5.9 Shares of Government and higher education R&D expenditure in total public expenditure on R&D (%), 2003



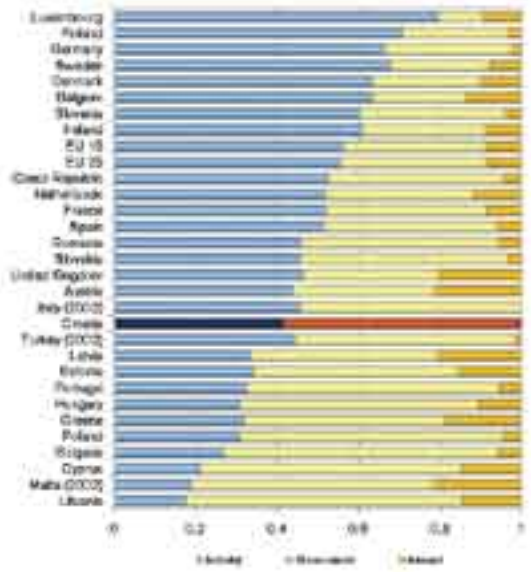
Source: Towards a European Research Area: Science, Technology and Innovation, Key Figures 2005

Table 5.5 GERD by source of funds

Year	Source	BERD	GOVERD	HERD	GERD
1997	**Total, HRK 000**	**311,182**	**326,218**	**320,951**	**958,351**
	Own resources	89.60%	14.60%	20.70%	41.00%
	Central and local government	1.60%	71.00%	65.70%	46.70%
	Private and public enterprises	6.90%	2.20%	9.60%	6.20%
	Other domestic resources	0.80%	1.30%	1.90%	1.30%
	Foreign investors	1.10%	10.90%	2.20%	4.80%
1998	**Total, HRK 000**	**343,540**	**260,683**	**376,992**	**981,215**
	Own resources	88.07%	13.08%	20.48%	42.18%
	Central and local government	0.45%	79.19%	64.97%	46.16%
	Private and public enterprises	10.66%	5.18%	13.17%	10.17%
	Other domestic resources	0.27%	1.68%	0.32%	0.66%
	Foreign investors	0.55%	0.87%	1.06%	0.83%
1999	**Total, HRK 000**	**609,337**	**298,602**	**489,822**	**1,397,761**
	Own resources	83.14%	14.61%	19.98%	46.37%
	Central and local government	2.40%	80.35%	69.58%	42.60%
	Private and public enterprises	11.40%	2.73%	7.72%	8.26%
	Other domestic resources	2.47%	0.96%	1.96%	1.97%
	Foreign investors	0.59%	1.34%	0.76%	0.81%
2000	**Total, HRK 000**	**847,874**	**405,382**	**628,583**	**1,881,839**
	Own resources	72.64%	15.84%	15.16%	41.20%
	Central and local government	202%	80.01%	77.52%	44.04%
	Private and public enterprises	10.66%	2.86%	6.21%	7.50%
	Other domestic resources	3.87%	0.91%	0.07%	1.96%
	Foreign investors	10.80%	0.39%	1.04%	5.30%
2001	**Total, HRK 000**	**739,868**	**594,836**	**637,200**	**1,780,379**
	Own resources	88.20%	87.24%	19.77%	47.37%
	Central and local government	2.47%	2.16%	72.82%	44.65%
	Private and public enterprises	8.21%	9.27%	6.30%	6.47%
	Other domestic resources	0.27%	0.34%	0.05%	0.45%
	Foreign investors	0.84%	0.99%	1.06%	1.06%
2002	**Total, HRK 000**	**855,902**	**446,643**	**703,762**	**2,006,307**
	Own resources	87.49%	15.68%	18.14%	47.18%
	Central and local government	1.83%	77.30%	71.00%	42.89%
	Private and public enterprises	7.51%	1.46%	9.66%	6.92%
	Other domestic resources	0.62%	3.96%	0.87%	1.49%
	Foreign investors	2.55%	1.60%	0.33%	1.56%
2003	**Total, HRK 000**	**864,196**	**485,336**	**859,742**	**2,209,274**
	Own resources	87.68%	17.19%	21.53%	46.45%
	Central and local government	1.58%	78.79%	66.16%	43.67%
	Private and public enterprises	7.62%	1.49%	8.19%	6.49%
	Other domestic resources	0.40%	0.70%	2.25%	1.18%
	Foreign investors	2.72%	1.83%	1.87%	2.20%
2004	**Total, HRK 000**	**1,077,390**	**541,141**	**968,155**	**2,586,686**
	Own resources	48.84%	15.42%	20.98%	31.42%
	Central and local government	1.73%	77.75%	70.49%	43.37%
	Private and public enterprises	44.29%	3.72%	7.03%	21.87%
	Other domestic resources	0.58%	1.38%	0.72%	0.80%
	Foreign investors	4.57%	1.74%	0.78%	2.56%

Source:CBS

Figure 5.11 GERD by main source of funds (in %), 2003



Source: Eurostat

Figure 5.12 GERD by main sectors of performance (%), 2003

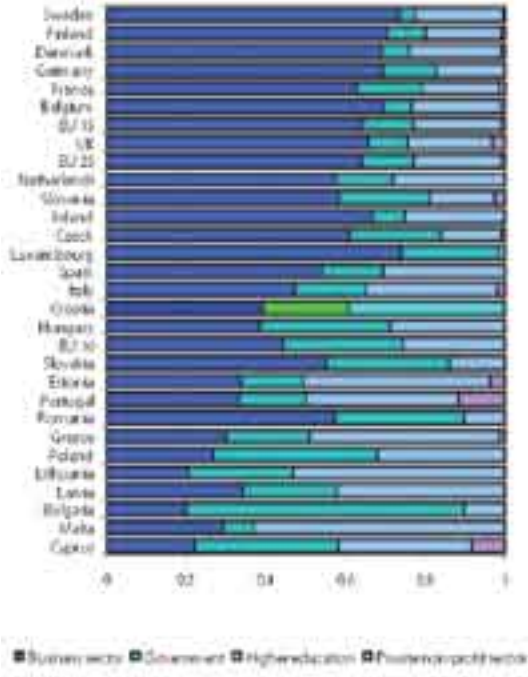
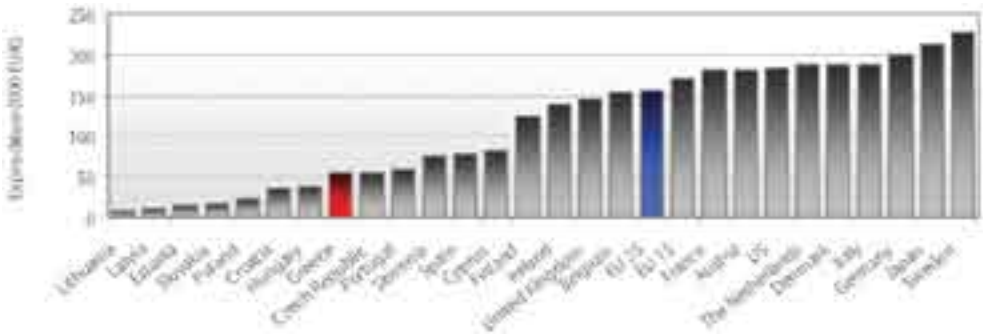
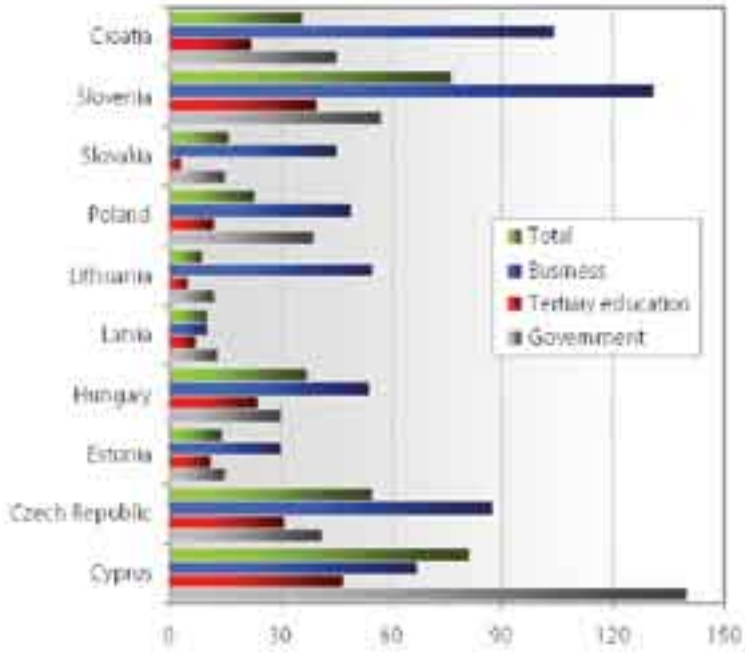


