2. Use of knowledge for economic development

**SDS guidelines:** SDS priorities aimed at efficient creation, two-way flow and application of knowledge for economic development and high-quality jobs are: improving the quality of tertiary education, promoting lifelong learning, and increasing the effectiveness and level of investment in research and technological development.

2.1 Education and Training

**Slovenia’s human capital improved during SDS implementation, but it still lags behind the EU average in terms of the share of adults with tertiary education.** In 2012, the share of the adult population (aged 25–64) with tertiary education rose to 26.1% and Slovenia’s lag behind the European average was below the level seen at the beginning of SDS implementation (2005). During the past year, the share of the population with tertiary education rose only in the younger and middle age groups, where the highest increase was also recorded between 2005 and 2012, and declined in the age group above 45. Slovenia thus come very close to the EU’s 2020 strategy objective for education of young people (40% by 2020), since the share of young people (aged 30–34) with tertiary education was 39.1% in 2012. Considering the favourable trends in the participation of young people in tertiary education, it may be expected that this objective will be reached in the forthcoming years. However, the share of young people aged 25–29 with tertiary education lags behind the EU average, which is well above the OECD average, Slovenia also has a low share of early school leavers. In 2011, the drop-out rate decreased to 4.2% and was below the national objective within the EU’s 2020 strategy (5.1%) and well below the EU average. In the 2011/12 academic year, the participation of young people of enrolment age in tertiary education was 56.9% and exceeded the SDS target (55%) for the third consecutive year. The participation of the 20–24 age group in tertiary education in Slovenia is the highest in the EU. The high participation of young people in tertiary education is a result of: (i) a high percentage of students enrolled in upper secondary education programmes and programmes for continuing education at the tertiary level, (ii) a high number of study places available in relation to the number of applicants, (iii) absence of tuition fees for full-time level 1 and 2 studies and (iv) benefits of student status.

**Along with the shrinking generations of students, the structure of enrolment of young people in secondary schools has been moving towards increasing enrolment in technical and other vocational programmes.** The proportion of young people enrolled in lower and middle vocational programmes has remained at approximately the same level during the past three years and has experienced the sharpest decline during SDS implementation. The past three years also saw a decline in the number of pupils enrolled in gymnasiums, though this still remains above the 2005 level. On the other hand, the number of young people enrolled in upper secondary technical and other vocational programmes has been on the increase. During SDS implementation, the number of enrolled students has decreased in all educational programmes except in the vocational course, due to the shrinking of student generations. In the future, young people should be additionally motivated to enrol in upper secondary technical and other vocational programmes and efforts should be made to increase the interest in vocational education, since there is shortage of certain occupational profiles.

**As regards the tertiary education enrolment structure, a decrease in the social sciences enrolment rate has been noted.** In the academic year 2011/12, the number of students enrolled in tertiary education decreased for the second consecutive year (by 2.9%), due to demographic changes. In relative terms, the sharpest decrease was in the area of social sciences, business science and law, where the decline has been noticed since 2006. The number of enrolments was highest in the fields of health and welfare and science, mathematics and computing. In both areas, the highest enrolment increase was recorded during the entire period of SDS implementation. As a result, the structure of enrolment in tertiary education has changed significantly during the past few years. In 2011/12, the share of enrolment in social and business science and law decreased to 33.6%, but nevertheless exceeded the EU average (according to the latest international data) in 2010.

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58 Percentage of the population aged 18-24 with at most lower secondary education and not in further education or training.
**Development Report 2013**

**Development by the priorities of SDS – Use of knowledge for economic development**

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**Table 2: Enrolment in tertiary education by field of education, Slovenia 2005–2011**

<table>
<thead>
<tr>
<th></th>
<th>No. of enrolments</th>
<th>Increase (%)</th>
<th>Difference 2005–2011</th>
<th>Enrolment structure (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>104,003</td>
<td>-9.4</td>
<td>-10,791</td>
<td>100.0</td>
</tr>
<tr>
<td>Education</td>
<td>8,258</td>
<td>-18.4</td>
<td>-1,860</td>
<td>8.8</td>
</tr>
<tr>
<td>Humanities and arts</td>
<td>9,016</td>
<td>4.9</td>
<td>420</td>
<td>7.5</td>
</tr>
<tr>
<td>Social sciences, business and law</td>
<td>34,962</td>
<td>-29.9</td>
<td>-14,941</td>
<td>43.5</td>
</tr>
<tr>
<td>Science, mathematics and computing</td>
<td>7,779</td>
<td>24.6</td>
<td>1,538</td>
<td>5.4</td>
</tr>
<tr>
<td>Engineering, manufacturing, processing and construction</td>
<td>20,027</td>
<td>11.5</td>
<td>2,065</td>
<td>15.6</td>
</tr>
<tr>
<td>Agriculture and veterinary</td>
<td>3,249</td>
<td>-7.3</td>
<td>-257</td>
<td>3.1</td>
</tr>
<tr>
<td>Health and welfare</td>
<td>11,135</td>
<td>31.6</td>
<td>2,673</td>
<td>7.4</td>
</tr>
<tr>
<td>Services</td>
<td>9,577</td>
<td>-4.3</td>
<td>-429</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Source: SIRS; calculations by IMAD.


