



PRIVATE SECTOR DEVELOPMENT

Project Insights



Assessment of the National Innovation System of the Former Yugoslav Republic of Macedonia

Report in support of the formulation of a
National Innovation Strategy



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the European Union

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FOREWORD

Between 2000 and 2008, the Western Balkan economies experienced rapid growth, modest inflation, and increased macro-economic stability. The onset of the global economic crisis, however, saw a sharp drop in external trade and industrial production across the region. The crisis underscored the fact that buoyant growth prior to 2008 relied, to a large extent, on external financial flows – particularly FDI flows and international capital transfers that offset large and unsustainable trade and current account deficits.

The economic crisis is prompting governments in the region to make policy choices that will have implications for their long-term competitiveness. To assist Western Balkan governments in the design and implementation of those policies, the OECD Investment Compact for South East Europe (OECD IC) implemented a three-year, EU-financed project called the Regional Competitiveness Initiative (RCI). The RCI's goal is to help governments in the region with the design of sustainable economic policies to support innovation and human capital development. Between 2010 and 2013, the RCI led pilot projects in seven Western Balkan economies: Albania, Bosnia and Herzegovina, Croatia, The Former Yugoslav Republic of Macedonia, Kosovo*, Montenegro, and Serbia.

Within the framework of its RCI pilot project, the Former Yugoslav Republic of Macedonia requested assistance with the preparation of an innovation strategy. The decision to seek OECD support came as a result of a roundtable meeting on 5 October 2010 in Skopje between members of the business community, researchers, government officials and the OECD IC. This paper outlines the results of this RCI project.

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

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This Review of the National Innovation System of the Former Yugoslav Republic of Macedonia has been prepared as part of a pilot project of the European Commission-sponsored Regional Competitiveness Initiative (RCI) conducted by the OECD Investment Compact for South East Europe. The objective of the RCI is to strengthen the competitiveness of the economies in the Western Balkans through human capital development, innovation, and sector specific policy reforms.

The report was written by the OECD Investment Compact for South East Europe under the supervision of Alan Paic, Head of the Investment Compact for South East Europe. The sections on research organisations, linkages and the role of the government were partly drafted by Ricardo Pinto from Pinto Consulting GmbH. Prof. Radmil Polenakovik from the National Center for Development of Innovation and Entrepreneurial Learning provided some initial analysis of the results from a business survey. Valuable administrative support was provided by Karen Crombie, Liz Zachary and Laurent Rota. The final report was edited and prepared by Vanessa Vallée.

The review could not have been done without the precious input of the Science, Technology and Industry Directorate, OECD, and more particularly Michael Keenan. Much gratitude is also due to the entire support team in the Former Yugoslav Republic of Macedonia, all members of the project team and Steering Committee of the project as well the SME Department and more particularly Suzana Kostadinova and Imerali Baftijari. Wolfgang Polt also provided valuable advice on policy options.

Field research for this report was conducted by Nicolas Philiponet and Aleksandra Terzieva. The Working Group on Innovation in the Former Yugoslav Republic of Macedonia assisted the OECD with data collection. Furthermore, Gesellschaft für Konsumforschung (GfK) Skopje conducted a survey, designed by the OECD, on the innovation activities in private companies that was used as a basis for the analysis of the innovative activities of the private sector.

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ABBREVIATIONS

ALB	Albania
BGR	Bulgaria
BIH	Bosnia and Herzegovina
HRV	Croatia
MKD	Former Yugoslav Republic of Macedonia
ROU	Romania
SRB	Serbia
APPRM	Macedonian Agency for Entrepreneurship Promotion
BEEPS	Business Environment and Enterprise Performance Survey
BERD	Business Expenditures on Research and Development
CEFTA	Central European Free Trade Agreement 2006 ¹
CIRI	Chamber of Economy's Centre for Implementation of Development Ideas
CIS	Community Innovation Survey
CMC	Network of Certified Management Consultants
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EU	European Union
EIS	European Innovation Scoreboard
ETF	European Training Foundation
FME	Faculty of Mechanical Engineering
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit
GERD	Gross Expenditure dedicated to Research and Development
IMF	International Monetary Fund
IPA	Instrument for Pre-Accession
IPR	Intellectual Property Rights
IRI	Investment Reform Index
IT	Information Technology
IUS	Innovation Union Scoreboard
MASA	Macedonian Academy of Sciences and Arts
NECC	National Entrepreneurship and Competitiveness Council
NCDIEL	National Center for Development of Innovation and Entrepreneurial Learning
PISA	Programme for International Student Assessment
PPP	Purchasing Power Parity
R&D	Research and Development
SBIR	Small Business Innovation Research
SEE	South East Europe
SME	Small and Medium-Sized Enterprises

¹ CEFTA parties include Albania, Bosnia and Herzegovina, Croatia, Kosovo, the Former Yugoslav Republic of Macedonia, the Republic of Moldova, Montenegro and Serbia.

SOIP	State Office of Industrial Property
TIDZ	Technological and Industrial Development Zones
USAID	United States Agency for International Development
VAT	Value Added Tax
VET	Vocational Education and Training
WTO	World Trade Organization

EXECUTIVE SUMMARY

The Former Yugoslav Republic of Macedonia is at a critical stage in its economic development. The country has achieved stable economic growth for the last fifteen years thanks to its integration into global trade and restructuring of the domestic economy. Throughout most of the previous decade, it grew at a solid pace and was initially able to better weather the impact of the 2008 financial crisis than were neighbouring economies. For a transition economy, however, the GDP growth which has been achieved so far has not been strong enough to significantly lift the living standards of the population. Now, as it emerges from the recession and continues on the path to EU accession, the country will need to move toward a more sustainable growth model with innovation at its core.

Although the country has integrated into the global and regional economy and has attracted foreign direct investment (FDI), its industries have been unevenly affected throughout the transition period. While a significant portion of FDI was invested in manufacturing in the 1990s, since 2000 FDI has been largely in non-tradeables and relatively little investment has come from greenfield ventures. In addition, the country primarily exports low technology as well as non-technology goods with high comparative advantage from sectors which tend to be based more on factor endowments than on innovation. In contrast, sectors which are generally receptive to research and development (R&D) and other knowledge-intensive industries, represent only a very small share of the economy's exports basket and no comparative advantage. In recent years, labour and capital accumulation have increasingly contributed to GDP growth, accompanied by a dip in total-factor productivity. In order to keep up the productivity gains, serious improvements in the economy's capacity to absorb knowledge and engage in innovation activities will be needed.

The Former Yugoslav Republic of Macedonia already possesses a major prerequisite for developing an innovation system that could be a pillar of economic growth: The government has shown an exceptional commitment to creating a business environment conducive to investment and innovation. The country's ranking has improved to an impressive 23rd in the World Bank's 2013 *Doing Business* report. This is largely thanks to its one-stop-shop and favourable regulatory framework which guarantees national treatment. There have also been noticeable improvements in the enforcement of competition policy. Likewise, the Intellectual Property Rights (IPR) framework of the country is well-developed. With the advent of an institutional framework for venture capital and the formation of a business angels network, businesses are deemed to have better access to finance than before, although levels of financial intermediation and competition in the financial market remain low.

Despite the overall favourable policy framework conducive to innovation, the innovation performance of the Former Yugoslav Republic of Macedonia lags significantly behind that of similar countries and the EU. Relative to other economies in the region, it spends a very small portion of national resources on R&D. Statistics show that this spending is decreasing even more which has, unsurprisingly, coincided with a decline in the number of people employed in R&D. Moreover, absorptive capacity and business investment in R&D are very low: only a small percentage of research is carried out in the business sector. The majority of R&D occurs in public institutions and the government of the country employs the largest share of R&D workers of any in the region. Consequently, innovation outputs in the Former Yugoslav Republic of Macedonia – reflected in the number of patents and trademarks as well as the innovation components on the Global Competitiveness Index – is low relative to neighbouring countries.

Consequently, there is much room for improvement in the innovative capacity of the actors in the national innovation system. First, the research sector in the Former Yugoslav Republic of Macedonia is limited in its scope. Public research institutions include the national science academy (MASA), five state

universities, and nine private universities; however, only one university engages in research while others focus mainly on teaching. All research institutions in the country suffer from small research capacities which are heavily constrained by their budgets. Not surprisingly, this results in low research performance as measured by the number of citable documents and publications per million inhabitants.

Second, the commercialisation and innovative application of research is another weakness in the country. No institutions exist to measure the extent to which research is translated into innovative activity. Furthermore, largely due to government influence, universities do not view this as a goal of their research.

Third, steps could be taken to address the weaknesses in innovation linkages. Surveys show that few companies have ever cooperated with universities and other research institutions, which themselves vary in how open they are to collaborating with the private sector. There is no administrative framework in place for inter-sectoral research mobility in the Former Yugoslav Republic of Macedonia. Moreover, members of the private sector seldom participate in government bodies of research institutions and universities. Few businesses participate in the 20 business associations that currently exist. Unfortunately, there is no system of incentives to try to induce international research talent from abroad into the country.

Fourth, although the country offers a solid human capital foundation, its skills profile is unfavourable to fundamental research and innovation in the business sector. Despite significant efforts and reforms in the past few years, the workforce is not adequately skilled. This partly explains the high unemployment rate (32% overall and 53.7% of those aged between 15 and 24 in 2010), which is also exacerbated by labour market rigidities. The state will need to put more emphasis on promoting lifelong learning and closing the skills gap between the education system and the needs of the economy.

Nevertheless, an overview of the innovation actors in the Former Yugoslav Republic of Macedonia points to a number of bright spots: various forms of infrastructure for innovation linkages – clusters, incubators, and technology parks – already exist. A sizeable number of companies report being involved in innovative activities, most of which is market-driven. On the whole, Macedonian researchers rank well in terms of co-operation with other researchers from abroad. Relatively new programs intended to promote linkages – such as the financing program of the Ministry of Education and Science or the innovation voucher scheme – are emblematic of a government commitment to strengthen innovation in the country. Most importantly, the government passed the National Innovation Strategy in 2012, laying the foundation for a number of measures intended to promote innovation.