Figure 5.14 Expenditures per researchers (in 000 EUR), 2001



Source: Towards a European Research Area - Science, Technology and Innovation, Key, Figures 2005; Croatia – CBS

Figure 5.15 Expenditures per researchers in Croatia and the new Member States, 2001 (in 000 EUR)



Source: Towards a European Research Area - Science, Technology and Innovation, Key, Figures 2005: Croatia – CBS, Calculation by the author

Table 5.6 Number of published research works* by sector of performance and place of publishing

	2000			2001			2002			2003			2004		
	Total	Inside Croatia	Foreign countries	**Total**	Inside Croatia	Foreign countries	**Total**	Inside Croatia	Foreign countries	**Total**	Inside Croatia	Foreign countries	**Total**	Inside Croatia	Foreign countries
All sectors	**8,841**	6,157	2,792	**7,180**	4,949	2,375	**8,645**	6,092	2,793	**9,779**	6,100	3,963	**10,900**	6,541	4,646
Business sectors	**374**	297	86	**533**	462	126	**525**	468	108	**473**	392	140	**480**	232	249
Government	**2,660**	2,227	459	**2,098**	1,627	488	**1,963**	1,545	445	**2,956**	1,950	1,125	**3,458**	2,222	1,391
Higher education	**5,807**	3,633	2,247	**4,549**	2,860	1,761	**6,157**	4,079	2,240	**6,350**	3,758	2,698	**6,962**	4,087	3,006

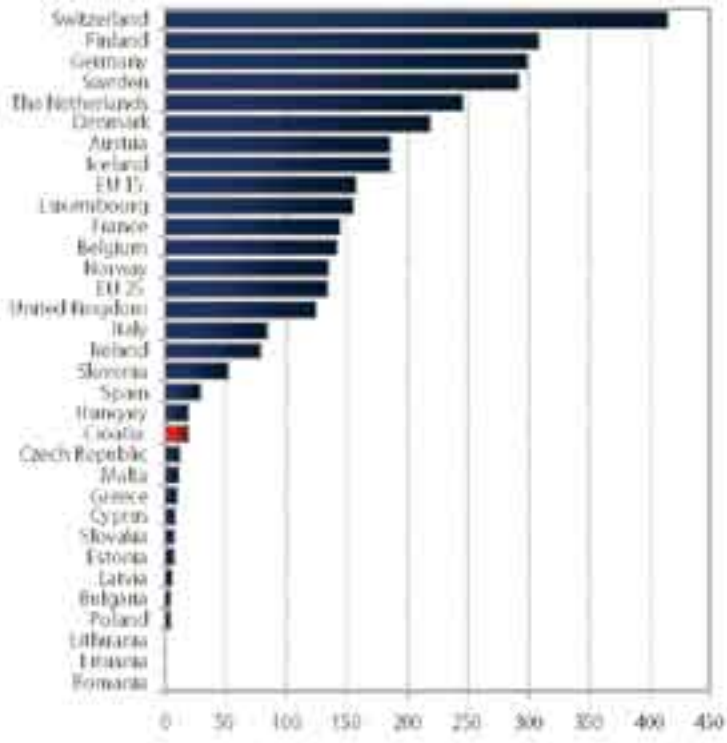
*Note: CBS registers as all publications that are published in Croatia or foreign countries. The same research work can be published both in Croatia and abroad.

Table 5.7 Number of patent applications and granted patents at the State Intellectual Property Office of the Republic of Croatia

	1998	1999	2000	2001	2002	2003	Total
Business sector							
Patent applications	26	17	23	25	26	39	156
Patent granted	18	15	10	11	5	3	62
Government sector							
Patent applications	4	0	7	0	3	4	18
Patent granted	4	4	0	0	2	-	10
Higher Education sector							
Patent applications	5	3	0	3	1	3	15
Patent granted	2	1	0	2	2	2	9
Total	**59**	**40**	**40**	**41**	**39**	**51**	**270**

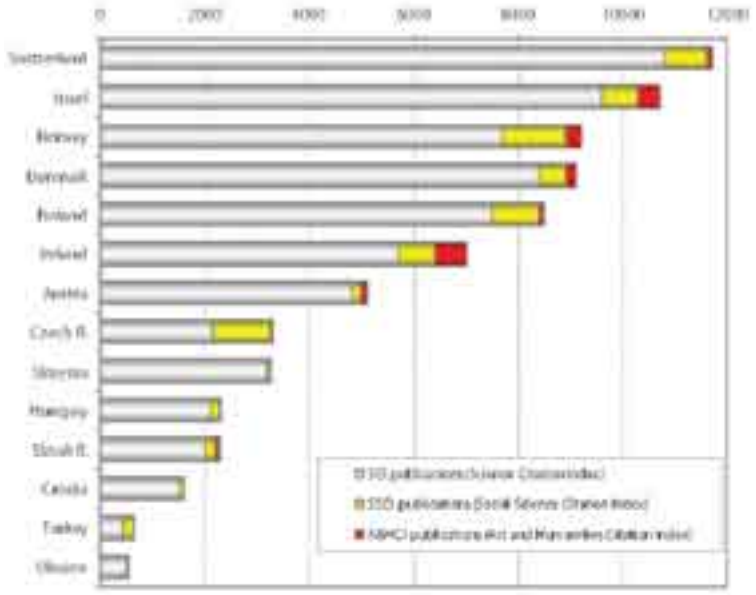
Source: CBS

Figure 5.17 Number of patent applications to the European Patent Office (EPO) per million inhabitants, 2002



Source: EUROSTAT

Figure 5.18 Croatian scientific production – number of cited scientific publications per million population (1996-2000)



Source: National and University Library.

Table 5.8 MoSES budget plans for research projects and programs by scientific fields, comparison of 1996 and 2003 (in HRK)

	Budget resources foreseen by NSRP* 1996-1998		Project and programs funds according to contracts in 2003		Index 1996/2004
	Total	%	Total	%	
Natural sciences	18,500,000	25.34	30,871,000	24.83	168
Technical sciences	19,500,000	26.71	22,893,000	17.42	118
Biomedical sciences	14,500,000	19.86	35,070,000	28.21	246
Biotechnical sciences	8,770,000	12.01	11,958,000	9.62	140
Social sciences	6,730,000	9.22	11,300,000	9.09	182
Humanities	6,020,000	6.87	12,214,000	9.83	253
Total	**73,020,000**	**100.00**	**124,306,000**	**100.00**	**171**

Source: MoSES, 2005

* National Scientific and Research Program (1996-1998).

Table 5.9 Policy measures of the Croatian innovation program HITRA

Sub-Program	Type of projects	Targets of the policy measures
TEST (pre-commercial projects)	"Simple" technology projects (TP)	Development of the commercially promising products, processes and services prior to their commercial use up to the stage of original solutions (prototype/pilot stage).
	"Cooperative" technology projects (STIRP)	Development of the multidisciplinary, cooperative research for launching new or developing the existing technological areas.
	Nucleus (Jezgre)	Research and technological nucleus aimed at concentration of R&D resources (experts, equipment, instruments) both from public and private sector to gain critical mass for technology and research based services.
RAZUM (company's development)	Knowledge-based companies	Development of the knowledge-based companies at the start-up or expansion phase, aimed at the commercialization of research by entrepreneurial projects.

Source: MoSES

Table 5.10 Expenditure of HITRA program compared to some R&D and TE expenditures of MoSES (in 000 HRK)

	2001		2002		2003		2004	
	Total	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**
MoSES total expenditure	2,320,209.17	100	2,488,131.20	100	2,664,972.38	100	2,725,342.33	100
Higher education	1,341,181.51	57.8	1,453,163.10	58.4	1,688,450.41	63.3	1,795,426.76	65.9
Scientific research	644,931.92	27.8	757,119.01	30.4	751,187.12	28.2	698,717.83	25.6
Technology development	57,250.00	2.47	56,354.22	2.26	63,274.87	2.37	58,626.05	2.15
a. RAZUM	19,411.73	0.83	18,057,27	0.72	27,135.49	1.01	18,677.91	0.68
b. TEST	21,226.88	0.91	21,540.31	0.86	25,144.82	0.94	33,527.08	1.23
Total TEST and RAZUM	40,638.61	1.7	39,597.58	1.59	52,280.32	1.96	52,204.99	1.91

Source: Answers of the Government of the Republic of Croatia to the Questionnaire of the European Commission, October 2003, www.vlada.hr

CHAPTER 6

ACHIEVING EQUALITY IN AND THROUGH TERTIARY EDUCATION

Table 6.1 Number of students who completed secondary school and entered into the tertiary education system

School year	Total population aged 18, mid-year estimate[1]	Those who completed secondary school[2]	Total number of those who completed secondary school and enrolled in the first year of studies	Percentage of secondary school pupils who enroll in the tertiary education system	Percentage of those aged 18 and enrolled in the first year / total population of that age (percentage of relevant age group)
1995/96	63,794	45,088	23,711	52.59	37.17
1996/97	61,358	48,498	25,473	52.52	41.52
1997/98	62,435	51,005	27,369	53.66	43.84
1998/99	61,461	51,165	27,234	53.23	44.31
1999/00	62,255	50,928	31,016	60.90	49.82
2000/01	60,520	49,081	31,690	64.57	52.36
2001/02	59,820	48,203	33,447	69.39	55.91
2002/03	58,800	47,057	34,968	74.31	59.47
2003/04	58,320	47,092	34,466	73.19	59.10

Source: CBS

Notes:

1) For 2003, an estimate was given at the beginning of the year.
2) Since 1996, this includes the data on children and youth with development difficulties and religious grammar schools.