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**Some tertiary education quality criteria point to a modest improvement in the past few years; however, the problem of employability of graduates has become aggravated.** The ratio between the number of students and the number of teaching staff at the tertiary level, which is a frequently used international criterion, improved in 2011/12, continuing the favourable trends from previous years. In the period 2005–2011, this was due to the reduction in the number of students, larger number of teaching staff and the growing number of institutions that carry out tertiary education programmes. Despite the progress made during SDS implementation, Slovenia considerably lagged behind the OECD average in terms of the number of enrolments per teacher in 2010. It should be pointed out that this unfavourable ratio is partly due to fictitious enrolments motivated by the benefits offered by the status of being a student. The envisaged reduction in the number of students enrolled in tertiary education due to the shrinking of young generations could also result in an improved ratio between the number of students and the number of teachers in the future. The share of foreign students in Slovenia continued to increase in 2011/12 but nevertheless remained low. The average duration of undergraduate studies in higher education is also becoming shorter, largely due to the introduction of Bologna study programmes. In 2011, the average duration of university undergraduate studies was 5.8 years (6.1 years in 2010) and was also shorter than in 2005 (6.3 years), which is primarily the result of the growing share of Bologna study programme graduates. Simultaneously, the extremely rapid increase in the number of Bologna study programme graduates among the registered unemployed also points to their poor employability and/or overparticipation in tertiary education. Tertiary education thus also contributes to the growing labour market imbalances.

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**Figure 14: The ratio between the number of students and the number of teaching staff in tertiary education for the academic year 2009/10**

Source: OECD.

**Figure 15: The number of unemployed people with tertiary education by field of education, Slovenia**

Source: Employment Service of the Republic of Slovenia.
Labour market imbalances have increased during the crisis; from this perspective, abandoning of the system of monitoring the demand for specific vocational profiles is problematic. In the period 2008–2012, employment opportunities for people with tertiary education have declined sharply. The number of vacancies for people with tertiary education declined dramatically, mainly in the areas of the humanities and arts and the social sciences, business and law. Moreover, the number of such people among the unemployed greatly increased. Unemployment among all people with tertiary education more than doubled. The implementation of the amendments to the Labour Market Regulation Act, which abolishes the compulsory registration of job vacancies with the Employment Service of the Republic of Slovenia, will eliminate the legal basis for the system of monitoring the demand for vocational profiles, which represents an important source of public information about job opportunities for students deciding to continue their education and for the state management of the labour and education markets. It is therefore urgent to establish a system of monitoring and forecasting employers’ requirements for knowledge and skills.

The crisis has aggravated the problems of the transition of young people from education to employment, particularly among young people with tertiary education (aged 25–29). Due to the high level of participation of young people in upper secondary and tertiary education, the share of young people not in employment and not in any education and training (NEET levels) in Slovenia is relatively low\(^59\) and declined during the period of SDS implementation. The share of NEET in Slovenia is lower than the EU average in all age groups. It rose sharply from the beginning of the crisis (by 4.1 pp in the period 2008–2011) in the 25–29 age group, however, which points to the problems with employing young graduates and their retreat into inactivity. This is associated with a decline in the demand for this type of labour, a sharp increase in unemployment among young people and a sharp increase in the number of graduates and with the fact that young people in this age group use almost every opportunity to get free education. A number of programmes aimed at facilitating the employment of young people have been carried out within the Active Employment Policy (e.g. Prvi izziv [First Challenge] and Zaposli me [Employ Me]) and were well received by young people and employers. However, the sharp increase in unemployment among graduates shows that these measures were not sufficient. At the same time, the number of young people moving abroad is on the increase.