This report recommends five strategic directives to improve the innovation environment and capacity of the Former Yugoslav Republic of Macedonia:

- *Enhance the business sector's propensity to innovate:* The government could raise innovation awareness by organising media campaigns, conferences, and seminars in manner similar to that of the Estonian Innovation Awareness Programme or the Flemish Cooperative Innovation Networks (VIS) in Flanders, Belgium. Moreover, policy makers will need to facilitate access to finance and encourage private investment in R&D and innovation by tailoring financial products to innovative companies and entrepreneurs, developing business infrastructure, attracting venture capital funds, and introducing tax rebates, innovation vouchers, grants, and other subsidies.
- *Strengthen human resources for innovation:* The government should adapt education policy to develop the skills needed for innovation. It can accomplish this by tailoring tertiary education to promote innovation through entrepreneurial learning and fostering closer links with the private sector. It can also further develop vocational training and ensure that the Employment Services Agency skills assessment be continued and further developed.

- *Create a regulatory framework in support of innovation:* A framework needs to be established to regulate IPR of academic researchers. Moreover, the government could tailor procurement policy to better stimulate innovation by utilising functional requirements instead of detailed specifications. Lastly, it is imperative for the government to continue its push to create a favourable business climate.
- *Increase knowledge flows and interaction between innovation actors:* The government could consider further developing incubators, science parks, and business clusters in addition to encouraging new measures such as brokerage events, training sessions, and participation in international companies. This initiative should be combined with thorough evaluation of the existing clusters in the country by the Ministry of Economy, while the Ministry of Education and Science should look to streamline its funding scheme for R&D-oriented projects. Furthermore, measures could be taken to encourage innovation and technology transfer between multinational companies and local suppliers as was done in the Czech Republic by Czechinvest. Lastly, the government should strengthen links between the Macedonian Diaspora and the home country through initiatives similar to the UNDP Transfer of Knowledge through Expatriate Networks (TOKTEN) programme.
- *Co-ordinate policy design, implementation and monitoring of innovation policies:* The government could establish a body to facilitate intra-government communication on innovation-related issues. Policymakers would also need to ensure that the hitherto underdeveloped dialogue between the public and private sectors be improved. Lastly, monitoring and impact evaluations of existing innovation initiatives could be carried out.

The government of the Former Yugoslav Republic of Macedonia is already taking steps to improve the innovation environment: In 2012, it adopted the National Innovation Strategy, the most comprehensive framework for developing a national innovation system in the country to date, a plan that will introduce policy measures and regulatory reforms to boost innovative performance. The key component of the innovation strategy is the Law for Innovation Activity, a far-reaching law passed in 2013 that regulates the various facets of the innovation process in the country.

Chapter one of this report will give an overview of the economic performance and existing framework conditions for innovation in the Former Yugoslav Republic of Macedonia, while chapter two will describe the innovation performance of the country. Chapter 3 will review the capacity to innovate and conduct research and development of the major actors of the innovation system. Chapter 4 will provide policy recommendations and strategic direction for the government of the country on how to improve the innovation environment and capacity.

CHAPTER 1: ECONOMIC PERFORMANCE AND FRAMEWORK CONDITIONS

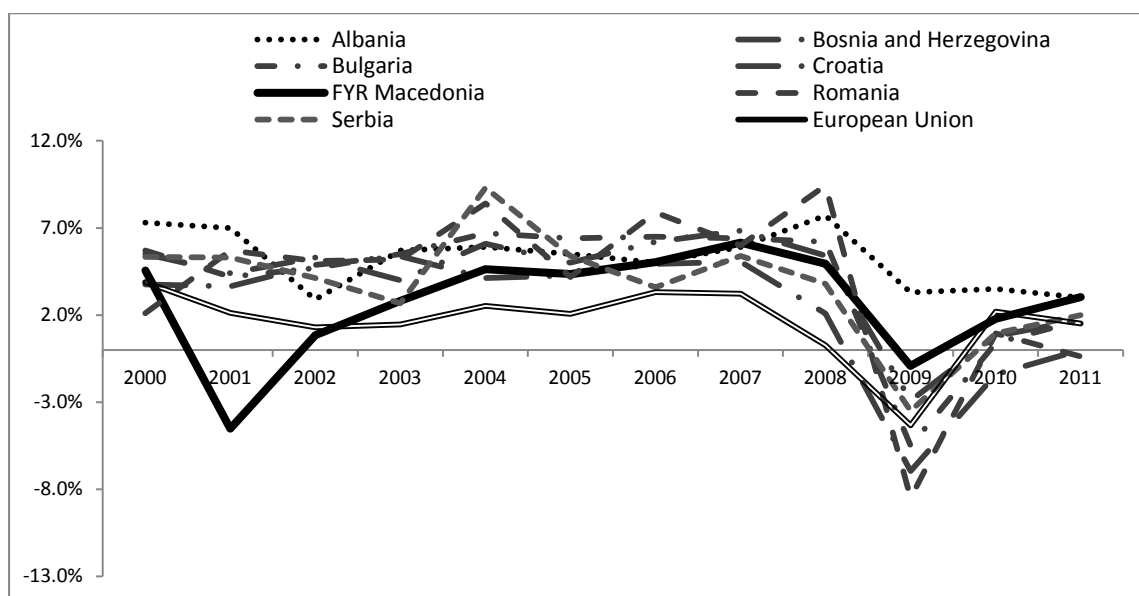
This chapter gives an overview of the macroeconomic performance and framework conditions in the Former Yugoslav Republic of Macedonia. It first highlights important features of its economic development over the last two decades. The analysis focuses on the country's integration in Europe and the global economy, its openness to international trade and foreign direct investment and trends in productivity. It then evaluates the framework conditions for innovation in the country.

The Former Yugoslav Republic of Macedonia has achieved stable economic growth for the last fifteen years following its integration into global trade and restructuring of the domestic economy. Throughout most of the previous decade, it grew at a solid pace and was initially able to better weather the impact of the 2008 financial crisis than were neighbouring economies. Now, as it emerges from the recession and continues on the path to EU accession, the country will need to move toward a more sustainable growth model centred on innovation. The government has already demonstrated a commitment to bolstering the country's competitiveness by creating a favourable business environment, by gaining EU candidate status well in advance of many of its neighbours, and by laying the foundation for a comprehensive innovation promotion initiative.

1.1 Macroeconomic performance and productivity growth

After five years of a severe recession between 1990 and 1995, and in the decade preceding the financial and economic crisis, from 1996 to 2008, the Former Yugoslav Republic of Macedonia has experienced a steady pace of economic growth. The period 1996-2000 was characterised by relative economic stability and slow but important structural reforms including privatisation and trade liberalisation (EC, 2005). This economic revival was abruptly interrupted by an armed insurrection and the financial crisis in 2001 which caused a GDP decline of 4.5%. After the downturn in 2001, the country recovered macroeconomic stability and growth though not fast enough. Real gross domestic product (GDP) growth in 2002-2008 amounted to 4.1% on average. While it was higher than the European Union (EU) average of 2% for the same period, it was among the lowest in South East Europe (SEE) (Figure 1).

Figure 1. GDP growth in selected countries and the EU, 2000-2011

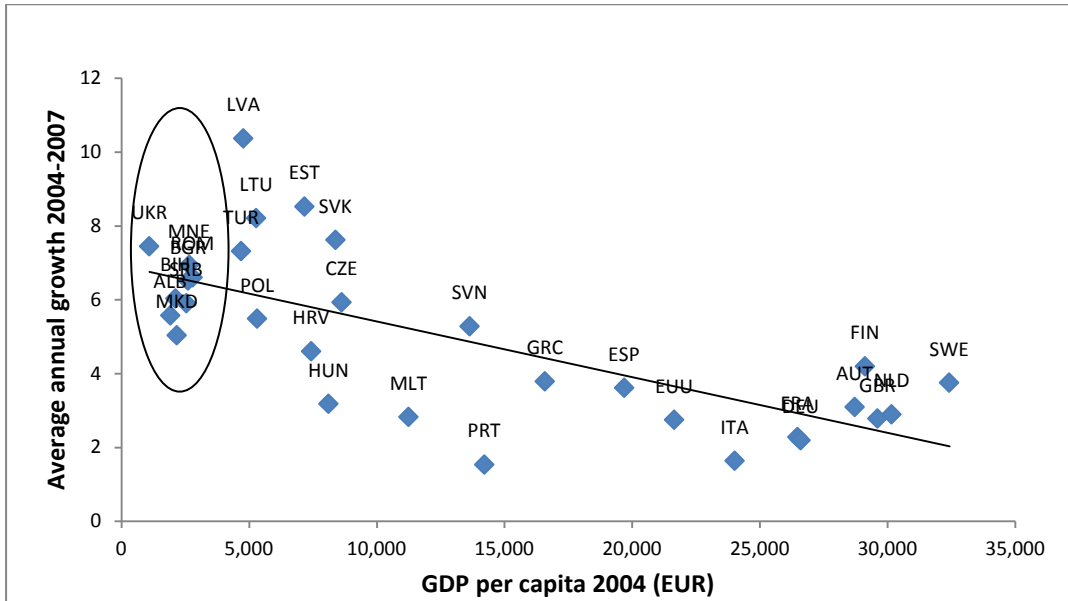


Source: World Bank, World Development Indicators

In contrast to the sharp downturn in the beginning of the 2000s, the Former Yugoslav Republic of Macedonia's economy suffered less from the current global financial crisis than most SEE economies (see Figure 1). In 2009, its GDP deteriorated by only 0.9% and has gradually returned to growth, while comparator economies experienced economic contraction ranging from 2.9% in Bosnia and Herzegovina to 8.5% in Romania. Albania has been the only growing economy in the region during the crisis period (3.3% in 2009). Partly due to the financial sector's limited exposure to non-performing loans, but also to the resilient domestic demand, the impact of the financial crisis on the country's economy remained relatively limited until 2012, when it experienced a significant slow-down as a result of the eurozone crisis (EC, 2010).

For a transition economy like the Former Yugoslav Republic of Macedonia, the GDP growth achieved so far has not been strong enough to significantly lift the living standards of the population. Figure 2 illustrates the catch-up effect according to which poorer economies tend to grow faster than wealthier ones. It reveals that economies like Bulgaria, Romania and Serbia, which had relatively similar levels of GDP per capita in 2004, experienced faster growth and catch-up than the Former Yugoslav Republic of Macedonia between 2004 and 2007.