Table 6.2 Students enrolled in tertiary education institutions (ISCED 5+6)*

Year	Institutions of tertiary education	Students enrolled						Number of students per 000 inhabitants
		Total	Female students	Female students %	Full-time students			
					Total	Female students	Female students %	
1993/94	63	82,361	39,239	47.6	72,678	35,019	48.2	17
1994/95	64	82,251	40,362	49.1	75,502	37,296	49.4	17
1995/96	65	86,357	42,117	48.8	75,285	37,673	50.0	18
1996/97	68	85,752	43,563	50.8	75,119	38,618	51.4	19
1997/98	69	90,021	45,291	50.3	74,464	38,852	52.2	20
1998/99	94	95,889	50,726	53.0	75,200	40,476	53.8	20
1999/00	93	100,144	52,634	52.7	77,690	41,573	53.5	21
2000/01	93	104,078	54,637	52.5	79,802	42,253	52.9	24
2001/02	95	112,537	59,028	52.6	83,083	44,098	53.1	25
2002/03	100	121,722	64,749	53.4	86,582	46,641	53.9	27
2003/04	102	126,322	67,828	53.8	88,991	48,140	54.1	28

Source: CBS

Explanatory note:

* According to the International Standard Classification of Education (ISCED), that was approved by the UNESCO General Conference in 1997 (ISCED 1997), levels of tertiary education correspond to educational level in Croatian teritary education system as follows:

ISCED 5A - scientific (university) studies that had a minimum theoretical duration of three years', typically of 4 or more years. This level includes all the research programmes which are not part of a doctorate, such as any type of Master's degree.

ISCED 5B - professional studies, more practically oriented and occupationally specific do not provide direct access to advanced research programmes and had minimum of two years' full-time equivalent duration, but generally of 2 or 3 years.

ISCED 6 - Second stage of tertiary education (leading to an advanced research qualification) – doctoral studies.

Table 6.3 Students in tertiary education enrolled for the first time in the 1st year

Academic year	Total number of enrolled students ISCED 5A+B	Total number of students who enrolled in the first year of studies for the first time	Re-enrolled (repeating 1st year)	Total number of enrolled students in the 1st year of studies with those repeating	Enrolled students in the 1st year of studies		Re-enrolled students in the 1st year of studies	
					ISCED 5A	ISCED 5B	ISCED 5B	ISCED 5A
1991/92	68,720	23,368	4,065	27,433	19,506	7,927	1,464	2,601
1992/93	75,514	22,827	6,460	29,287	19,942	9,345	2,386	4,074
1993/94	80,410	24,496	8,666	33,162	21,977	11,185	3,659	5,007
1994/95	82,251	23,165	7,892	31,057	20,856	10,201	3,032	4,860
1995/96	86,357	23,978	7,621	31,599	20,085	11,514	3,941	3,680
1996/97	85,752	25,860	6,769	32,629	21,118	11,511	2,675	4,094
1997/98	90,021	27,860	7,852	35,712	22,171	13,541	3,379	4,473
1998/99	95,889[a]	27,546	7,393	34,939	23,940	10,999	2,155	5,238
1999/00	100,144	31,377	8,181	39,558	25,108	14,450	2,315	5,866
2000/01	104,168	32,091	9,433	41,524	25,132	16,392	2,835	6,598
2001/02	112,537	33,958	10,080	44,038	25,374	18,664	3,094	6,986
2002/03	121,456	35,511	11,714	47,225	26,038	21,187	3,235	8,479
2003/04	125,781[b]	35,073	12,418	47,491[c]	26,813	20,678	4,664	7,754

Source: CBS

Note

a) From 98/99 ISCED 5 has included numbers of students studying for the master's degree.

b) Include also ISCED 5A second degree.

c)Total number of students who completed a four-year secondary school or another equivalent school.

Table 6.4 Distribution of the total number of students (ISCED 5A 1st/5B) enrolled in tertiary education institutions according to types of studies and payment (in %)

Academic year	Full-time students			Part-time students
	With MoSES support	They pay themselves	Foreign students	
1993/94	88	4	…	8
1994/95	86	6	…	7
1995/96	78	12	…	10
1996/97	76	13	…	11
1997/98	68	15	…	17
1998/99	65	18	…	17
1999/00	63	18	…	19
2000/01	59	23	…	18
2001/02	54	25	0.1	21
2002/03	50	24	0.1	26
2003/04	47	25	0.2	28

Source: MoSES

Table 6.5 Gross Enrolment Ratio (GER), ISCED 5+6

Academic year	GER* Both sexes	GER Men	GER Women	GPI** for GER
1994/95	24.6	24.8	24.5	0.98
1995/96	26.6	26.9	26.2	0.98
1996/97	28.1	27.2	29.0	1.07
1997/98	29.0	28.4	29.7	1.00
1998/99	31.4	29.1	33.8	1.16
1999/00	32.4	30.3	34.6	1.14
2000/01	34.3	31.9	36.6	1.15
2001/02	36.8	34.3	39.4	1.15
2002/03	39.7	36.4	43.1	1.18
2003/04	41.3	37.4	45.2	1.21

Source: CBS

Explanatory note: Definition

* Gross enrolment ratio (GER). Number of pupils enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the theoretical age group for the same level of education.

** Gender parity index (GPI). Ratio of the female-to-male value of a given indicator. A GPI of 1 indicates parity between sexes; a GPI that varies between 0 and 1 means a disparity in favor of males; whereas a GPI greater than 1 indicates a disparity in favor of females.

Table 6.6 Students enrolled in tertiary education institutions by type of institution

Academic year	Total	Universities					Non-university tertiary institutions		
		Total	Schools of professional higher education	Faculties			Total	Polytechnics	Schools of professional higher education
				Professional study	University study	Art academies			
1992/93	77,689	77,024	2,326	15,021	58,939	738	665	-	494
1993/94	82,361	81,709	3,362	15,465	62,141	741	652	-	442
1994/95	82,251	82,049	2,660	15,612	63,017	760	202	-	-
1995/96	86,357	86,133	4,141	16,440	64,759	793	224	-	-
1996/97	85,752	85,595	1,000	18,200	65,620	775	157	-	-
1997/98	90,021	87,317	848	19,408	66,063	998	2,704	702	1,839
1998/99	91,874	79,505	2,743	8,321	67,443	998	12,369	6,026	6,239
1999/00	96,798	77,612	3,960	3,006	69,598	1,048	19,186	12,140	6,963
2000/01	100,297	74,930	4,646	513	68,774	997	25,367	18,238	7,039
2001/02	107,911	82,709	3,968	7,165	70,635	941	25,202	16,024	9,070
2002/03	116,434	89,450	4,582	10,214	73,640	1,014	26,984	17,470	9,399
2003/04	120,822	97,414	4,493	16,021	75,847	1,053	23,408	13,198	10,102

Source: CBS

Table 6.7 Enrolled students by tertiary education institutions, total and 1st year

	1995/96		1996/97		1997/98		1998/99		1999/00		2000/01*		2001/02		2002/03		2003/04	
	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year
All Institutions	86,357	32,180	85,752	32,629	90,021	35,712	91,874	34,939	96,798	39,558	100,297	41,524	107,911	44,038	116,434	47,225	120,822	47,491
SPHE	4,141	2,851	1,000	606	848	498	269	-	146	-	136	-	-	-	-	-	-	-
Polytechnics	-	-	-	-	702	440	6,026	5,697	12,140	8,580	18,238	10,947	16,024	7,758	17,470	8,937	13,198	6,538
University institutions	-	-	-	-	5,732	3,066	8,713	4,696	10,777	5,222	11,549	5,381	13,038	5,655	13,981	5,798	14,595	5,669
Faculties	79,274	28,519	82,280	31,302	79,993	30,955	74,395	23,860	71,207	25,011	69,377	24,964	77,908	30,395	83,969	32,233	91,976	35,000
professional study	16,155	8,663	17,961	10,754	16,239	9,433	8,121	504	2,809	541	537	125	7,200	5,251	10,240	6,452	16,039	8,471
university study	63,119	19,856	64,319	20,548	63,754	21,522	66,274	23,356	68,398	24,470	68,840	24,839	70,708	25,144	73,729	25,781	75,937	26,529
Art academies	793	229	775	223	998	263	998	266	1,048	261	997	232	941	230	1,014	257	1,053	284
Theological schools	2,149	581	1,697	498	1,748	490	1473	420	1,480	484	-	-	-	-	-	-	-	-