In the period 2005–2010, the participation of adults in formal education declined but still exceeded the EU average. The gradual decline in adult participation at all formal education levels in Slovenia continued in 2010. The adult participation (age 25–64) was 3.9%, which was above the EU average (3.3%). Adult participation in education was lowest at primary school level, where it could be higher given the relatively high share of adults with unfinished primary education. Adult participation in upper secondary education could also be higher given the high share of the population with only completed primary education. In the period 2005–2010, adult participation in upper secondary and tertiary education declined. In addition to adult participation in formal education, participation in non-formal education, which did not undergo any significant changes during SDS implementation, and the strengthening of the assessment and evaluation of non-formally acquired knowledge are also important.

Adult participation in lifelong learning\(^60\) strongly declined during the crisis but still remained above the EU average. Adult participation in lifelong learning contributes to the flexibility of adults in the labour market and their employability. However, the labour cost data show that employers drastically reduced the costs of adult education during the crisis\(^61\). Adult participation in lifelong learning in (the second quarter of) 2012 was 14.7%. Compared with the previous year, it had declined by 2.5 pp and was lower than at the beginning of the crisis (2008), though nevertheless exceeding the EU average (9.7%). Higher older adult participation (aged 55–64), which is on the decline, could contribute to the maintenance of employability of older people (who are frequently less educated). The participation of the low educated is also low. The proposed Resolution on the Master Plan for Adult Education in 2012–2020 points in particular to the educationally disadvantaged.

Table 3: Adult participation (aged 25–64) in formal education in Slovenia (%)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4.4</td>
<td>4.0</td>
<td>3.9</td>
</tr>
<tr>
<td>primary education</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>upper secondary education</td>
<td>1.0</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>tertiary education</td>
<td>3.4</td>
<td>3.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Source: Eurostat.

\(^{59}\) In 2011 it was 8.8% among young people aged 18–24 (EU: 16.7 %).

\(^{60}\) It includes the participation in formal and non-formal education.

\(^{61}\) The average monthly education and training costs per employee totalled EUR 8 in 2011, which is one-third less than in 2009.
Box 6: Emigrants and brain drain

The number of people leaving Slovenia started to rise before the onset of the crisis and has been relatively high since 2008. An average of more than 2000 people left the country each year in the period 2000–2006. In the last year before the crisis (2008), the number of people leaving Slovenia rose dramatically, and this trend also continued in the period 2008–2011. In 2011 alone, 4,679 people left the country, i.e. almost 20% more than in 2010. As many as 75.2% of this number was of working age population (15–64 years of age). Most people (58.7%) left for other EU countries, in particular Germany and Austria. Some 22.6% left for other countries of the former Yugoslavia, 43% being older than 50. Only 37.1% of the people leaving Slovenia were previously employed. In the first nine months of 2012, the number of people leaving the country rose again: the number of people leaving the country (6,583) was double the number in the same period of the previous year. This is associated with the continuing crisis, which is deeper in Slovenia than in most other EU Member States, the ensuing lack of employment opportunities in Slovenia, and free access to the German and Austrian labour market after 1 May 2011.

A high proportion of people with tertiary education leaving Slovenia is recorded in the 25–39 age group. In addition to the increase in the number of graduates and the existing tertiary educated population, migrations abroad have an impact on the scope of the country’s available human capital. The data on the migration of Slovenian citizens abroad shows an increase in the number of people with tertiary education leaving the country: a total of 919, or 22.9% of the total of people who left the country in 2011. The number of people with tertiary education leaving the country was much higher than in 2005. Young people (aged 30–34) accounted for the highest share, i.e. one-fourth of the total number of emigrant tertiary educated people in 2011. The aforementioned data and adverse labour market trends could lead to a conclusion that people with tertiary education left the country on the completion of their studies due to poor employment opportunities.

The share of young people willing to go to work abroad is very high. Therefore the lack of jobs for the tertiary educated could lead to an increased brain drain in the future. The most common destinations of the Slovenian tertiary educated citizens that left the country in 2011 were other EU Member States (59.3%), particularly Germany, Austria and the United Kingdom. Studies abroad provide young people with additional knowledge and increase their employment possibilities abroad. The number of students studying abroad increased in the period 2008–2010, which due to the adverse market conditions increases the probability that more young people will stay abroad after they finish their studies. The number of Slovenia’s young people willing to go to find work abroad (regardless of their level of education) is the highest in the entire EU. As shown by the Eurobarometer data (2011), the share of Slovenia’s young people aged 15–35 who are willing (or desire) to go to work in another European country is 64.2% (EU: 57.5%). Due to the poor employment possibilities for the tertiary educated young people at home, migration flows are expected to intensify further, with all the negative consequences for innovative capacity and entrepreneurial activity this implies. Simultaneously, this would imply a temporary or permanent loss of human capital that cost a great deal of public funds.