Figure 2. The catch-up effect

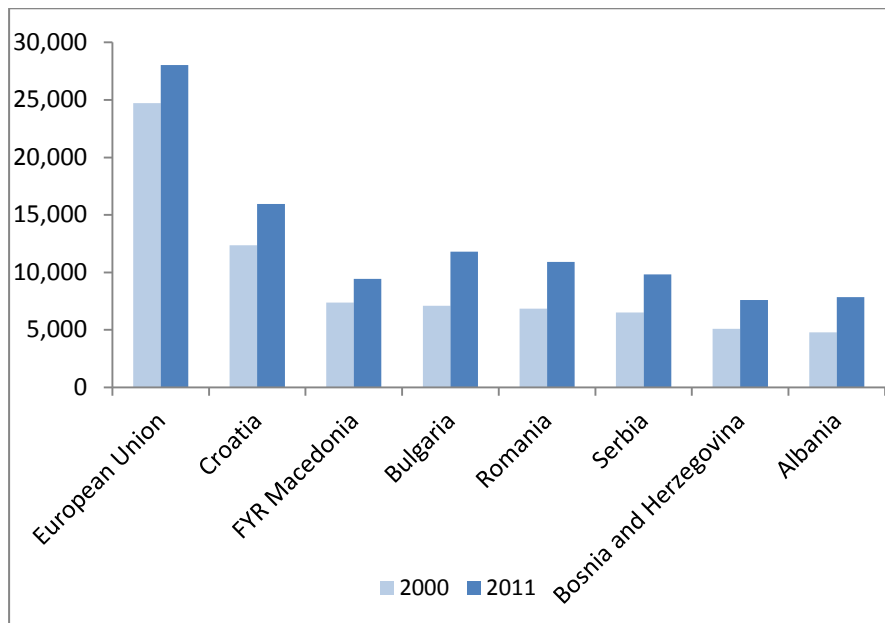


Source: Eurostat, OECD analysis

In fact, the country's GDP per capita increased by only 34% over the last decade, amounting to roughly USD 7,100 at current prices in 2011. Considering its rather low initial level, in terms of purchasing power parity, the GDP per capita reached only one third of EU-27 average in 2011, but still lies ahead of some of the economies in the region like Albania and Bosnia and Herzegovina (Figure 3).

Figure 3. GDP per capita PPP

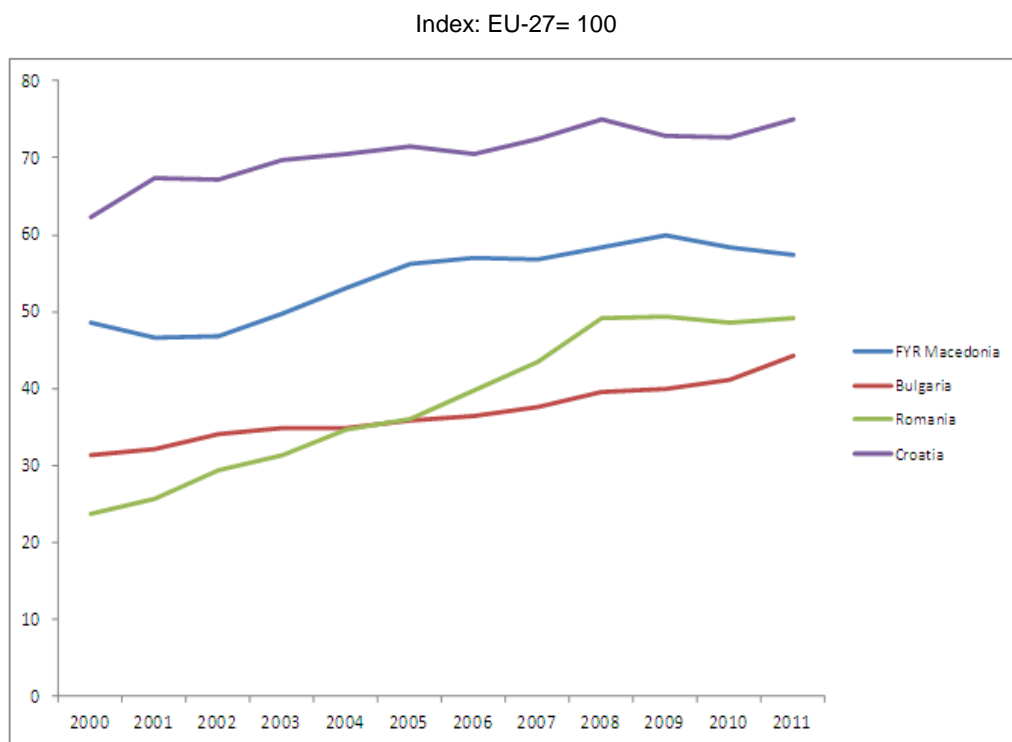
in constant 2005 international \$



Source: World Bank, World Development Indicators

The evolution of productivity is central to explaining the economy's weaker-than-expected growth performance. Labour productivity, measured as GDP per person employed, represented 57% of the EU-27 average in 2011 (see Figure 4). The country experienced significant productivity growth between 2000 and 2005, but post-2005 growth has slowed down. The Former Yugoslav Republic of Macedonia remains ahead of Romania and Bulgaria, though its low labour force participation, high rate of unemployment (32% in 2010) and the high degree of informality in the labour market complicate international comparisons.

Figure 4. Labour productivity per person employed



Source: Eurostat

Labour market rigidities might have played an important role in the poor performance of the Macedonian labour market (Micevska, 2008). To counteract wage compression and long duration of unemployment spells, the government made important changes to the labour laws (OECD 2010a). The main reforms included a deduction of minimum social contributions and the introduction of measures to facilitate hiring of workers. As a result, the Rigidity of Employment Index declined from 40 to 14 (on a scale of 0 to 100) in the *World Bank Doing Business Report 2010*.

With regards to wage distribution, certain degrees of differentiation exist by sector and occupation. The average wage in the services sector, in particular, energy supply, telecommunications and financial intermediation, lies significantly above the national average (9% in 2008). As a result, workers in the primary sector and in manufacturing have comparatively lower wages (12 percentage points lower than the services sector in 2008 alone). These trends point at the responsiveness of the country's labour market to relative skills scarcity and productivity (Mojoska-Blazevski et al. 2009).

Apart from labour productivity, there are other determinants that affect the productivity of a country. Total factor productivity accounts for the portion of output which is not explained by the quantity of input

used in production. In the decade preceding the crisis, total factor productivity (TFP) accounted for almost two-thirds of output growth during 1996–2000 and 2001–08, while the contributions from labour and capital were low, explaining around one-third of the growth rate (see Table 1). In particular, between 2002–06 its TFP contribution was one of the strongest in South East Europe (Borys et al., 2008). Large contributions from TFP are common in the aftermath of a communist regime due to the efficiency gains realised from a reallocation of resources, but they tend to decrease along the transition process and to be replaced by capital accumulation and labour growth.

In recent years, labour and capital accumulation have increasingly contributed to GDP growth. And capital accumulation is expected to increase even further in the future due to the recent reforms in the general business climate (rank 23rd in the 2013 WB Doing Business) and the establishment of a pro-active investment promotion agency (Dethier et al. (2008) and Harding and Javorcik (2011), among others). This is already apparent from the table below with capital contribution increasing post-2006, accompanied by a dip in TFP. Since the onset of the crisis, the TFP level has been on a downward path, which is of concern as post-transition gains have been realised and stronger knowledge-based and within-sector TFP growth is now necessary (Orszaghova et al. 2013).

Table 1. Growth decomposition of FYR Macedonia

	1996-2000	2001-2008	2006-2008
Real GDP growth			
contributions	3.4	3.7	5.2
Capital	0.9	1.2	1.9
Labour	0.2	0.3	2.3
TFP	2.2	2.2	0.9

Source: IMF (2009); projections for 2008; calculations are made based on the following assumptions: capital share 0.4% and depreciation 8%.

1.2 Economic structure: International trade, investment and production

Trade and investment impact innovation in various ways such as technology transfer, competition effects, scale economies and spillovers (an overview in Onodera, 2008). As a result, trade and investment affect each stage of the business development. Trade can lead to substantial economic benefits through more efficient allocation of resources and deepening specialisation allowing countries to profit from comparative advantage. Innovative and more productive companies export, invest abroad or license their technologies to exploit the benefits of their innovations. As such, open markets would benefit innovative firms. Open markets lead to an increase in the size of the market over which the firm can exploit its innovation and realise monopoly profits.

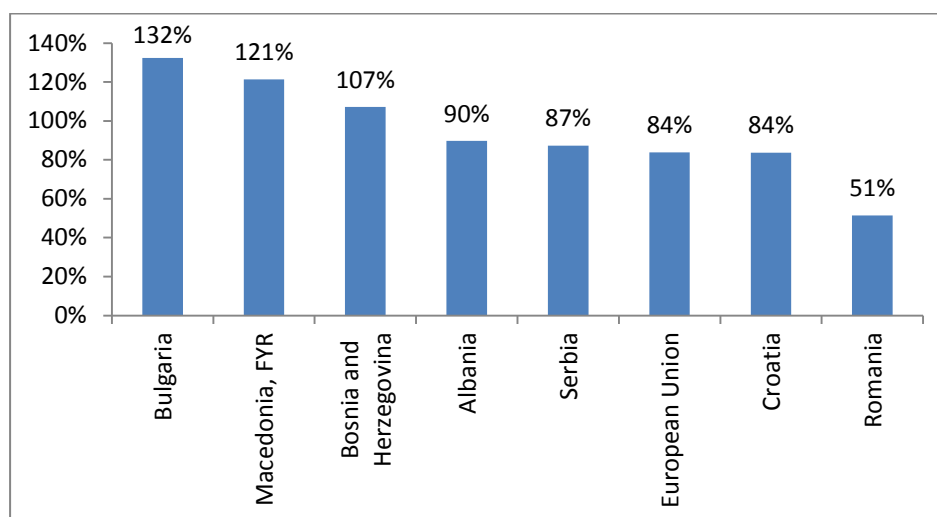
1.2.1 International trade

Trade flows, both imports and exports, are considered as being important channels of technology transfer and knowledge spillover. They can spur innovation and increase productivity of domestic firms by increasing competitive pressure.