Source: CBS

Table 6.8 Students enrolled by ISCED fields of education - total and proportion, percentage of female students

ISCED fields of education	2003/2004		2002/2003		2001/2002		2000/2001		1999/2000	
	Total	% female	Total	% female	Total	% female	Total	% female	Total	% female
Total	**120,822**	**53.8**	**116,434**	**53.4**	**107,911**	**52.5**	**100,297**	**52.5**	**96,753**	**52.7**
Teacher training	6,011	93.2	5,506	93.4	4,804	93.2	4,978	93.5	3,991	94.3
Education science	455	82.2	442	72.4	306	63.7	273	61.9	6,323	71.3
Arts	2,826	63.6	2,735	63.2	1,995	65.9	2,176	69.0	1,173	59.4
Humanities	8,690	73.2	9,023	73.6	8,612	73.6	8,499	74.5	6,346	73.6
Social and behavioral science	2,277	71.0	2,381	71.8	2,157	73.3	1,760	75.0	2,055	75.2
Journalism and information	2,175	71.5	1,453	68.5	1,530	66.5	1,240	66.6	1,177	66.7
Business and administration	26,286	61.3	23,174	63.2	18,782	63.1	17,207	63.3	14,666	61.9
Law	13,814	66.4	13,999	67.3	12,739	66.9	12,888	67.5	12,759	67.2
Life sciences	1,274	80.5	1,291	80.9	1,264	79.8	590	81.5	676	79.4
Physical sciences	1,792	49.7	1,801	50.0	1,734	51.2	1,681	52.2	1,662	38.1
Mathematics and statistics	1,815	62.7	1,686	62.5	1,261	58.4	1,185	57.2	219	57.5
Computing	2,813	15.0	2,975	18.2	2,893	17.4	2,393	16.5	1,276	16.8
Engineering & engineering trades	11,770	12.9	10,964	12.3	11,871	15.8	11,414	15.6	11,090	15.9
Manufacturing and processing	3,904	54.3	3,988	53.6	3,105	56.7	2,847	52.9	3,076	58.0
Architecture and building	4,942	30.1	4,829	29.7	4,943	30.2	4,846	29.9	4,809	31.2
Agriculture, forestry and fishery	3,743	43.7	3,556	42.8	3,461	43.5	3,404	41.8	2,993	42.5
Veterinary	592	52.0	579	48.9	568	49.8	619	48.5	649	45.8
Health	8,081	72.3	7,815	70.9	8,377	71.7	6,426	69.7	5,780	67.9
Social services	851	90.8	781	90.8	693	90.5	607	90.4	608	91.1
Personal services	5,521	47.9	5,404	45.9	5,037	45.4	4,687	47.2	4,701	54.5
Transport services	8,868	21.8	8,903	20.2	8,484	20.3	7,381	16.6	7,261	17.8
Environmental protection	390	44.9	469	39.0	348	40.2	197	48.7	116	79.3
Security services	1,932	24.3	2,680	23.2	2,947	22.6	2,999	27.2	3,347	24.0

Source: CBS

Table 6.9 Enrolled students by tertiary education institutions and fields of study

	1996/97		1997/98		1998/99		1999/00		2000/01*		2001/02		2002/03		2003/04	
	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year
All Institutions	**85,752**	**32,629**	**90,021**	**35,712**	**91,874**	**34,939**	**96,798**	**39,558**	**100,297**	**41,524**	**107,911**	**44,038**	**116,434**	**47,225**	**120,822**	**47,491**
SPHE	**1,000**	**606**	**848**	**498**	**269**	-	**146**	-	**136**	-	-	-	-	-	-	-
Technical	699	421	592	350	269	-	146	-	136	-	-	-	-	-	-	-
Biotechnical	301	185	256	148	-	-	-	-	-	-	-	-	-	-	-	-
Social sciences	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polytechnics	-	-	**702**	**440**	**6,026**	**5,697**	**12,140**	**8,580**	**18,238**	**10,947**	**16,024**	**7,758**	**17,470**	**8,937**	**13,198**	**6,538**
University institutions	-	-	**5,732**	**3,066**	**8,713**	**4,696**	**10,777**	**5,222**	**11,549**	**5,381**	**13,038**	**5,655**	**13,981**	**5,798**	**14,595**	**5,669**
Technical	-	-	183	78	1,414	657	1,647	891	1,915	1,135	1,635	866	1,754	856	1,777	833
Biomedical	-	-	655	404	713	338	777	434	1,209	611	2,385	861	1,701	508	2,137	863
Biotechnical	-	-	-	-	255	159	397	221	436	216	420	222	451	224	419	172
Social and Humanities	-	-	4,894	2,584	6,331	3,542	7,956	3,676	7,989	3,419	8,598	3,706	10,075	4,210	10,262	3,801
Universities	**82,280**	**31,302**	**79,993**	**30,955**	**74,395**	**23,860**	**71,207**	**25,011**	**69,377**	**24,964**	**77,908**	**30,395**	**83,969**	**32,233**	**91,976**	**35,000**
professional study	17,961	10,754	16,239	9,433	8,121	504	2,809	541	537	125	7,200	5,251	10,240	6,452	16,039	8,471
Technical sciences	8,720	4,494	8,221	4,062	3,894	22	2,066	446	57	-	2,525	1,635	2,941	1,790	4,091	2,179
Biomedical sciences	822	458	280	111	122	-	-	-	-	-	632	405	399	169	1,209	358
Biotechnical sciences	353	245	284	187	153	-	29	-	-	-	181	181	248	201	359	239
Social and Humanities	8,066	5,557	7,454	5,073	3,952	482	714	95	480	125	3,862	3,030	6,652	4,292	10,380	5,695

	1996/97		1997/98		1998/99		1999/00		2000/01*		2001/02		2002/03		2003/04	
	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year	total	1st year
university study	64,319	20,548	63,754	21,522	66,274	23,356	68,398	24,470	68,840	24,839	70,708	25,144	73,729	25,781	75,937	26,529
Natural sciences	2,936	1,129	2,809	1,154	2,909	1,327	2,907	1,329	2,367	1,216	3,086	1,436	3,238	1,451	3,732	1,501
Technical sciences	17,864	5,712	17,750	6,071	17,677	6,318	18,192	6,795	18,398	7,082	18,983	7,285	17,823	6,494	18,184	6,460
Biomedical sciences	5,043	985	4,809	935	4,689	967	4,712	953	4,693	957	4,615	945	5,157	1,183	5,117	1,245
Biotechnical sciences	3,833	1,134	4,007	1,267	3,684	1,458	3,391	1,516	3,334	1,481	3,299	1,390	4,153	1,758	4,270	1,749
Social s and Humanities	34,643	11,588	34,379	12,095	37,315	13,286	40,453	14,254	40,048	14,103	40,725	14,088	43,358	14,895	44,634	15,574
Art academies	**775**	**223**	**998**	**263**	**998**	**266**	**1,048**	**261**	**997**	**232**	**941**	**230**	**1,014**	**257**	**1,053**	**284**
Humanities	775	223	998	263	998	266	1,048	261	997	232	941	230	1,014	257	1,053	284
Theological schools*	**1,697**	**498**	**1,748**	**490**	**1,473**	**420**	**1,480**	**484**	**-**	-	-	-	-	-	-	-
Humanities	1,697	498	1,748	490	1,473	420	1,480	484	-	-	-	-	-	-	-	-

Source: CBS

Note:* since 2000/01 theological schools of HE have been represented as professional and university studies; ** according to NSKO.