The statistical definition of the population was changed in 2008; nevertheless this is a rising emigration trend. The data include only the registered departures. This year, the Statistical Office succeeded for the first time in also acquiring the data on socio-economic characteristics of the people leaving Slovenia by establishing a link between regular annual statistics and the 2011 census data (cf. http://www.stat.si/novica_prikazi.aspx?id=5226).

Figure: The share of young people (aged 15–35) willing (desiring) to work in another European country, in 2011, in %

Note: The survey included young people aged 15–35. It was conducted by telephone between 26 and 30 January 2011. In Slovenia, the survey included 1,002 persons (also about 1,000 persons in most other countries).
The total public expenditure on education expressed in relation to GDP remained high. In 2010, public expenditure on education decreased in real terms (by 1.7%) at all levels except pre-school. In relation to GDP, it remained at the 2009 level (5.66% of GDP) and was somewhat lower than in 2005. In relation to 2005, public expenditure was lower at the primary and upper secondary levels (fewer enrolments) and higher at the pre-school and tertiary education levels (more enrolments). According to the latest international data for 2009, expenditure on education somewhat exceeded the EU average (5.41% of GDP), which is due to a high level of participation of young people in education and the method of education financing. In the structure of public expenditure by purpose, the share of expenditure on transfers to students participating in education and households in Slovenia was 7.8% (comparison for 2009), primarily due to the low share of private expenditure on tertiary education. Slovenia is one of the few countries where only a small proportion of students (only part-time students) pay tuition fees. According to data published in the National Student Fee and Support Systems (2012), no tuition fees are also paid in Sweden, Finland and Austria. Like in Denmark, tuition fees are only paid by part-time students in Slovenia. Although public expenditure on tertiary education in relation to GDP exceeds the EU average, expenditure on tertiary education per participant considerably lags behind the average due to the relatively large number of participants. A possible solution for reducing public expenditure and increasing expenditure per participant is to introduce tuition fees, which would also contribute to improved efficiency of studies. Eventual introduction of tuition fees should be accompanied by a system of study assistance (scholarships and long-term student loans), such as is already in place in many other countries.

The new Resolution on the National Programme of Adult Education is in the process of being adopted. The Resolution is a basis for determining the annual adult education programmes adopted by the Government of the Republic of Slovenia, for substantive preparation of the measures and programmes for drawing the European cohesion policy funds until 2020, and for systemic regulation of the area of adult education and managing the education policy at the state and local levels. The vision of the National Programme of Adult Education 2012–2020 is to provide equal opportunities for a quality education in all stages of life to each adult in Slovenia, in particular by encouraging the educationally disadvantaged and other vulnerable groups. The purpose of the National Programme of Adult Education is to raise the competitive (educational) level of the population, to enhance the employability of the active population, to improve the possibilities of learning and participation in education, and to raise the general education level. Like the previous resolution, this resolution is also focused on three priority areas until 2020: increase in literacy, acquisition of basic capabilities, development of support activities (consulting, information, quality), spreading of non-formal general education forms, participation of local communities in defining educational products and services, etc. in the first area (general education); increase in the share of adults with finished primary education, four-year upper secondary and higher vocational education and opening of new possibilities for determining, evaluating and recognising knowledge in the second (education for increasing the education level of adults); development and implementation of educational programmes and activities adapted to labour market requirements and implementation of active employment policy measures (encouraging practical and non-formal training, training carried out by registered providers, lifelong career orientation and acquisition of basic and vocational competencies) in the third area (education and training for labour market needs). The level of participation of people aged 25–64 in lifelong learning, measured by the Slovene Labour Force Survey, should rise to 19% in 2020 and, measured by the Adult Education Survey, to 45% (Resolution on the National Programme of Adult Education 2012–2020 – working material, 2013).

1 According to the data obtained by the Slovene Labour Force Survey, adult participation in lifelong learning was calculated on the basis of annual data of quarterly averages. The Adult Education Survey measures the participation in education for the past 12 months before the survey. After 2013, the data obtained by the Adult Education Survey published every three years will be used as an indicator for measuring adult participation in lifelong learning at the EU level.
Given the relatively high unemployment among those with tertiary education and the great dissatisfaction of employers with graduates’ skills, the quality and efficiency of investments and responding to the needs of employers represent the major educational policy challenges. The share of people with tertiary education in Slovenia is on the increase and the public expenditure on education is relatively high. Empirical studies show that the high share of people with tertiary education generally has a positive influence on economic growth. However, given the modest demand for people with tertiary education, particularly during the crisis, the problem of their employability in Slovenia has become aggravated to a great extent. This raises the issue of the efficiency of investments in tertiary education and of the markedly high level of participation in tertiary education more than ever before. The expansion of the network of institutions at the tertiary level indeed increases their accessibility but raises the issue of education quality. From this perspective, it is urgent to find a new balance between the accessibility and the quality of education. A system of monitoring employers’ needs by knowledge and skills should also be established.