The Former Yugoslav Republic of Macedonia is very well integrated in multilateral trading systems with trade in goods and services accounting for 121% of GDP in 2011, the second highest after Bulgaria (Figure 5). Exports from the Former Yugoslav Republic of Macedonia doubled in euro terms over the last decade, reaching EUR 3,720mn in 2011 and thus 49% of GDP. At the same time, imports increased from EUR 2,173mn in 2001 to EUR 5,415mn in 2011, which represents 72% of GDP. Among the comparative economies, this makes the Former Yugoslav Republic of Macedonia the economy with the highest import

share and the second highest export share in GDP after Albania. The Former Yugoslav Republic of Macedonia's accession to the WTO in 2003 and CEFTA in 2006 as well as its intensifying integration with the EU since 2005 have mostly contributed to this increase.

Figure 5. Trade (% of GDP)



Source: World Bank, World Development Indicators

The EU is the country's largest trading partner, collectively accounting for 64% of the economy's exports and 56% of its imports in 2011. Germany is the top destination for domestic products as well as the top country of origin for imports. Greece, the United Kingdom and Bulgaria have also strong trade relations with the Former Yugoslav Republic of Macedonia. Serbia has been traditionally the closest trading partner in the region, while Russia is a strategic trading partner for crude oil imports. However, most recent foreign trade data indicate a deterioration of the trade balance with the EU and the CEFTA economies, whose current parties include Albania, Bosnia and Herzegovina, the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia and Kosovo*, and a narrowing of the trade deficit with the developing countries and other developed countries (National Bank of the Republic of Macedonia, 2012).

Table 2. Main trading partners of the FYR Macedonia in 2011

Main export partners	in mill. US dollars	Main import partners	in mill. US dollars
Germany	1241.9	Germany	728.9
Serbia	874.2	Russia	683.7
Bulgaria	307.7	United Kingdom	591.0
Italy	289.7	Greece	566.3
Greece	215.2	Serbia	533.9

Source: UN Comtrade

The concept of revealed comparative advantage (RCA) can be useful for characterising the distribution of exports across different kinds of products or economic activities. The concept relates to the relative opportunity costs of producing goods and services in different countries and is widely used to

evaluate export strengths. A value for RCA higher than one indicates a comparative advantage and can be interpreted as specialisation in the particular industry or commodity.

According to Table 3, the Former Yugoslav Republic of Macedonia primarily exports low technology as well as non-technology goods with high comparative advantage. Exports are driven by iron and steel and general manufactured products, such as textiles and leather, agricultural products, food and beverages, as well as petroleum derivatives, mining and chemicals. All these are sectors which tend to be based more on factor endowments than on innovation. In contrast, sectors which are generally receptive to R&D and other knowledge-intensive industries, such as production of electrical machinery and pharmaceuticals, for example, represent only a very small share (4.5%) of the economy's export basket and no comparative advantage.

Table 3. Industry shares in manufacturing imports and exports and revealed comparative advantage in FYR Macedonia, 2010

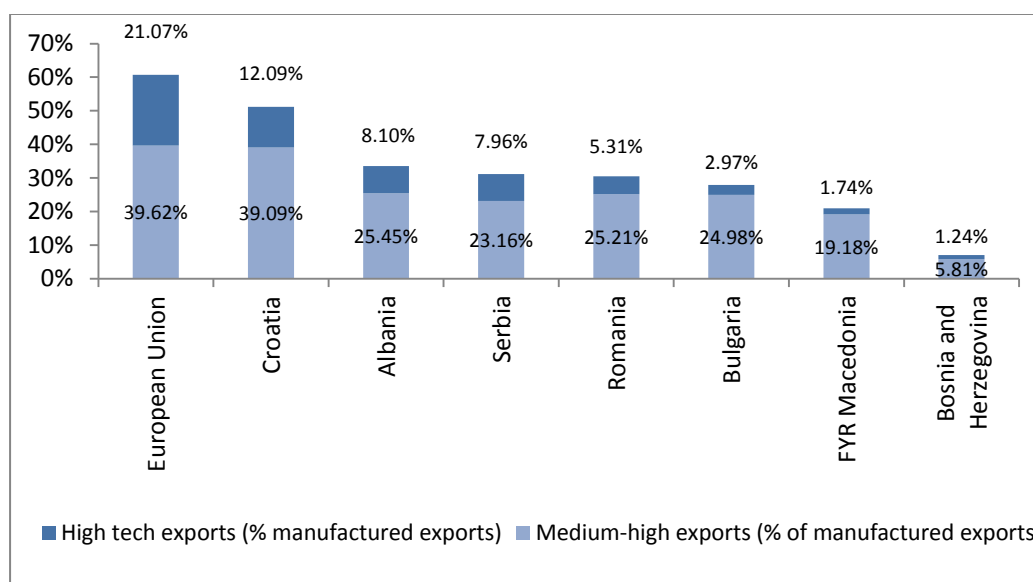
Industry	Total trade		Trade in intermediate goods	
	Share of total exports	RCA	Share of total exports	RCA
Agriculture, Hunting	6.80%	2.74	5.30%	1.98
Forestry, Logging	0.03%	0.33	0.05%	0.32
Fishing	0.02%	0.12	0.04%	0.43
Mining of coal and lignit, Extraction of peat	0.05%	0.07	0.09%	0.07
Mining of metal ores	4.78%	3.89	7.79%	3.71
Other mining and quarrying	0.86%	1.06	1.40%	2.72
Food products, Beverages	9.00%	1.74	1.78%	0.74
Tobacco	0.84%	2.91	0.01%	0.20
Textile	2.14%	1.03	1.46%	0.68
Leather	16.63%	8.42	0.03%	1.30
Footwear	2.28%	2.14	0.05%	0.17
Wood and wood and cork products	0.22%	0.34	0.34%	0.32
Paper	0.38%	0.28	0.57%	0.28
Printing and publishing	0.16%	0.25	0.12%	0.16
Coke, refined petroleum products and nuclear fuel	6.58%	1.33	10.74%	1.28

Pharmaceuticals	2.29%	0.66	0.03%	0.01
Chemicals excluding pharmaceuticals	8.16%	1.04	12.86%	1.06
Rubber and plastics products	1.35%	0.55	2.10%	0.61
Other non-metallic mineral products	2.43%	2.24	3.95%	2.43
Iron and steel	23.34%	8.24	38.07%	7.86
Ferrous scrap metals	0.59%	2.00	0.96%	1.91
Non-ferrous metals	0.27%	0.08	0.44%	0.08
Non-ferrous scrap metals	0.79%	2.14	1.28%	2.04
Fabricated metal products	1.29%	0.59	1.93%	0.66
Machinery and equipment, not elsewhere classified	2.61%	0.32	1.23%	0.24
Office, accounting and computing machinery	0.11%	0.03	0.02%	0.01
Electrical machinery and apparatus, not elsewhere classified	2.24%	0.55	3.46%	0.74
Radio, television and communication equipment	0.22%	0.03	0.20%	0.02
Medical, precision and optical instruments	0.38%	0.11	0.39%	0.26
Motor vehicles, trailers and semi-trailers	0.79%	0.10	1.01%	0.21
Railroad and transport equipment, not elsewhere classified	0.31%	0.64	0.37%	1.28
Aircraft and spacecraft	0.00%	0.00	0.00%	0.00
Manufacturing not elsewhere classified, Recycling	0.95%	0.31	0.19%	0.24
High technology	3.00%	0.14	0.64%	0.04
Low technology	16.63%	1.26	1.78%	0.21
Medium-high technology	8.16%	0.29	12.86%	0.47
Medium-low technology	6.58%	0.56	10.74%	0.66
ICT	2.24%	0.11	3.46%	0.21

Source: OECD STAN, author's compilation

Although the Former Yugoslav Republic of Macedonia experienced some improvements towards medium-technology and capital-intensive products in the pre-crisis period (Orszaghova et al., 2013), this trend reversed in 2009. As Figure 6 shows, in 2011, 21% of the country's manufacturing exports originated from high and medium-high technology industries. However, only 1.7% were high technology, a rather low share compared to its peers' and to the EU, in particular.

Figure 6. Share of high and medium-high technology manufacturing exports, 2011



Source: OECD STAN, author's compilation

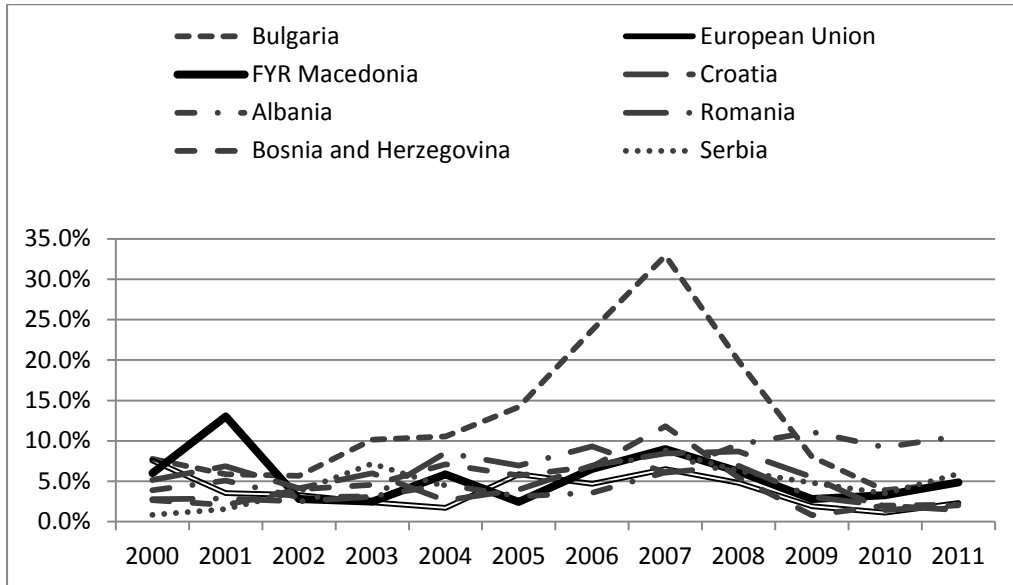
The country's export promotion programmes and measures in place focus predominantly on the traditional sectors highlighted above. However, this improved following the country's most recent export promotion initiative for ICT. In particular, the Macedonian Bank for Development Promotion implements projects focusing on export factoring, insurance of loans for export preparation, and insurance of loans for foreign buyers of products originating from the Former Yugoslav Republic of Macedonia (OECD, 2012).