Table 6.10 Number of enrolled students in S&T field per 000 inhabitants of the 20-29 age group

Year	2003/2004		2002/2003		2001/2002		2000/2001		1999/2000	
	total	female	total	female	total	female	total	female	total	female
Total No. of enrolled students	120,822	64,957	116,434	62,200	107,911	56,797	100,297	52,680	96,753	50,982
No. of students enrolled in S&T field	28,310	8,603	27,534	8,465	27,071	8,270	24,956	7,173	22,808	6,560
% of S&T students in total No. of enrolled students	23.4	13.2	23.6	13.6	25.1	14.6	24.9	13.6	23.6	12.9
No. of inhabitants in 20-29 age group, mid-year estimate	611,600	300,800	608,100	299,500	603,700	297,500	596,600	294,100	641,800	318,300
No. of enrolled students in S&T field per 000 inhabitants of the 20-29 age group	46.3	28.6	45.3	28.3	44.8	27.8	41.8	24.4	35.5	20.6

Source: CBS

Table 6.11 Number of foreign students

	2003/2004			2002/2003			2001/2002		2000/2001		1999/2000	
	Under-graduate	MSc	PhD	Under-graduate	MSc	PhD	Under-graduate	MSc	Under-graduate	MSc	Under-graduate	MSc
EU	196	35	5	135	49	3	126	37	156	32	161	39
Former Yugoslavia	2,758	121	12	2,340	132	7	2,250	132	2,247	132	2,275	128
Other countries	260	19	2	163	5	2	130	19	139	14	190	22
Total	**3,214**	**175**	**19**	**2,638**	**186**	**12**	**2,506**	**188**	**2,542**	**178**	**2,626**	**189**

Source: CBS

Table 6.12 Number of state grants supporting students

Year	Category of grants									Total
	A	B	C	D	D-1	E	F	G	I	
1996/97	700	150	150	-	-	-	-	-	-	1,000
1997/98	330	560	260	280	-	-	-	-	-	1,430
1998/99	322	522	167	439	-	-	-	-	-	1,450
1999/00	543	194	193	129	-	-	-	-	-	1,059
2001*	666	150	181	156	-	-	-	-	-	1,153
2002	1,015	378	204	349	-	1,085	-	-	-	3,031
2003	1,142	379	180	209	-	1,243	33	4	-	3,190
2004	1,362	434	180	284	13	1,552	82	16	53	3,976
2005	1,281	374	145	404	54	1,005	160	21	57	3,501

Source: MoSES

* Since 2001, grants have been awarded annually, not like stipends for academic year.

Explanatory note:

Categories of state grants:

A - state grant for specially gifted full-time undergraduate students

B - state grant for full-time students of teacher and professor undergraduate studies programs

C - state grant for full-time undergraduate students who intend to graduate and get employment in the areas of special government care or on islands

D - state grant for all full-time undergraduate students - Croatian Homeland War veterans, children of killed Croatian War veterans, the Homeland War disabled veterans and their children

D-1 state grant for all full-time undergraduate students – children of killed, died and missing persons, children of military and civilian war-disabled persons in peace time, and military and civilian war-disabled persons in peace time

E - state grant for other full-time undergraduate students (including monitoring the social status of students, i.e. providing additional points for: termination of the child allowance in 2001; for brothers and sisters attending school and for the income of the members of common household)

F - state grant for full-time undergraduate students from the city of Vukovar

G - state grant for full-time undergraduate students who were placed in social welfare homes or with adoptive families

H - application for the compensation of part of the tuition feesfor undergraduate students - Croatian Homeland War veterans, children of killed Croatian Homeland War veterans, the Homeland War disabled veterans and their children

I - application for awarding state grants for full-time undergraduate students with disabilities

Table 6.13 Student dormitories and student beneficiaries

Academic year	Dormitories	Total students	Female students	Index of the number of students accommodated in dormitories 1993/94 = 100	Number of students who were not accepted because of full capacities	Ratio number of grants/ number of students accommodated in student dormitories*
1993/94	12	8,817	4,087	100.0	7,328	-
1994/95	10	8,778	4,321	99.6	1,243	-
1995/96	10	8,707	4,406	98.8	1,153	-
1996/97	10	8,500	4,416	96.4	1,375	-
1997/98	10	8,955	4,848	101.6	1,039	0.11
1998/99	10	8,705	4,779	98.7	3,945	0.16
1999/00	10	8,756	4,963	99.3	4,389	0.17
2000/01	10	8,751	5,159	99.3	5,128	0.12
2001/02	10	8,864	5,282	100.5	5,103	0.13
2002/02	11	9,067	5,473	102.8	4,064	0.33
2003/04	12	9,080	5,592	103.0	5,213	0.35

Source: CBS

Note:

* number of grants from table 6.12.

Table 6.14 Graduated students according to education levels, ISCED 5+6

Year	ISCED 5A+B	Master's degree ISCED 5A	Doctor's degree ISCED 6	Total ISCED 5+6	o/w. women	% of women	% of grad. ISCED 5A+B	% of grad. Master's degree, ISCED5A	% of grad. ISCED6
1991	8,760	722	298	9,780	5,075	51.9	89.6	7.4	3.0
1992	7,918	567	234	8,719	4,827	55.4	90.8	6.5	2.7
1993	8,368	580	267	9,215	5,028	54.6	90.8	6.3	2.9
1994	8,491	596	217	9,304	5,157	55.4	91.3	6.4	2.3
1995	9,390	535	213	10,138	5,311	52.4	92.6	5.3	2.1
1996	11,510	605	352	12,467	6,500	52.1	92.3	4.9	2.8
1997	11,460	571	307	12,338	6,327	51.3	92.9	4.6	2.5
1998	13,286	568	339	14,193	7,535	53.1	93.6	4.0	2.4
1999	13,315	686	338	14,339	7,829	54.6	92.9	4.8	2.4
2000	13,510	679	280	14,469	7,951	55.0	93.4	4.7	1.9
2001	13,810	676	255	14,741	8,172	55.4	93.7	4.6	1.7
2002	14,868	777	314	15,959	9,022	56.5	93.2	4.9	2.0
2003	15,762	808	321	16,891	9,626	57.0	93.3	4.8	1.9

Source: CBS, annual reports.

Table 6.15 Graduated students by fields of study, ISCED 5+6

Year	Number of graduates						%				
	Natural sciences	Technical sciences	Biomedical sciences	Biotechnical sciences	Social sciences and humanities	Total	Natural sciences	Technical sciences	Biomedical sciences	Biotechnical sciences	Social sciences and humanities
1991	374	2,911	1,119	701	4,675	9,780	3.8	29.8	11.4	7.2	47.8
1992	286	2,532	1,356	614	3,931	8,719	3.3	29.0	15.6	7.0	45.1
1993	350	2,653	1,165	668	4,379	9,215	3.8	28.8	12.6	7.2	47.5
1994	420	2,635	1,172	588	4,489	9,304	4.5	28.3	12.6	6.3	48.2
1995	448	3,221	1,188	612	4,668	10,137	4.4	31.8	11.7	6.0	46.0
1996	531	3,622	1,553	791	5,970	12,467	4.3	29.1	12.5	6.3	47.9
1997	603	3,865	1,283	704	5,883	12,338	4.9	31.3	10.4	5.7	47.7
1998	625	4,135	1,473	673	7,287	14,193	4.4	29.1	10.4	4.7	51.3
1999	680	4,295	1,499	652	7,212	14,338	4.7	30.0	10.5	4.5	50.3
2000	582	3,957	1,317	615	7,778	14,469	4.0	27.3	9.1	4.3	53.8
2001	531	3,849	1,184	617	8,018	14,741	3.6	26.1	8.0	4.2	54.4
2002	563	3,487	1,389	436	8,846	15,959	3.5	21.8	8.7	2.7	55.4
2003	488	2,919	1,835	629	9,379	16,891	2.9	17.3	10.9	3.7	55.5

Source: CBS

Explanatory note:

Number of students enrolled and graduated by fields of science is done in accordance with Regulation of the fields of science (OG no. 29/97,135/97,8/00 and 30/00). New Regulation was drafted by the National Council for Science in May 2005 (OG 76/05).

Table 6.16 Graduated female students by fields of study, ISCED 5A+B

Year	Natural sciences		Technical sciences		Biomedical sciences		Biotechnical sciences		Social sciences and humanities		Polytechnics[1]		Total		% of females	Graduated in regular time[2]
	total	female	total	female	total	female	total	female	total	female	total	female	total	female	total	female
1991	192	115	2,729	765	841	581	600	244	4,398	2,970	...	...	8,760	4,675	53.4	15.4
1992	178	134	2,403	735	1,101	745	534	214	3,702	2,681	...	...	7,918	4,509	56.9	13.7
1993	209	148	2,521	773	933	648	556	210	4,149	2,876	...	...	8,368	4,655	55.6	10.5
1994	253	176	2,492	788	951	682	523	184	4,272	2,950	...	...	8,491	4,780	56.3	13.0
1995	300	213	3,079	902	983	680	564	214	4,464	2,971	...	...	9,390	4,980	53.0	11.6
1996	371	283	3,434	868	1,314	935	692	263	5,699	3,745	...	...	11,510	6,094	52.9	14.9
1997	487	347	3,691	954	1,074	766	634	233	5,574	3,652	...	...	11,460	5,952	51.9	13.4
1998	505	340	3,954	918	1,248	866	575	209	7,004	4,820	...	...	13,286	7,153	53.8	13.0
1999	500	332	4,116	1,049	1,208	888	605	229	6,886	4,850	...	...	13,315	7,348	55.2	15.5
2000	422	296	3,804	1,005	1,049	747	547	233	7,468	5,170	220	55	13,510	7,506	55.6	13.7
2001	382	250	3,670	901	1,009	762	539	234	7,668	5,354	542	250	13,810	7,751	56.1	14.9
2002	417	286	3,281	875	1,128	785	367	169	8,437	5,923	1,238	448	14,868	8,486	57.1	...
2003	317	201	2,709	631	1,555	1,102	549	293	8,991	6,282	1,641	606	15,762	9,115	57.8	...