2.2 Research & development, innovation and use of information-communication technologies

Investment in R&D accounted for its all-time largest share of GDP in 2011 (2.47%), simultaneously with a considerable increase in the number of enterprises included in the survey. Slovenia significantly increased its R&D expenditures in 2011, which, given the modest GDP growth, was reflected in their larger share of GDP. The increase in expenditures was significantly influenced by a higher number of reporting units of the business sector captured in the survey (643 reporting units) and some other changes (see indicator 2.4), which does not allow comparison with previous years. Slovenia increased its lead in relation to the EU average, where the share of R&D expenditures in GDP is stagnant (it accounted for 2.03% of GDP in 2011), and joined the five EU Member States with the highest expenditures for R&D in relation to GDP. However, considering a continued shrinking of government budget appropriations for R&D in 2012, the decline in economic activity in 2012 and the unfavourable forecast of economic trends for 2013, the business sector cannot be expected to compensate for the loss of government investment in R&D despite a higher tax allowance introduced in 2012. Investments in R&D by the business sector in 2011 grew faster than in the government sector and the share of enterprises in gross domestic expenditure on R&D rose to 61.2%. In addition to the increase in own funds, the business sector was able to use foreign funds for R&D investments to a greater extent than before. In 2011, the inflow of these funds into Slovenia increased considerably and totalled EUR 63 million, of which EUR 30.2 million was provided by the European Commission. Although more than one-half of these funds were used by businesses, their share significantly lagged behind that of companies in other EU Member States (EU, 2011: 71.0%). This can be attributed to (i) inadequate participation of a larger number of small and medium-sized enterprises in international trade and cooperation with foreign partners, (ii) weak links with research institutions at home, (iii) lack of knowledge and skills of small enterprises for obtaining foreign funds, and (iv) an excessive administrative burden associated with reporting. Another shortcoming of R&D investment in Slovenia is related to the fact that service companies account for a small proportion of the total R&D expenditures by the business sector (about 14% in 2010 against between 30% and 60% in most EU Member States).

Encouraging trends in strengthening the human capital for innovation continue. The growth of the total number of researchers was reflected in particular in their increase in the business sector in 2011. In the same year, Slovenia exceeded the EU average (2010: 44.9%) regarding the business sector share in the total number of researchers by 6.5 pp. In the period 2005–2010, trends in the number of doctorate graduates of science and technology were more favourable than those at the EU level, with the increase in their number much higher in Slovenia. These favourable trends came to an end in 2011, when the number and the proportion of doctorate graduates of science and technology were more favourable than those at the EU level, with the increase in their number much higher in Slovenia. These favourable trends came to an end in 2011, when the number and proportion of doctorate graduates of science and technology in the total number of PhDs declined. As the number of enrolments in doctoral studies in science and technology rapidly increased over the past few years (including in 2011, when a 9.4% increase was recorded), their number may be expected to rise further in the future. The inflow of highly qualified staff is very important, as they can contribute to enhancing the competitiveness of businesses with their knowledge and international connections. The favourable trends regarding the growing share of researchers in the business sector and the increase in the number of doctorate graduates of science and technology were also due to the incentive measures of the government (young researchers, young researchers in the enterprise sector, interdisciplinary groups and capacity-building of R&D departments in companies). Evaluations have shown positive effects of certain measures for strengthening capacity, transfer of knowledge, and increasing the research and development activity in companies (e.g. young researchers in the enterprise sector).
sector\textsuperscript{67} and interdisciplinary groups in companies\textsuperscript{68}). For the majority of measures introduced, the complexity of administrative procedures relating to tenders and reporting was seen as a problem.

The number of science and technology graduates increased in 2011 and so did the risk of their brain drain.