1.2.2 Foreign direct investment

Firms which are exposed to international market competition are more likely to innovate (Jaumotte and Pain, 2005). Links to global production chains, through FDI and by domestic firm sales abroad, provide unique opportunities for knowledge transfer and national capability accumulation (Keller, 2004).

Over the last decade inward FDI flows increased considerably in the Former Yugoslav Republic of Macedonia and comparator economies in absolute terms and relative to GDP. The ratio of FDI relative to GDP (5.1%) in the country has been among the highest in South-East Europe for the period 2000-2011. Only Bulgaria, Albania (see Figure 7) and Montenegro have achieved better performance on average. Inflows of FDI reached a peak in 2007 representing 9% of GDP. Most recently, however, the global economic crisis, which strongly impacted the capacity of potential investors, caused a sharp decrease in FDI inflows. In 2011, inflows of FDI dropped to USD 422 mil. representing only 4.9% of GDP, which was significantly below some neighbouring countries like Albania (10.6%) and Serbia with 5.9% (Figure 7). It should be noted that FDI inflows were relatively strong though in the period 2006-2008 which coincided with a strong GDP growth.

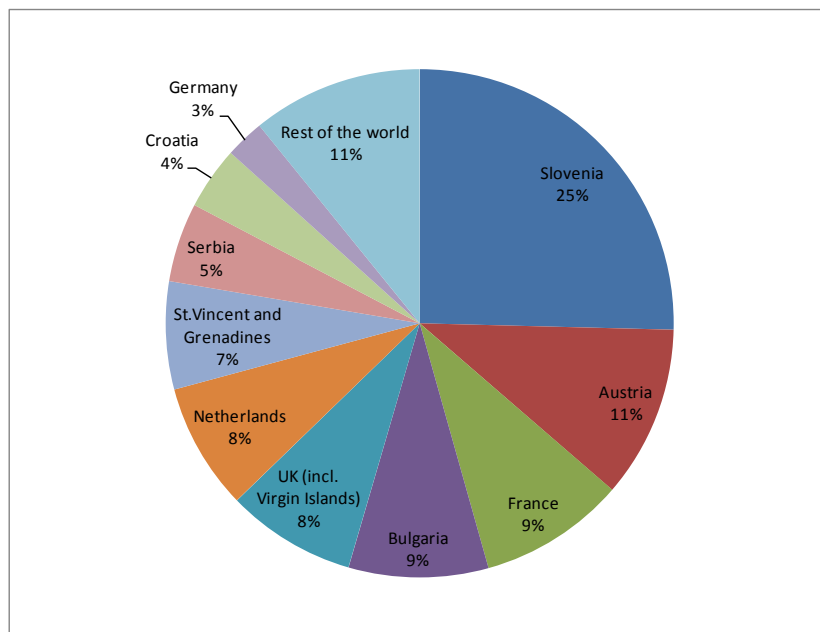
Figure 7. FDI net inflows (% of GDP), 2000-2011



Source: UNCTAD

Historically, European Union member countries have been the largest sources of FDI flows to the Former Yugoslav Republic of Macedonia, contributing to over two thirds of the FDI stock accumulated up to 2011. In the last four years, particularly, Slovenia, Austria, France and Bulgaria invested heavily in the country. The neighbouring economies of Serbia and Croatia belong also to the list of top ten investors (Figure 8).

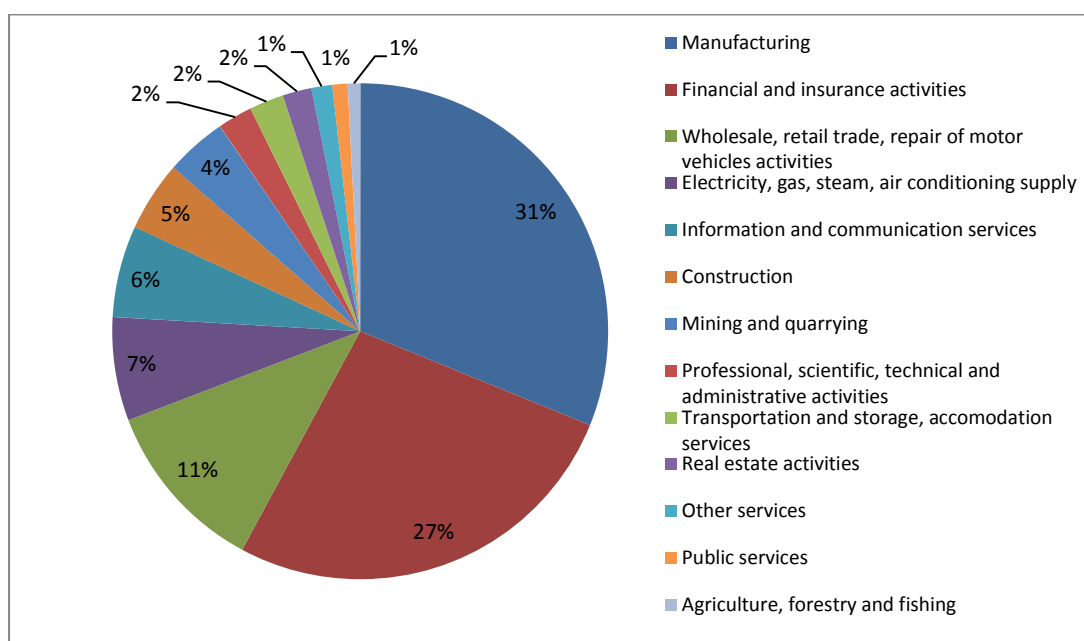
Figure 8. FDI inflows by main investment sources, 2007-2010



Source: Vienna Institute for International Economic Studies

The economy's industries have been unevenly affected by inward FDI flows over the transition period. Whilst in the nineties, the manufacturing sector attracted more than two thirds of total inflows, mainly participating in the privatisation process, after 1999 its portion dropped to a mere 24% on average with an incidence of divestment in 2008. Despite a large investment in the transport equipment sub-sector in 2010 which boosted its share again, manufacturing remains the second biggest sector in terms of FDI (31%) after the services sector in the Former Yugoslav Republic of Macedonia (Figure 9). Since 2000, FDI activity has focused predominantly on the non-tradable sector which, unlike manufacturing, presents little opportunity for knowledge spillovers. In particular, financial services, trade, transport and telecommunications have made up for 50% of total FDI on annual average. In addition, little investment has come from greenfield ventures. 2009 is the first year reporting any greenfield activity, USD 12 mil. (UNCTAD, 2012), which represented 6% of total FDI in the country.

Figure 9. FDI stock in FYR Macedonia by activity, 2010



Source: Vienna Institute for International Economic Studies

There is, indeed, little doubt that FDI in manufacturing, and particularly of the greenfield type, can exert a strong effect on economic growth, since it has the potential to affect not only the capital stock but also productivity. The direct effect on productivity has been central to the theory of multinational firms as already noted by Caves (1974) and Hymer (1976) who relate the existence of multinational firms to their ownership of technological assets. The direct effect of FDI on the productivity of foreign affiliates may be complemented by spillover effects. Keller and Yeaple (2009) show that the knowledge imported by foreign firms can spill over to the other firms of the industries where they operate. Finally, greenfield investment, in particular, may also affect productivity in other firms located in their supply chain, thereby producing vertical spillovers. Indeed Smarzynska Javorcik (2004) reported evidence of positive spillovers from foreign firms operating in Lithuania on the upstream part of their supply chain.

The government of the Former Yugoslav Republic of Macedonia has recognised the significance of the manufacturing sector and particularly foreign investment projects which build a new productive unit from scratch – i.e. greenfield investment – for the future sustainable growth of the country. It has demonstrated commitment for attracting FDI through establishing a solid institutional framework, which

includes an FDI minister and a dynamic investment promotion agency, Invest Macedonia. Since its establishment the agency has played a role in creating a solid and growing pipeline of foreign investment projects, especially in the automotive and pharmaceutical industries. For now, the majority of the Former Yugoslav Republic of Macedonia's technology efforts include absorption of imported technologies and mastery of production capability (Svarc et al., 2011), which is normal for an economy at this stage of development. In the future, FDI will be necessary in order to create and expand export-oriented manufacturing facilities, facilitate structural change, and promote the transfer and development of new technology and know-how.

1.2.3 Firm demographics

Economic growth is increasingly driven by big ecosystems, globalisation puts more of a premium on size than ever before, and many of the most important challenges for innovators involve vast systems, such as education and health care, or global warming. As a result, it is large companies which have the scale and scope to operate at technologically efficient scales, to export to international markets and engage in innovation. At the same time, although big companies often excel at incremental innovation, dynamic small companies may be found in specialised economic activities; the kind of important nodes in global value chains that change the rules of the game. Finally, what matters is not so much the size of companies but whether they grow, and progress tends to come from high-growth companies.

The transition process in the Former Yugoslav Republic of Macedonia has resulted in a considerable increase in the number of enterprises, partly as a result of the dismantling of previously large companies into smaller ones, but also to a large extent due to new start-ups. At the time of declaring independence in 1989, only 2,000 businesses existed in the country. However, the first half of the nineties experienced the strongest growth in the enterprise sector bringing the number of enterprises to around 33,500 in 1997. At the same time, employment in these business entities diminished from 432,400 to 283,142 in 1997 (EC, 2005).

Nowadays, the business sector in the Former Yugoslav Republic of Macedonia largely consists of small and medium sized enterprises: 61,794 in 2010, thus accounting for 99.8% of the total (see Table 4). This share is in line with the share of SMEs in the EU. The vast majority of SMEs in the Former Yugoslav Republic of Macedonia (93.3%) is represented by micro companies with up to 10 employees. In contrast, the 131 large companies in the economy account for 0.2% of all enterprises.

Large companies also make a significant contribution to the economy in the Former Yugoslav Republic of Macedonia. In terms of employment, the few existing large companies employ more than half of the labour force, while the micro companies account only for 20%. This contrasts with the EU where large companies total about one third of employment and SMEs account for the remaining two thirds. In addition, large companies also account for about a third of value added in the economy.