Source: CBS, annual reports

Explanatory note:

1) Polytechnics are not divided into fields of science because within a Polytechnic can have programmes from different fields of science.

2) Until 1995 the numbers did not contain graduates form religious faculties.

Table 6.17 MSc and PhD graduates by fields of study

Year	MSc graduates (ISCED5A2nd)								PhD graduates (ISCED6)							
	Natural sciences	Technical sciences	Biomedical sciences	Biotechnical sciences	Social sciences and humanities	Total	o/w female	% of female	Natural sciences	Technical sciences	Biomedical sciences	Biotechnical sciences	Social sciences and humanities	Total	o/w female	% of female
1991	97	126	216	85	198	722	302	41.8	85	56	62	16	79	298	98	32.9
1992	77	86	178	58	168	567	242	42.7	31	43	77	22	61	234	76	32.5
1993	89	86	170	79	156	580	270	46.6	52	46	62	33	74	267	103	38.6
1994	123	100	178	50	145	596	291	48.8	44	43	43	15	72	217	86	39.6
1995	94	103	147	33	158	535	257	48.0	54	39	58	15	47	213	74	34.7
1996	98	125	155	49	178	605	278	46.0	62	63	84	50	93	352	128	36.4
1997	72	110	142	44	203	571	260	45.5	44	64	67	26	106	307	115	37.5
1998	75	108	143	68	174	568	248	43.7	45	73	82	30	109	339	134	39.5
1999	110	114	205	30	227	686	323	47.1	70	70	72	27	99	338	158	46.7
2000	106	113	198	44	218	679	314	46.2	54	40	70	24	92	280	131	46.8
2001	96	123	107	58	292	676	296	43.8	53	56	68	20	58	255	125	49.0
2002	88	143	173	47	326	777	385	49.6	58	63	88	22	83	314	151	48.1
2003	104	151	190	54	309	808	386	47.8	67	59	90	26	79	321	125	38.9

Source: CBS, annual reports

Table 6.18 Graduated students by ISCED fields of study, percentage of women, ISCED 5A1st+B

Field of study	2003		2002		2001		2000		1999	
	total	female	total	female	total	female	total	female	total	female
Total	**15,762**	**57.8**	**14,868**	**57.1**	**13,810**	**56.1**	**13,510**	**55.6**	**13,315**	**55.2**
Teacher training	1,425	95.6	1,250	95.4	1,283	94.8	1,148	94.5	691	94.9
Education science	102	63.7	38	73.7	20	70.0	28	75.0	844	81.4
Arts	479	64.1	444	66.9	360	68.9	361	67.9	185	66.5
Humanities	1,272	75.2	1,242	79.5	1,169	80.1	979	80.0	830	76.6
Social and behavioral science	255	74.5	271	74.9	190	69.5	190	71.6	212	72.6
Journalism and information	329	75.4	,207	76.3	144	76.4	137	81.0	130	73.8
Business and administration	3,156	65.6	3070	65.8	2,336	67.4	2,071	65.9	2,117	65.4
Law	1,231	70.1	1,111	67.5	1,105	67.4	1,131	66.1	920	70.1
Life sciences	179	82.7	221	86.4	217	85.3	212	88.7	131	78.6
Physical sciences	185	53.0	237	55.7	177	54.2	227	59.5	295	41.7
Mathematics and statistics	89	64.0	130	67.7	124	66.9	176	70.5	158	44.9
Computing	352	25.6	435	19.1	388	24.2	296	28.0	204	33.8
Engineering & engineering trades	982	9.4	1,179	11.8	1,333	17.2	1,420	16.9	1,554	14.2
Manufacturing and processing	315	71.4	316	63.9	334	62.3	429	65.7	430	70.0
Architecture and building	492	31.3	535	35.5	457	37.4	547	35.1	517	37.1
Agriculture, forestry and fishery	402	41.0	354	47.5	447	45.2	391	43.2	389	42.4
Veterinary	94	37.2	136	41.9	66	39.4	124	45.2	146	36.3
Health	1,512	73.7	1,067	74.9	1,046	76.2	1,082	71.9	1,208	73.5
Social services	106	92.5	177	92.7	-	-	87	95.4	99	98.0
Personal services	730	51.6	677	46.8	726	6.9	783	51.2	679	57.6
Transport services	1,340	15.4	1,319	17.1	1,483	16.0	1,268	15.5	1,280	18.1
Environmental protection	53	24.5	5	80.0	7	85.7	6	83.3	1	100.0
Security services	682	26.7	447	20.1	398	19.6	417	19.2	295	20.3

Source: CBS.

Table 6.19 Graduated students, ISCED 5A/5B

Year	No. of enrolled students	Total no. of graduated students ISCED 5A+B	% of total graduated students	Total no. of graduated students of university studies, ISCED 5A1st	No. of enrolled o/w female	% of total graduates in HE, female
1991/92	68,720	8,760	12.75	5,671	34,070	49.58
1992/93	75,514	7,918	10.49	5,073	36,179	47.91
1993/94	80,410	8,368	10.41	5,308	38,199	47.51
1994/95	80,185	8,491	10.59	5,542	39,214	48.90
1995/96	84,208	9,390	11.15	6,079	40,931	48.61
1996/97	85,752	11,510	13.42	7,679	32,629	38.05
1997/98	90,021	11,460	12.73	7,803	45,291	50.31
1998/99	91,874	13,286	14.46	8,867	34,939	38.03
1999/00	96,798	13,315	13.76	8,847	39,558	40.87
2000/01	100,297	13,510	13.47	8,884	52,680	52.52
2001/02	107,911	13,810	12.80	8,378	56,797	52.63
2002/03	116,434	14,868	12.77	9,415	62,200	53.42
2003/04	120,822	15,762	13.05	9,243	64,957	53.76

Source: CBS, annual reports

Explanatory note:

Gross graduation rates refer to the total number of graduates (the graduates themselves may be of any age) at the specified level of education divided by the population at the typical graduation age from the specified level.

In Croatia like as in a many countries, defining a typical age of graduation is difficult, however, because graduates are dispersed over a wide range of ages.

Table 6.20 Graduated students in science and technology per 000 inhabitants, aged 20-29

	2003/2004		2002/2003		2001/2002		2000/2001		1999/2000	
	total	female	total	female	total	female	total	female	total	female
Total number of tertiary graduates	15,762	9,115	14,868	8,486	13,810	7,751	13,510	7,506	13,315	7,348
Number of tertiary graduates in S&T	2,594	864	3,053	1,025	3,030	1,066	3,307	1,244	3,289	1,079
Share of tertiary graduates in S&T in total number of graduates (%)	16.5	9.5	20.5	12.1	21.9	13.8	24.5	16.6	24.7	14.7
Number of inhabitants aged 20-29, mid-year estimate of CBS	611,600	300,800	608,100	299,500	603,700	297,500	596,600	294,100	641,800	318,300
Number of tertiary graduates in S&T per 000 inhabitants aged 20-29	4.2	2.9	5.0	3.4	5.0	3.6	5.5	4.2	5.1	3.4

Source: CBS

CHAPTER 7

RESOURCING THE TERTIARY EDUCATION SYSTEM

Table 7.1 Teaching staff in tertiary education employed in full-time and/or part-time teaching in Croatia

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Teaching staff, both genders	6,169	6,325	6,030	6,253	6,748	7,563	7,701	7,622	8,132	7,917	8,764
Teaching staff, % female	33	34	34	34	35	34	35	35	37	37	
Full-time teaching staff, both genders	5,136	5,282	5,229	5,230	5,297	5,298	5,269	5,665	5,844	5,745	6,497
Full- time teaching staff, % female	35	36	36	36	37	37	38	37	40	40	
Teaching staff per 1,000 students	76.9	75.1	70.3	69.5	73.4	78.1	74.0	67.7	67.0	62.7	

Source: CBS, Bulletins

Note: Teaching staff includes total number of persons responsible for teching acitivities employed in full-time and part-time teaching in tertiary education.