Favourable trends relating to science and technology graduates that have an important role in technological development and innovation, continued: in the period 2005–2011 their number increased substantially (by 14.2% in 2011 alone) and so did their share in the total number of graduates. Due to the shrinking of generations, the number of enrolments in science and technology courses declined in 2011/12. This is why there is a need to strengthen the interest in science already at the lower levels of education and provide students with better information about the employment demand for these job profiles. Unlike Slovenia, more than one-half of EU Member States have already adopted national strategies for developing key competencies in the areas of science and mathematics in primary and upper secondary education\textsuperscript{70}. The Resolution on Research and Innovation Strategy of Slovenia 2011–2020 (ReRIS11-2020) called for encouraging students to pursue science and technology studies; however, the number of sponsorship scholarship recipients in this area is declining. The female population represents further opportunities for increasing enrolment, since it has a modest share in the total enrolment in science and technology courses (29.0% in 2010). Increased participation in the practicum during studies and the development of a system of medium- and longer-term timely monitoring of employers’ needs (by area and skill) should also be put in place in the area of science and technology in order to improve the employability of graduates and increase the efficiency of investment in education. As the crisis continues, i.e. given the fact that further recruitment of staff in the public sector has been halted and that the forecasts for a rapid economic recovery are bad, the risks of major loss of human capital and particularly the emigration of graduates, which is not restricted to science and technology, are increasingly becoming reality (see Box 6).

\textsuperscript{67}The shortcoming of this measure was that it is oriented towards basic research, which reduces the applicability of research results, in particular for small and medium-sized enterprises that lack own research teams. Measures supporting applied research could facilitate the companies to faster introduce new knowledge in production processes, the increase in innovation activity and value added (Evaluation of measures to encourage R&D activities in the enterprise sector and knowledge institutions, 2012).

\textsuperscript{68} Most companies with this type of groups increased the proportion of their highly qualified staff and the proportion of own funds for R&D investments and knowledge transfer (Jaklič et al., 2012).

\textsuperscript{70} Eurydice Report (2012): Developing Key Competences at School in Europe: Challenges and Opportunities for Policy.

\textbf{Innovation activity of Slovenian companies remains weak, and the lag behind the EU average increases.}

In the three-year period 2008–2010, Slovenia’s share of innovation-active enterprises (IAE) dropped to 49.4%, or a percentage point less than in the period 2006–2008. The majority of the EU Member States have succeeded in maintaining or increasing the level of innovation intensity despite the economic crisis. Germany is the most successful EU Member State in terms of innovation, with almost 80% of innovation-active enterprises. A high level of innovation activity is also recorded in Portugal (60%), one of the countries hardest hit by the crisis. The lagging behind of Slovenia in terms of innovation activity reduces the competitiveness of its goods and services in foreign markets and brings a continued stagnation in the share of high-tech goods (see indicator 1.14) and knowledge-based services in total exports (see Chapter 1.3.1). In the majority of EU Member States, including Slovenia, companies most frequently introduce technological and non-technological (organisational and marketing) innovations simultaneously, which points to the interconnection between various types of innovation. The importance of the complementarity of technological and non-technological innovations is corroborated by empirical analyses which show that a combination of various types of innovation has a strategic importance, as the companies using such innovations are the most successful and generate the majority of further innovations (INNO-GRIPS, 2012).

\textbf{Slovenia considerably lags behind in innovation intensity of service activities.} Similarly as in the EU, Slovenian manufacturing companies are more actively involved in innovation (54.4%) than service companies (44.7%). However, innovation activity in the EU Member States that recorded the highest growth in innovation
intensity in the period 2006–2010 increased more in services than in manufacturing. Slovenian service companies, on the other hand, recorded a greater decline in innovation activity than manufacturing companies. The share of Slovenian service companies in the total expenditure of innovation-active companies that introduced technological innovations in 2010 was considerably lower (18.4%) than in most EU Member States (between 25% and 65%). This is partly associated with the introduction of specific measures for stimulating innovation activity in services (e.g. Germany). The results of the EPISIS project show a series of policies that support service innovations, such as shifting the innovation policy from incentives for the supply of innovations to higher incentives for demand for innovations (e.g. public procurement); equal treatment of technological and non-technological research and innovations in state aids and other incentives; and more adequate support to service innovations related to key societal challenges, etc. (EPISIS Final Report, 2012). Slovenia is too slow in following these trends, since innovation policy instruments do not sufficiently take into account the structure of the economy or the specificities of innovation in service activities (Stare, 2012). This is probably one of the major reasons for the low level of innovation activity of small enterprises and its continued decline in the period 2006–2010, given the fact that the major part of small enterprises are in the service sector.