The contribution of SMEs in terms of value added (65.7%) is more important than their contribution in terms of employment (43.7%). The opposite phenomenon is observed in the EU where SMEs account for a larger share of employment (67.5%) than value added (58.4%). This could be the result of an underestimation of employment in SMEs in the Former Yugoslav Republic of Macedonia due to informal employment.

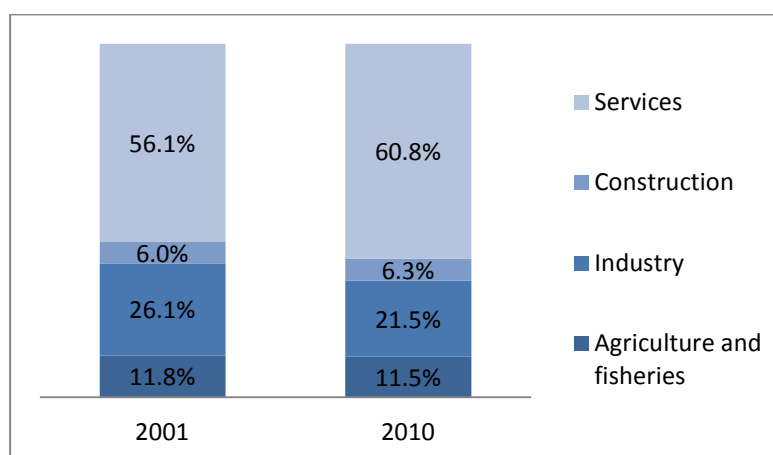
Table 4. Structure of the business enterprise sector in FYR Macedonia, 2010

	Number of enterprises			Employment			Value added		
	FYR Macedonia		EU27	FYR Macedonia		EU27	FYR Macedonia		EU27
	Number	Share	Share	Number	Share	Share	Number	Share	Share
<i>Micro</i>	57775	93.3%	92.2%	112037	20.0%	29.7%	869	23.9%	21.5%
<i>Small</i>	3361	5.4%	6.5%	69975	12.5%	20.6%	739	20.3%	18.6%
<i>Medium-sized</i>	658	1.1%	1.1%	63235	11.3%	17.2%	784	21.5%	18.3%
<i>SMEs</i>	61794	99.8%	99.8%	245247	43.7%	67.5%	2392	65.7%	58.4%
<i>Large</i>	131	0.2%	0.2%	315553	56.3%	32.5%	1248	34.3%	41.6%
<i>Total</i>	61925	100%	100%	560800	100%	100%	3641	100%	100%

Source: SBA Factsheet, 2012

Like most transition economies, the Former Yugoslav Republic of Macedonia has experienced a shift in output generation, with a declining share of industry and an increasing contribution by services. While in 1990 manufacturing amounted to 48% of the total value added (EC, 2005), its portion dropped to a mere 26.1% of gross value added in 2001 (Figure 10). In contrast, services reached 56.1% of total output in 2001. As Figure 10 shows, there has been an increasing shift to services (60.8% in 2010) over the last decade and a further decline of the manufacturing sector, to 21.5%. Nevertheless, the manufacturing sector still comprises the majority of medium-sized and large companies in the country. The share of agriculture has remained steady though very high, which should be a concern for national policy-makers who are trying to bring the economy up the value chain.

Figure 10. Gross value added by main sectors (in %)



Source: European Commission (2012)

1.3 Framework conditions

To support innovation, the creation of new technologies and the flow of information in both the public and the private sector, certain framework conditions need to be present in the country (OECD, 2004). These include access to finance, legislations to regulate intellectual property and competition, and product and labour market regulations. There are several reasons why framework conditions are central to innovation performance:

- Companies need funds for basic research and development as well as for introduction of new products and processes. However, since innovative projects have uncertain outcomes and tend to have longer payback periods, businesses and more particularly SMEs and start-ups may find it difficult to access finance.
- Companies innovate in order to differentiate themselves from their competitors and gain market share. However, if significant barriers to entry exist in a particular market, innovative entrepreneurs will not be able to introduce new products or services. Conversely, incumbents will have little incentive to improve their products and processes, leading to a poor innovation outcome (De Rosa et al. 2009).
- Companies that engage in the development of new technologies face difficulties in protecting the fruits of their labour. Competing companies attempt to imitate successful products and adopt them to their own use (Helpman, 1992). Therefore, intellectual property rights, such as patents and copyrights, aim to incentivise innovation by allowing firms to capture a higher share of the social returns to their research investments.

The business climate in the Former Yugoslav Republic of Macedonia is ranked 23rd out of 185 economies in the 2013 Doing Business Index of the World Bank (Table 5). Not only is the Former Yugoslav Republic of Macedonia the country with the most favourable business climate in the SEE region, but it also outperforms the EU average (40th). The successful implementation of the ‘regulatory guillotine’ since 2006, which focuses on reducing regulatory and administrative costs, has helped the country to its current position in the Doing Business ranking. In particular, its notable progress on facilitating market entry now places its economy as one of the five most attractive locations in the world for business start-ups.

Table 5. Doing Business 2012-2013 scores

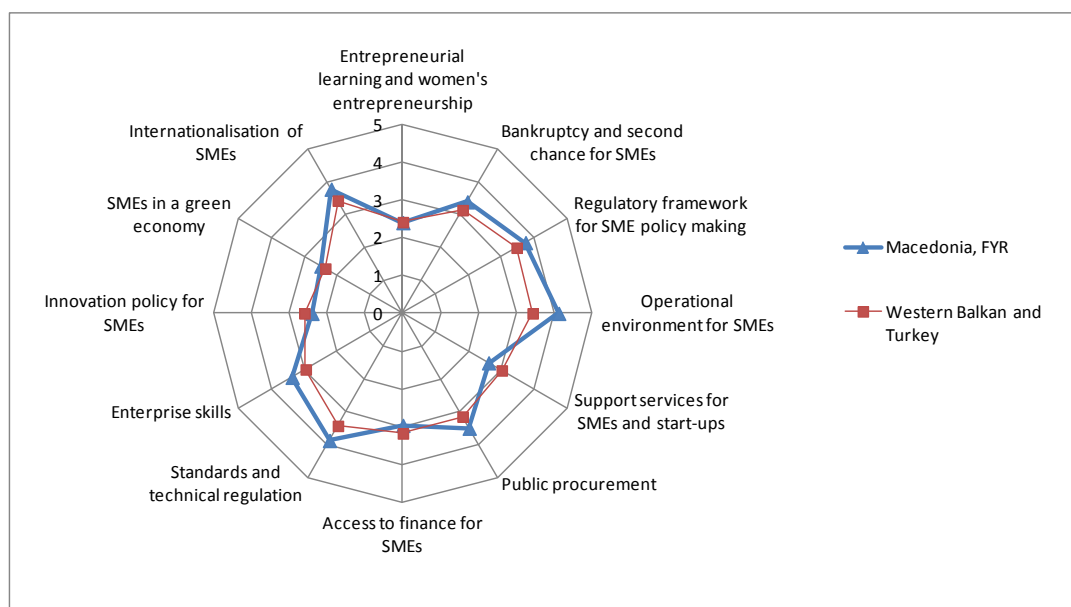
Topic Rankings	DB 2012 Rank	DB 2013 Rank
Starting a Business	6	5
Dealing with Construction Permits	65	65
Getting Electricity	116	101
Registering Property	50	50
Getting Credit	23	23
Protecting Investors	17	19
Paying Taxes	24	24
Trading Across Borders	70	76
Enforcing Contracts	58	59
Resolving Insolvency	56	60

Source: World Bank, Doing Business

The regulatory framework for fledgling businesses is one of the country's key strengths. In particular, a one-stop shop has been created to simplify business registration, and start-up fees have been reduced (EC, 2010). An additional achievement is the improvement in the area of tax policy. The corporate income tax was reduced to 10%, effective as of 2008. A recent reform to allow businesses to pay corporate taxes only on distributed profits has also decreased the tax burden on businesses. The total corporate tax rate in 2012 amounted to 9.7% of companies' profits on average, compared to 43.4% in the EU and 42.7% in OECD countries (IFC and WB, 2012). This change has significantly increased the country's ranking in *Paying Taxes*. Further progress has been made towards closing down non-operating companies, by allowing for more efficient and quicker bankruptcy proceedings (EC, 2012).

The OECD SME Policy Index (OECD, 2012), which monitors the design and implementation of framework conditions and policies to support small and medium-sized enterprises (SMEs) in Western Balkan economies and Turkey (WBT) complements the picture above. While this index situates the investment climate in the Former Yugoslav Republic of Macedonia above the WBT average in most of the policy areas, access to finance and innovation policy remain a challenge (see Figure 11).

Figure 11. SME Policy Index Scores of FYR Macedonia



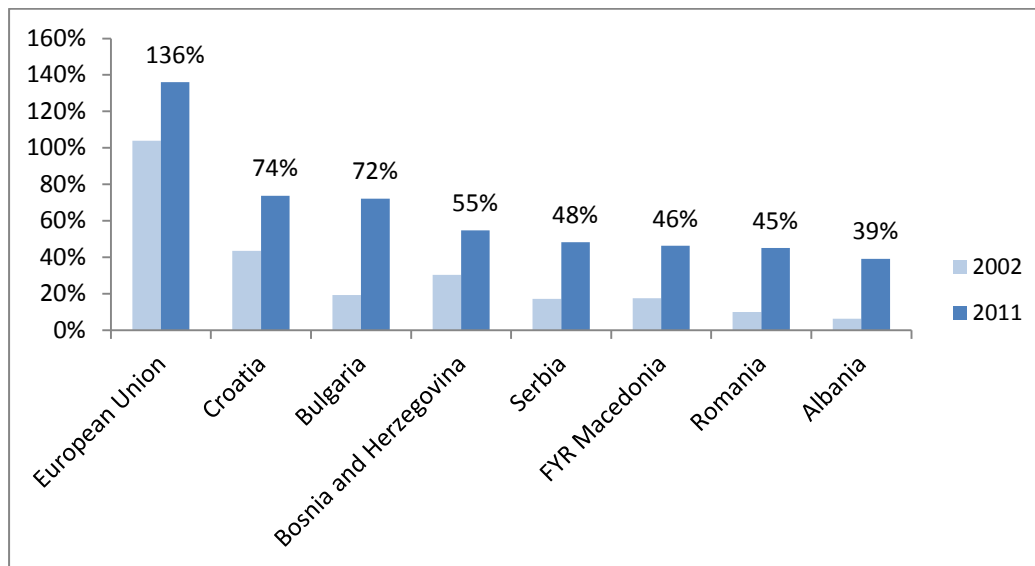
Source: OECD (2012).