Table 7.2 General structure of teaching staff (full-time and part-time) employed at tertiary education institutions

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Scientific/teaching positions	2,655	2,727	2,959	3,307	3,634	3,743	3,668	3,874	3,926	4,234
Teaching positions	975	934	967	1,104	1,197	1,206	1,078	1,332	1,339	1,446
Assistants	1,924	1,952	1,971	2,016	2,230	2,102	2,160	1,994	2,017	2,461
Associates	771	417	356	321	502	650	716	932	635	623
Total	**6,325**	**6,030**	**6,253**	**6,748**	**7,563**	**7,701**	**7,622**	**8,132**	**7,917**	**8,764**

Source: CBS, Bulletins

Note: Scientific/teaching positions include total number of persons in the following grades: full professor, associate professor and assistant professor.

Teaching positions include total number of persons in the following grades: professors at polytechnics, senior lecturer, lectures, senior lector, lector, senior corepetitor and corepetitor.

Assistants include total number of persons in the following grades: assistant and senior assistant.

Associates include total number of persons in the following professional grades: associate, senior associate and adviser.

Table 7.3 Structure of teaching staff at tertiary education institutions

	1996		1997		1998		1999		2000		2001		2002		2003		2004	
	Total	Full-time	Total	Full-time	Total	Full-time	Total	Full-time	Total	Full-time	Total	Full-time.	Total	Full-time.	Total	Full-time	Total	Full-time
Full professor	1,004	848	1,040	906	1,139	946	1,253	995	1,336	1,023	1,356	1,007	1,359	1,040	1,412	1,086	1,429	1,093
Associate professor	731	615	738	640	777	655	870	694	971	694	1,015	728	993	757	1,036	794	1,109	846
Assistant professor	920	785	949	834	1,043	878	1,184	929	1,327	941	1,372	959	1,316	992	1,426	1,049	1,388	1,021
All scientific-teaching positions	2,655	2,248	2,727	2,380	2,959	2,479	3,307	2,618	3,634	2,658	3,743	2,694	3,668	2,789	3,874	2,929	3,926	2,960
Professor at polytechnics	54	35	29	11	21	5	20	11	56	39	58	33	84	66	90	58	87	60
Senior lecturer	171	132	218	185	270	215	311	243	371	255	432	305	422	304	489	341	495	368
Lectures	630	473	559	384	544	369	606	364	648	331	614	327	459	296	640	321	654	285
Senior lector	29	29	31	30	50	50	52	52	55	55	38	38	43	43	52	52	47	47
Lector	76	67	81	64	69	58	68	59	57	48	52	43	55	45	49	35	40	24
Senior corepetitor	4	4	3	3	5	5	5	5	4	4	6	6	8	7	5	5	5	5
Corepetitor	11	7	13	10	8	5	42	39	6	3	6	2	7	3	7	3	11	8
All teaching positions	975	747	934	687	967	707	1,104	773	1,197	735	1,206	754	1,078	764	1,332	815	1,339	797
Senior assistant	296	252	281	259	355	326	383	316	443	334	443	324	471	354	437	326	430	336
Assistant	1,266	1,102	1,180	1,073	1,054	897	1,067	841	1,157	765	1,027	692	945	758	918	675	1,072	863
Joung assistant	362	334	491	446	562	505	566	484	630	504	632	503	744	658	639	554	515	430
Associates	363	347	417	384	356	316	321	265	502	302	650	302	716	342	932	545	635	359
Other	408	406																
All assistant positions	2,695	2,441	2,369	2,162	2,327	2,044	2,337	1,906	2,732	1,905	2,752	1,821	2,876	2,112	2,926	2,100	2,652	1,988
All teaching staff	6,325	5,436	6,030	5,229	6,253	5,230	6,748	5,297	7,563	5,298	7,701	5,269	7,622	5,665	8,132	5,844	7,917	5,745

Source: CBS, Annual reports

Table 7.4 Job titles and job complexity coefficients for tertiary education institutions

a) 1st category positions[82]

1.	dean of faculty or polytechnic (full professor, permanent grade; full professor, first election; associate professor; assistant professor; college professor).	
	a) more than 500 employees	3.50
	b) from 200 to 500 employees	3.40
	c) less than 200 employees	3.30
2.	vice-dean of faculty or polytechnic (full professor, permanent grade; full professor, first election; associate professor; assistant professor; college professor; senior lecturer).	
	a) more than 500 employees	3.30
	b) from 200 to 500 employees	3.25
	c) less than 200 employees	3.20
3.	head of university department (full professor, permanent grade; full professor, first election; associate professor; assistant professor)	3.25
4.	deputy head of university department (full professor, permanent grade; full professor, first election; associate professor; assistant professor)	3.20
5.	head of section, head of office (more than 20 employees)	
	- full professor, permanent grade	3.20
	- full professor, first election	2.80
	- associate professor	2.40
	- assistant professor	2.20
	- college professor	2.20
	- senior lecturer, senior assistant	1.80
6.	head of section, head of office (less than 20 employees)	
	- full professor, permanent grade	3.15
	- full professor, first election	2.70
	- associate professor	2.30
	- assistant professor	2.10
	- college professor	2.10
	- senior lecturer, senior assistant	1.75
7.	head of laboratory, chair leader (full professor, permanent grade)	3.10
8.	head of laboratory, chair leader (full professor, first election)	2.65
9.	head of laboratory, chair leader - associate professor	2.25
10.	head of laboratory, chair leader - college professor - assistant professor	2.05
11.	head of laboratory, chair leader - senior lecturer - senior assistant	1.80
12.	head of laboratory, chair leader - lecturer - assistant	1.55

82 These work positions apply to the management positions within the higher education system. The term "1st category" describes a work position that requires a university degree. This government provision also includes the job titles and job complexity coefficients in public institutes, which have been omitted in this part of the work.

b) 1st category positions

1.	full professor - permanent grade	3.05
2.	full professor - first election	2.50
3.	associate professor	2.10
4.	assistant professor, college professor	1.90
5.	library adviser	1.90
6.	senior lecturer, senior assistant, senior foreign language instructor, senior rehearsal manager, senior librarian	1.65
7.	assistant	1.45
8.	expert associate I	1.30
9.	lecturer, foreign language instructor, rehearsal manager, graduate librarian, junior assistant, associate II	1.25

Source: Provision of the Government of the Republic of Croatia on Changes and Amendments to the Provision on Job Titles and Job Complexity Coefficients for State Jobs

Table 7.5 Allocation from the state budget for tertiary education and science

	2000	2001	2002	2003	2004	% GDP (2004)
GDP (mil $)	18,427	19,863	22,812	28,810	34,685	
GDP (mil HRK)	152,519	165,639	179,386	193,067	207,082	
Higher education	1,375,239,061	1,416,839,255	1,553,490,888	1,688,450,414	1,795,426,757	0.8670
Science	542,321,771	654,021,660	746,694,321	751,187,122	698,717,829	0.3374
Technology	-	54,242,296	52,027,239	63,274,869	58,626,049	0.0283
International cooperation	-	31,955,579	36,742,528	33,854,163	37,973,513	0.0183
ICT	7,349,223	33,489,754	104,421,099	107,236,816	104,012,721	0.0502
Other institutions	101,344,405	146,558,326	-	-	-	
Ministry	38,905,590	23,663,543	15,669,030	20,968,992	30,585,466	0.1477
HAZU*	42,544,599	46,934,406	48,914,526	48,121,743	64,675,822	0.3123
Total MoSES	2,107,704,649	2,407,704,819	2,557,959,631	2,644,003,384	2,790,018,157	1.347

Source, MoSES

* HAZU – Croatian Academy of Sciences and Arts

Table 7.6 Sources of financing of tertiary education and science

Year	Total public expenditure for HE (mil HRK)	Total public expenditure for institutes (mil HRK)	Total financial resources from the budget (mil HRK)	Own income (mil HRK)	Total public expenditure per student *		
					HRK	US$	EUR
1996	755.96	390.79	1,146.75	266	8,816	1,622	1,296
1997	908.63	399.55	1,308.18	333	10,094	1,639	1,450
1998	1,053.78	522.65	1,576.42	407	11,470	1,813	1,606
1999	1,249.99	501.45	1,751.44	449	12,913	1,816	1,704
2000	1,475.30	534.45	2,009.75	522	14,716	1,778	1,926
2001	1,498.26	652.28	2,150.53	644	13,884	1,665	1,858
2002	1,602.49	685.39	2,287.89	724	13,763	1,750	1,857
2003	1,658.52	751.19	2,409.71	826	13,727	2,049	1,816
2004	1,795.43	698.73	2,494.14	926	…	…	…

Source: MoSES, calculation by author

Note: Own income includes the following sources of financing: tuition fees and registration fees paid by students who enter as full-time students or part-time students, revenues from scientific activities, revenues realized at the market and donations.