The stimulation of innovation activity requires a wider range of incentive policies. The focus on R&D investments is too narrow, since many innovations do not depend on research but on the creativity of employees, their organisational and marketing skills, and develop in close cooperation with customers, i.e. by means of greater adaptation to the needs of the users of products and services (OECD STI Outlook, 2012). The business sector’s innovation capacity also depends on the quality of support and on the innovation level of the public sector. The Eurobarometer analysis shows that the majority of Slovenian companies are satisfied with the access to information and advice on this support, but only 14% of the companies believe that the various measures provide a sound support for innovation in companies; moreover, only 17% of companies agree that the legislative and the tax system encourage companies’ innovations. At the same time, as many as 82% of Slovenian companies consider that the public sector should enhance the innovativeness of its services in order to adapt them to the needs of companies, while the share of such companies at the EU level is considerably lower (58%) (Flash Eurobarometer, 2012).

Slovenia is too slow in strengthening intangible assets, such as patents and Community design registrations, though makes more progress in applications for Community trademarks. Intangible assets are becoming increasingly important for growth and productivity. The data on individual components of intangible assets are, for the time being, highly restricted; however, the trends indicate that investments in intangible assets are growing faster than those in tangible assets. In some OECD countries, investments by businesses in intangible assets are already the same or higher than in physical assets. The number of patent applications per million population in Slovenia declined in 2011, further increasing the country’s lag behind the EU average (first estimates for 2011: 63.9 and 128.1 patent applications per million population in Slovenia and the EU respectively). Given the fact that legislation introducing the single European patent was adopted in 2012, cheaper and shorter procedures for obtaining unitary patent protection in the EU may be expected, which should further facilitate access to patent protection for small and medium-sized enterprises. The first estimates for 2012 show that Slovenia also considerably lags behind the EU average in Community designs, achieving less than half of the average. In 2012, Slovenian patent applicants filed considerably more applications for trademark protection with OHIM than the year before, the number amounting to 66.8% of the EU average. The average annual growth in the number of Slovenian applications for legal protection of Community trademarks in the period 2005–2012 remains among the highest in the EU.

The use of e-services in Slovenia has been stagnating since 2010, though it continues to increase in the EU. Slovenia lags behind most new EU Member States in terms of the population share that uses the Internet regularly (68%). The biggest difference in relation to the EU average (14 pp in 2012) remains in internet use by the older population (aged 55–74), although this difference declined in the past year. The crisis caused the biggest decline in the share of users with low levels of education and those with the lowest incomes. In the past few years, the public sector and businesses invested considerably in modern information and communication infrastructure which facilitates effective use of e-services; however, with a few exceptions, it has not yet been sufficiently used, including due to an inadequate legal regime. The share of Slovenian companies which use automated data exchange with the public administration and financial institutions is higher than the EU average, but the proportion of companies with automated data exchange with customers and suppliers (use of e-invoices, exchange of information on products and transport documents) is substantially lower. The use of e-services enables an increase in the efficiency of operations and consequently facilitates breakthroughs into foreign markets. According to the Global Information Technology Report (2012), Slovenia is also ranked very low in terms of the impact of information and communication technology on the creation of new services and business models, the use of new organisational models, and the efficiency of public

There are three types of intangible assets: a) software and databases; b) innovative property (R&D, patents, copyrights, design and trademarks); c) economic competencies which include company-specific human capital, organisational skills, certain aspects of advertising and marketing (Corrado et al., 2012).

Office of Harmonization for the Internal Market.

On 1 January 2013, amendments to the VAT Act took effect and facilitated the issuing of e-invoices.
administration\textsuperscript{74}, Slovenia’s gap is also due to the fact that its companies (compared with the other new EU Member States) are substantially less internationalised in terms of formal ownership, as direct foreign investments normally accelerate the introduction of new technologies and procedures in companies, including automated data exchange with customers and suppliers. The increased use of information and communication technologies and the creation of new solutions and business models largely rely on the availability of qualified staff. Due to the versatile application of information and communication technology in the private and public sectors, a further increase in demand and a growing shortage of specialists in this field can be expected\textsuperscript{75}. The inflow of information and communication technology specialists\textsuperscript{76} from educational institutions in Slovenia is too modest, despite the increasing trend in the number of graduates. A further weakness is insufficient training and learning of participants through practice and insufficient contacts with companies during educational processes; moreover, as the crisis continues, there is also a risk of such participants, particularly graduates, migrating abroad.