Access to finance in general is an issue for companies in the Former Yugoslav Republic of Macedonia. According to the BEEPS (World Bank, 2011) conducted by the EBRD and the World Bank in 2008, 72% of companies considered access to finance as an obstacle to their development, with 29% considering access to finance as a major or very severe barrier (EBRD, 2010). Most recently, sources of external finance including bank lending have suffered significant setbacks due to the crisis.

As a consequence, credit penetration in the Former Yugoslav Republic of Macedonia is still limited, with domestic credit representing only 46% of GDP in 2011. While the impact of the financial crisis on the banking sector has been modest, bank lending has become more restrictive. After a strong and stable credit growth of 30-35% per annum before the crisis, credit to the private sector increased by only 3.6% in 2009. Although it recovered at the end of 2010, it remains rather limited at about 10% in nominal terms. As Figure 12 illustrates, the share of private credit increased from 18% in 2002 to 46% in 2011. Nevertheless,

it still amounts to only one third of the EU average. This ratio also puts the Former Yugoslav Republic of Macedonia among the countries in the region with the lowest credit penetration.

Figure 12. Domestic credit to private sector (% of GDP)



Source: World Bank, World Development Indicators

To help companies access bank loans, credit guarantee schemes were set up in the past, although the resources dedicated to this initiative had always been limited, constraining their scope and effectiveness. In response to the crisis in 2009, the government increased the funding of the Macedonian Bank for Development Promotion for co-financing and guarantee schemes applicable to SMEs, in particular, but banks were reluctant to use the scheme due to complicated procedures and the interest rate ceiling it imposed. As a result, no credit guarantee schemes exist any more (OECD, 2012).

The leasing market is still underdeveloped compared to other countries in the region, but its importance has been steadily increasing. Notably, the assets of the leasing sector represented only 2.2% of 2009 GDP in the Former Yugoslav Republic of Macedonia and 3% of the total assets of the financial sector, compared to 14% of 2010 GDP in Croatia. While in 2006 only two leasing companies were registered with total assets accounting for the mere 0.9% of GDP, by 2011 eleven companies had started operation, which speaks to a revival of the sector (Boskovska, 2011 and PWC, 2011).

Other sources of finance, such as private equity and risk capital, are similarly in their early stages of development. Private equity finance is not readily available. Neither has a commercial private equity sector developed nor did international funds show interest in investing in the region. SEAF Macedonia, established in 1998, presents the only notable exception. Venture capital is almost non-existent not only in the Former Yugoslav Republic of Macedonia, but in the region as a whole. According to EVCA (2012), VC investment in South-East Europe amounted to less than 0.005% of GDP in 2011. A first step, however, was made by USAID in 2011 through the launch of the first Business Angels Network in the Former Yugoslav Republic of Macedonia, a formal network of entrepreneurs and wealthy individuals willing to invest their money, knowledge, skills and social capital in new and innovative business ideas with high growth potential for the Former Yugoslav Republic of Macedonia business market.

The institutional framework for venture capital has undergone significant reforms but further improvement is necessary. The Former Yugoslav Republic of Macedonia government made great progress

in reforming the real estate cadastre and property registration system. The coverage of real estate cadastre increased from 43% in 2005 to 99.8% in 2011, and the increased efficiency and confidence in the registration system lead to the increase in using property as a financial asset (WB, 2012). In addition, the credit information system has improved considerably. A fully functioning private credit bureau was established in 2011, containing information on repayment history, unpaid debts, or the outstanding credit of individuals and firms; the bureau already and covers 72% of adults. There is also a public credit registry which collects data from banks and covers 35% of loans (IFC and WB, 2012). Significant changes in credit information are not reported though, which undermines the accuracy and validity of credit information. The insolvency law also lags behind international practice with regard to rules concerning reorganisation and the problem of double taxation prevails (OECD, 2012).

As regards to barriers to investment, according to the *OECD Investment Reform Index (IRI)*, the restrictions to FDI in the Former Yugoslav Republic of Macedonia are minimal (OECD, 2010a). The principle of national treatment is included in the legal framework and is well implemented. The government has ratified bilateral treaties and international instruments to regulate investment disputes. The investment promotion agency Invest Macedonia also plays an active role in promoting the Former Yugoslav Republic of Macedonia as an investment destination. The OECD *IRI* highlights that the Former Yugoslav Republic of Macedonia could facilitate FDI by increasing linkages between local and foreign companies or creating a one-stop-shop for foreign investors or allowing the investment promotion agency to act as such (OECD, 2010a).

On the other hand, restrictions to national treatment remain. For instance, in the area of capital movements, foreign residents are still not allowed to own agricultural land, even though they can sign long-term lease contracts. They can acquire buildings, apartments and office premises only under the terms of reciprocity under the amendments to the Law on Ownership and Other Real Rights of 2008 (PriceWaterhouseCoopers, 2012). Notable limits still remain on the amounts that non-residents can transfer through their local and foreign currency accounts (EC, 2012). 49% ownership restrictions are also in place in industries such as arms trading and production (OECD, 2010b).

Even though since 2008 the country fulfills the requirements of the first stage of the Stabilisation and Association Agreement with the EU in the field of capital movements and payments (EC, 2012), in the area of movement of people, restrictions further remain. The social security system is not co-ordinated with that of other countries though there are preparations to improve co-ordination (EC, 2011).

Regarding the provision of services, some limitations include the need for foreign operators to establish a branch of subsidiary in order to serve the local market. In addition, there are still nationality requirements in many sectors, including veterinary, private education and tourism (EC, 2012). Despite an improved recognition of professional qualifications, through the enactment on the Law on recognition of professional qualifications, there are still many conditions pertaining to language and nationality in the regulation of professions (EC, 2011).

Restrictions exist not only for non-residents but for the Former Yugoslav Republic of Macedonia residents as well. In particular, nationals are restrained from investing abroad as they are prohibited from purchasing foreign securities and real estate in a foreign country and have to overcome high bureaucratic hurdles to open a bank account abroad (EC, 2012).

The framework of intellectual property rights is relatively advanced in the Former Yugoslav Republic of Macedonia by regional standards. The country has ratified most of the international framework for IPR enforcement (OECD, 2010c) and in particular the World Trade Organization (WTO) agreement on Trade Related Aspects of Intellectual Property. However, inventions patented by the State Office for Industrial Property remain few and the main reason for that is low awareness by companies and the public of the

benefits of IPR. Furthermore, substantive examination of patent applications is not carried out at the State Office for Industrial Property. Instead, the validity of invention registrations is assessed only at the stage of infringement examination, creating legal uncertainty around patent rights (EC, 2012).

With respect to competition policy, the Commission for the Protection of Competition (CPC), an independent state body, which is responsible for the implementation of the Law on Protection of Competition has continuously improved its enforcement record (EC, 2012). In 2012, 23 decisions were taken in the field of concentration, a sharp increase compared to 2009, three decisions were adopted on cartels and three for the abuse of a dominant position. Although the number of initiated decisions in the field of state aid has increased, the quality of some of them could be improved. The competition agency is also increasingly investigating economically important areas, particularly telecommunications and broadcasting – dominated by a very small number of incumbent suppliers, which undermines effective competition.

Corruption continues to be a major problem. The Business Environment and Enterprise Performance Survey (BEEPS) survey (2009) and a recent OECD survey on high-growth SMEs singled out the informal sector as the main obstacle to firm investment. Although this sector's share in the official economy of the Former Yugoslav Republic of Macedonia has been continuously declining over the last decade, it still represents about 24% of GDP (Garvanlieva et al., 2012). The International Labour Organization estimates that the share of informal workers is 42.8% for the 15 to 19 years olds, 22.2% for the 20 to 24 year olds and 6.5% for workers older than 25 years (International Labour Organization, 2008). Fuelled by weaknesses in tax and expenditure policies and in law enforcement, the informal sector thus remains a major challenge to competition.

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CHAPTER 2: INNOVATION PERFORMANCE

This chapter provides an overview of the general innovation performance of the country. This is done by an analysis of the inputs and formal outputs of innovation and international benchmarking of the country on several innovation indices.

The innovation performance of the Former Yugoslav Republic of Macedonia lags behind that of similar countries and the EU. Relative to other countries in the region, it spends a very small portion of national resources on research and development (R&D). Statistics show that this spending is decreasing even more which has, unsurprisingly, coincided with a decline in the number of people employed in R&D. Moreover, absorptive capacity and business investment in R&D are very low: only a small percentage of research is carried out in the business sector. The majority of R&D occurs in public institutions and the government of the country employs the largest share of R&D workers of any in the region. Consequently, innovation outputs in the Former Yugoslav Republic of Macedonia – reflected in the number of patents and trademarks as well as the innovation components on the Global Competitiveness Index – is low, relative to neighbouring countries.

2.1 Innovation inputs

Innovation inputs are tools and resources such as financial resources and employees, which enable companies or institutions to innovate. This section will focus on the gross expenditures on R&D and the human resources for science, technology and innovation in the Former Yugoslav Republic of Macedonia.

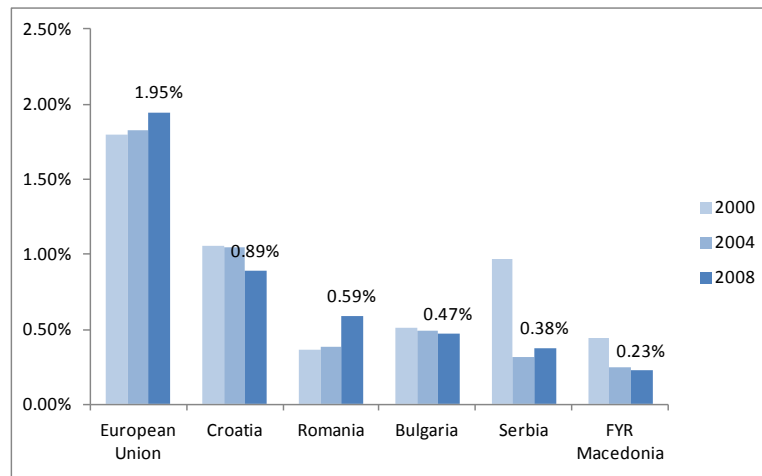
Gross expenditure on R&D

Spending on R&D is a widely-used measure of innovation inputs, indicating how much an economy invests into the creation of new knowledge (OECD, 2011). Nonetheless, R&D spending does not encompass all forms of innovation activity and, in particular, non-technological innovations.