* total number of students (full-time and part-time)

… data are not available

Table 7.7 Expenditures for tertiary education, as % of GDP and type of cost

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Ratio of Exp/ENR to GDP per capita. **Tertiary****	0.377	0.367	0.373	0.377	0.415	0.423	0.372	0.341	0.316
Ratio of Exp/ENR FT to GDP per capita. **Tertiary***	0.427	0.419	0.451	0.461	0.518	0.531	0.483	0.458	0.429
Total public expenditure on education as a % of total Government expenditure. **All levels**	8.1	7.9	7.9	8.7	9.5	10.2	10.2	9.9	9.9
Educational Expenditure (EE) by nature of spending in % of total EE in public institutions. ISCED 5&6. **Salaries all staff**	-	69.6	86.3	71.8	72.1	71.2	65.5	59.1	61.3
Educational Expenditure (EE) by nature of spending in % of total EE in public institutions. ISCED 5&6. **Other current**	-	28.8	10.7	24.3	23.3	28.0	28.5	32.5	30.0
Educational Expenditure (EE) by nature of spending in % of total EE in public institutions. ISCED 5&6. **Total current**	-	98.4	97.0	96.1	95.4	99.2	94.0	91.6	93.3
Educational Expenditure (EE) by nature of spending in % of total EE in public institutions. ISCED 5&6. **Capital.**	-	1.6	3.0	3.9	4.6	0.9	6.0	8.4	6.7

Source: MFIN, MoSES

*ENR refers to full-time students' number ISCED5A1st+B.

**ENR refers to full-time and part-time students' number ISCED5A1st+B.

Table 7.8 Government expenditure on tertiary education, in 000 HRK

Indicator	1995	1996	1997	1998	1999	2000	2001§	2002	2003
Realized expenditures of central Government for higher education (HRK)	647,587	737,749	889,887	1,027,021	1,223,195	1,467,618	1,498,255	1,579,590	1,650,656
Share of central Government expenditures for higher education in GDP	0.66	0.68	0.72	0.75	0.86	0.96	0.92	0.88	0.85
Total number of students**	84,208	85,752	90,021	91,874	96,798	100,297	107,911	116,434	120,822
Total Government expenditures per student (HRK)	7,940.17	8,815.63	10,093.50	11,469.82	12,913.45	14,716.06	13,884.17	13,763.11	13,726.96
Total public expenditure of general Government per student / (GDP/per capita)	0.377	0.367	0.373	0.375	0.415	0.423	0.372	0.341	0.316
Total public expenditures per student (USD)	1,518.2	1,622.4	1,639.3	1,803.4	1,815.6	1,778.0	1,664.9	1,750.2	2,048.8
Total public expenditures per student (EUR)	…	1,296.4	1,450.2	1,606.4	1,815.6	1,778.0	1,664.9	1,750.2	2,048.8
Number of full-time students**	74,315	75,119	74,464	75,200	77,690	79,802	83,083	86,582	88,991
Total Government expenditures per full-time students (HRK)	8,997.19	10,063.47	12,02.3	14,13.01	16,089.54	18,87.01	18,033.23	18,508.40	18,636.93
Total public expenditures per full-time student (USD)	1,720.3	1,852.0	1,981.8	2,203.3	2,262.2	2,233.6	2,162.5	2,353.6	2,781.6
Total public expenditures per student (EUR)	…	1,479.9	1,753.2	1,962.6	2,122.6	2,419.8	2,414.1	2,497.8	2,465.2
Total public expenditures for full-time student / (GDP/per capita)	0.427	0.419	0.451	0.459	0.518	0.531	0.483	0.458	0.429

Sources: Ministry of Finance, CBS, Statistical Yearbooks and Statistical reports, National Bank of Croatia

** Partial data, information on local government expenditure on tertiary education are missing

Table 7.9 Allocation from the state budget for tertiary education institutions

	2002	2003	Index	2004	Index	2005	Index
University of Zagreb	697,397,479	742,940,491	106.53	796,584,866	107.22	877,480,630	110.16
University of Rijeka	117,529,918	132,574,507	112.80	142,379,312	107.40	164,022,814	115.20
University of Osijek	91,919,990	97,801,583	106.40	112,656,201	115.19	129,145,948	114.64
University of Split	112,985,035	103,938,560	91.99	114,277,618	109.95	142,490,179	124.69
Polytechnics and Colleges	69,235,769	79,772,073	115.22	95,899,918	120.22	69,123,030	72.08
Libraries	6,706,846	7,302,049	108.87	7,472,995	102.34	8,079,956	108.12
Student's programmes	7,800,000	7,800,000	100.00	7,800,000	100.00	5,300,000	67.95
University of Zadar		27,946,981		37,213,904	133.16	39,456,383	106.03
University of Dubrovnik				4,996,593		26,866,990	537.71
Total	**1,565,130,792**	**1,689,189,323**	**107.93**	**1,888,651,005**	**111.81**	**2,043,845,496**	**108.22**

Source: MoSES

Table 7.10 Financing early stage researchers

2001		2002		2003		2004*	
Total (000 HRK)	% of total budget	Total (000 HRK)	% of total budget	Total (000 HRK)	% of total budget	Total (000 HRK)	% of total budget
91,766.3	3.93	112,644.9	4.94	132,081.7	4.96	153,378.7	1.84

Source: MoSES

*The plan of the state budget for the fiscal year 2004 merged two ministries (the Ministry of Science and Technology and the Ministry of Education and Sports), so the portion of the expenditures for research assistants in the MoSES budget is much lower than in previous years.

Table 7.11 Current expenditures on tertiary education institutions

	2001		2002		2003		2004*	
	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget
Salaries all staff	1,111.1	46.46	956.9	41.99	1,034.2	38.80	1,137.6	13.67
Other current	142.9	5.98	127.5	5.59	541.9	20.33	520.2	6.25
Total	**1,253.0**	**52.45**	**1,084.4**	**47.58**	**1,576.1**	**59.13**	**1,657.8**	**19.92**

Source: MoSES

Table 7.12 Capital expenditures on tertiary education institutions

	2001		2001		2002		2003		2004*	
	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget	Total (mil. HRK)	% of total budget
Facility construction and maintenance	12.7	0.92	38.7	1.62	29.6	1.89	13.9	0.82	38.1	2.02
Equipment, furniture and instruments	0.8	0.05	45.4	1.90	58.7	3.75	79.5	4.71	17.7	0.94
Total	**13.5**	**0.97**	**84.1**	**3.52**	**88.3**	**5.64****	**93.4**	**5.53**	**55.8**	**2.96**

Source: MoSES

Table 7.13 Expenditures for housing and board of students subsidized by the MoSES

	Total (mil HRK)	% of total budget
2001	232.5	9.72
2002	235.2	10.32
2003	253.6	9.52

Source: MoSES

Note: MoSES does not keep separate track for support for accommodation and support for student meals.

Table 7.14 Income realized by tertiary education institutions

	2000		**2001**		**2002**		**2003**		**2004***	
	Total (mil. HRK)	%	Total (mil. HRK)	%	Total (mil. HRK)	%	Total (mil. HRK)	%	Total (mil. HRK)	%
Own income	468.06	24.8	554.02	28.1	636.47	29.1	745.68	30.6	838.79	31.7
Income from the state budget	1,417.14	75.2	1,417.57	71.9	1,551.39	70.9	1,690.08	69.4	1,808.92	68.3
Total	1.885.20	100.0	1,971.59	100.0	2,187.86	100.0	2,435.76	100.0	2,647.71	100.0

Source: MoSES

Table 7.15 Private tertiary education institutions

	2001		**2002**		**2003**		**2004**		**2005**	
	Total	%	Total	%	Total	%	Total	%	Total	%
Employees										
Academic staff	30	78.95	34	82.93	37	84.09	38	79.17	39	78
Administrative staff	8	21.05	7	17.07	7	15.91	10	20.83	11	22
Employees										
Full-time	24	63.16	26	63.41	29	65.91	36	75	36	72
Part-time	3	7.89	2	4.88	2	4.55	0	0	2	4
External	11	28.95	13	31.71	13	29.54	12	25	12	24
Students										
Total full-time	612	100	663	100	568	100	634	100	553	100
Female	348	56.86	361	54.45	345	60.74	378	59.62	327	59.13
Total part-time	0	0	0	0	0	0	0	0	0	0
Income, in 000 HRK										
Total income	24,256	100	20,795	100	20,678	100	16,205	100	17,863	100
Income from state budget	4,644	19.2	0	0	0	0	0	0	0	0

Source: MoSES

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