2012 witnessed a rapid increase in broadband access, which was available to almost all households with internet connection (74\%). Households that do not use the internet indicate the high costs of access and equipment as the main reason for not using it, a fact that becomes increasingly common as the crisis continues. In the EU the proportion of respondents considering that the high costs inhibit access to the internet is twice lower. The lack of knowledge and skills to use the internet and the wide range of internet-related services (email, e-services provided by state institutions, social networks, etc.) represent the greatest obstacle for the elderly, whose share in the total population is increasing along with growing life expectancy. The all-Slovenian computer literacy campaign through intergenerational cooperation\textsuperscript{77} has shown that there is a great deal of interest among the elderly in acquiring basic e-literacy skills and that also many young people want to take part in the teaching as volunteers. The state should give more support to these and similar activities with appropriate programmes that could also include temporary employment of young people. The model of cooperation between actors in non-profit, private and public sectors, which was used in the implementation of the Simbio@ project, represents social innovation and a platform that could also be adapted to address problems in other areas.

Figure 17: Efficiency frontier of the innovation system for selected EU Member States

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\textsuperscript{74} Slovenia occupies 37th place among 142 countries on the Networked Readiness Index 2012. It is rated much lower in terms of economic effects: impact of information and communication technology in the creation of new services and business models (63\textsuperscript{rd}), impact of information and communication technology on the use of new organisational models (72\textsuperscript{nd}), and impact of the use of information and communication technology on the efficiency of public administration (61\textsuperscript{st}). The data cover the period 2010–2011.

\textsuperscript{75} There are currently 700,000 vacancies for this job profile in Europe. The European Commission, in cooperation with the largest companies in this area, is preparing a series of measures for increasing the inflow of qualified staff (e.g. training sponsored by companies, support to personnel mobility, improvement in the curricula for secondary and university-level education, training vouchers, etc.). (Digital Agenda for Europe, 2013).

\textsuperscript{76} Computer science, electronics, information technology and similar profiles.

\textsuperscript{77} The Simbio@ project was carried out for the first time in October 2011 and again in October 2012, when 3,250 young volunteers took part in the training of 5,033 elderly participants at 300 locations throughout Slovenia.

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\textsuperscript{78} We used the non-parametric Data Envelopment Analysis method to calculate the efficiency frontier of the selected sample of countries and identify each country’s efficiency with regard to the efficiency frontier. Since the innovation system efficiency depends on a number of factors, we used synthetic
Slovenia’s investment in innovation processes is short of achieving sufficient results, ranking it 12th out of 23 EU Member States in terms of efficiency in 2011. In the period since the beginning of the crisis (2008–2011), the efficiency of investment in innovation system further deteriorated while it improved in most EU Member States. According to the Innovation Union Scoreboard 2013, Slovenia’s innovation performance deteriorated during the past year but remained among the innovation followers of the most innovative EU Member States. Despite the strengthening of some factors of innovation capacity during the crisis (an increase in R&D investment and the strengthening of human capital), progress in other areas is either slow (intellectual property, transfer of knowledge to companies, and effective use of information and communication technologies by companies and the public sector) or is even delayed (innovation intensity). Few innovation policy measures point to good results in terms of increasing the number of patents or scientific publications (e.g. centres of excellence and competence centres) and to a smaller extent in the application of new knowledge through the sale of new products and services on the domestic and foreign markets. Considering the greater reduction in government budget appropriations for R&D in 2012 than in the majority of other public expenditures and the poor outlook for economic recovery that would encourage development expenditures of the business sector, the shrinking of the research and development activity, the decline of investment in new technologies and the risk of increased brain drain of tertiary educated people abroad, which in the long term weakens the knowledge capital for innovation activity in Slovenia, can be expected. After the adoption of the Resolution on Research and Innovation Strategy of Slovenia 2011–2020 (ReRIS11-2020), Slovenia faces a major challenge to strengthen its support to innovation and draft its national smart specialisation strategy for research and innovation, which will serve as a basis for the drawing of funding from the EU Cohesion and Structural Funds in the next financial perspective (Udovič, Bučar, Erawatch, 2012).

indicators with equal weights in our analysis. It should be pointed out that the efficiency frontier largely depends on the size of the sample and on the choice and accuracy of the selected input and output data.

79 Greece, Malta, Cyprus and Luxembourg were excluded from the group of EU Member States due to missing data.

80 The research voucher introduced in the autumn of 2012 should contribute to the strengthening of cooperation and knowledge transfer among research organisations and companies. A special new feature is that it also facilitates the co-financing of research in the area of creativity and marketing.

81 Evaluation of measures to encourage R&D activities in the enterprise sector and knowledge institutions, 2012.

82 Smart specialisation is a strategic approach of the EU Strategy 2020 for Cohesion Policy Targeted Support to Research and Innovation. National research and innovation strategies for smart specialisation will be a preliminary condition for drawing the funding from the European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development (EAFRD) in order to ensure efficient innovation policies and maximise the effects of EU investments.