The Former Yugoslav Republic of Macedonia is among the economies in the region that dedicate the smallest share of national resources to R&D (Figure 13). In 2008, the gross expenditure dedicated to research development (GERD) represented only 0.23% of GDP, compared to 1.95% in the European Union and figures ranging from 0.38% to 0.89% in comparative economies. In addition, as Figure 14 illustrates, the trend in R&D expenditure has been declining over the past decade. GERD amounted to 0.44% of GDP in 2000, but was reduced to less than half of that amount in 2007, decreasing to 0.175% of GDP. Josimovski (2011a) reports that GERD dropped to 0.20% of GDP in 2009, which corresponds to EUR 13.27 mn. According to the EC Progress Report (EC, 2013b), investment in research is likely to have diminished further in the following years, but the lack of reliable data makes it difficult to assert.

Figure 13. Gross expenditure on research and development

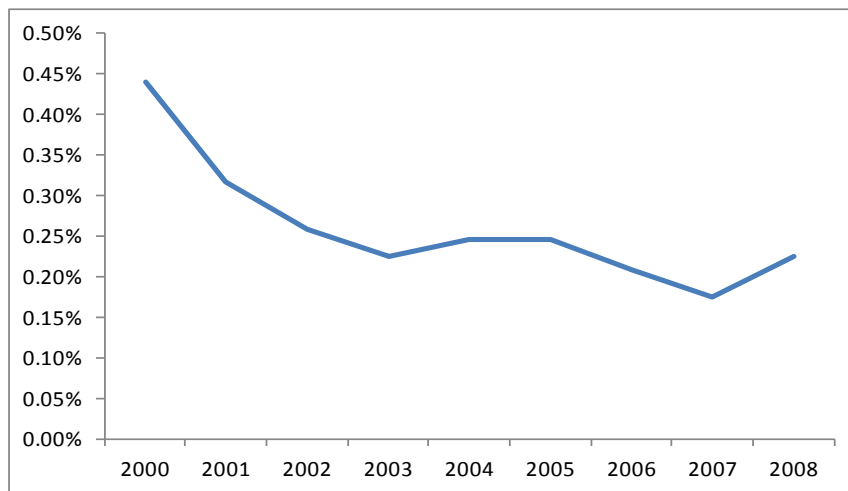
(% of GDP)



Source: World Bank, World Development Indicators

Figure 14. Gross expenditure on research and development over time in FYR Macedonia

(% of GDP)



Source: World Bank, World Development Indicators

The composition of R&D expenditures in the Former Yugoslav Republic of Macedonia reveals that the business sector plays a limited role in R&D. In 2009, Business Expenditures on R&D (BERD) represented 21.1% of GERD, in contrast to 62.2% of R&D expenditures in the EU (Josimovski, 2011). Even though companies may under-report R&D spending given the absence of tax benefits for R&D expenditure, businesses' low share of R&D investments suggests that research and development is driven mostly by the government.

Looking at the performers of R&D by expenditures also shows that research largely takes place in public institutions. Higher education institutions spent 32.5% of R&D expenditure and public research institutions another 46.4% of R&D expenditure in 2009. In contrast, universities and public research

organisations in the EU respectively spend 24.2% and 13.2% of R&D expenditure. Businesses spend only about a third of R&D expenditure in the Former Yugoslav Republic of Macedonia against about two thirds in the EU (Josimovski, 2011).

Human resources for science, technology and innovation

Developing and maintaining a skilled labour force base is a pre-requisite for an innovative and competitive economy. In particular, post-secondary education plays an important role in the development of innovation. As such, expenditure on education is an investment that can foster economic growth, enhance productivity, contribute to personal and social development and reduce social inequality (OECD, 2011, Education at a Glance).

Human capital development is particularly challenging in the Former Yugoslav Republic of Macedonia. Indeed, despite significant efforts and reforms in the last few years, challenges to develop skills are immense, especially when the current performance is compared to the objectives set by the strategic framework for European co-operation in education and training ('ET 2020', see Table 6). For instance, in the Former Yugoslav Republic of Macedonia the share of people aged 30-34 who have successfully completed university or university-like education at level 5-6 of the International Standard Classification of Education 1997 was only 17.1% in 2010. This compares to an average of 33.5% in EU-27 countries, 27% in Bulgaria, 24.3% in Croatia, and 18.1% in Romania. While the completion rate of secondary education is in line with European standards (see 'Early school leavers'), the performance of the Former Yugoslav Republic of Macedonia in terms of adult participation in lifelong learning is clearly below the EU average, though higher than comparator economies in the region (Table 6).

Table 6. EU benchmark for education and training

Benchmarks for Education and Training	ET 2020 benchmark	EU 27	Bulgaria	Croatia	FYR Macedonia	Romania
Early school leavers: % of 18-24 years olds with at most a lower secondary educ.(ISCED 2) and not in further education or training (2010)	<10	14.1	13.9	3.7	15.5	18.4
Tertiary attainment: % of 30-34 years olds with tertiary education and training (2010)	>=40	33.5	27.7	24.3	17.1	18.1
Adult lifelong learning participation: % of 25-64 participating in lifelong learning (2010)	>=15	9.1	1.2	2.2	3.2	1.3

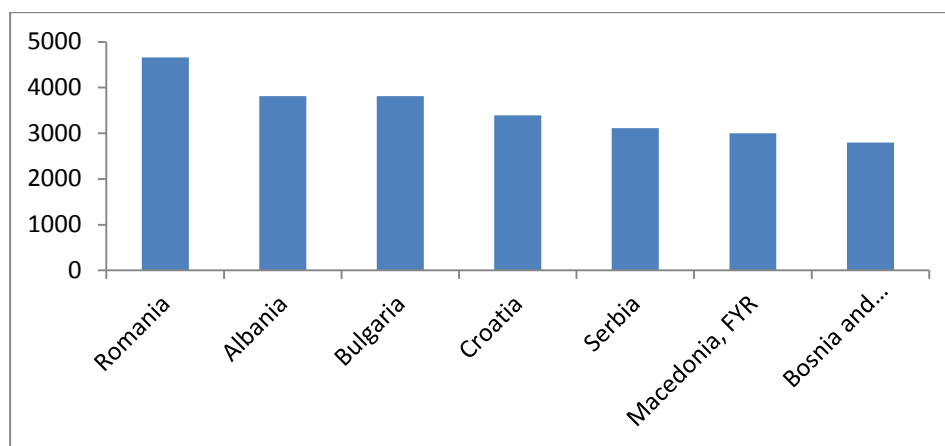
Source: Eurostat

In addition, results of the OECD Programme for International Student Assessment (PISA), in which the country participated in 2000, show that the mean performance for literacy in the Former Yugoslav Republic of Macedonia, 373, was the 4th lowest amongst the 14 non-OECD participants in the 2000 study ,

and was well below the OECD average of 500 (OECD and UNESCO, 2003)². The 2011 Trends in International Mathematics and Science Study assessment of eight-grade students in mathematics and science validates the poor performance of the country's students in international comparison. The mean performance for mathematics (a score of 426) and science (a score of 407) in the Former Yugoslav Republic of Macedonia was not only the lowest amongst all European countries, but it has also been continuously decreasing since 1999 (447 for mathematics and 458 for science).

Despite being low by regional standards, the enrolment of students in tertiary education increased over the past years. In particular, total enrolment went up by 35% between 2006 and 2009, but the number of students declined slightly by 5% in 2010 (UNESCO Institute for Statistics). As a result, with 2,997 students per 100,000 inhabitants, the Former Yugoslav Republic of Macedonia has relatively more students than Bosnia and Herzegovina (2,796), but it clearly lags behind all other comparative economies (see Figure 15).

Figure 15. Total enrolment of students in tertiary education, by 100,000 inhabitants, 2010



Source: UNESCO Institute for Statistics

Half of university students in the country graduate in social science, business, law, and humanities and art. In contrast, the number of tertiary graduates in engineering, manufacturing and construction has tremendously decreased from 23% in 1999 to a mere 8% in 2010. Meanwhile, only 13% of university students graduate in science and technology (STEM). These figures point to a potential lack of human resources in technical fields, which can be a significant obstacle for developing the innovative capacity of firms.

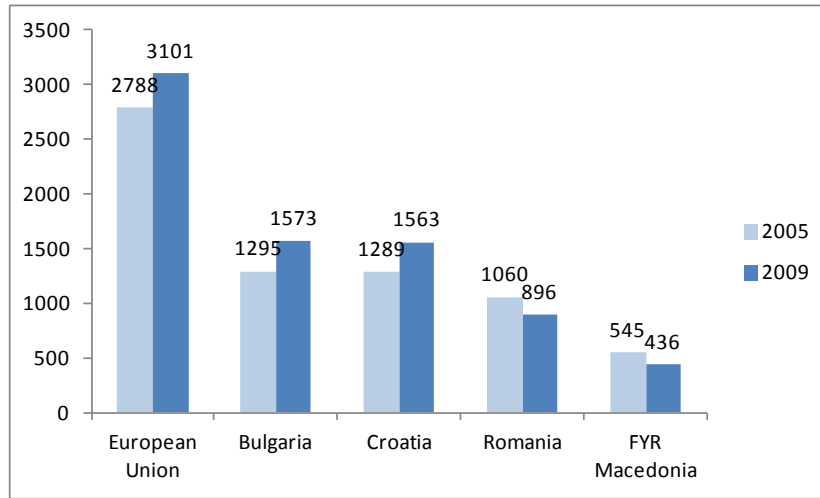
The country's human resources employed in R&D have declined alongside spending on R&D. In particular, the number of full-time equivalent researchers, defined as professionals engaged in the conception or creation of new knowledge, has diminished over the last few years, from 1110 researchers in 2005 to 893 in 2009. This represents a decrease of about 20%. The number of researchers per million inhabitants (Figure 16) also reveals that the Former Yugoslav Republic of Macedonia has a smaller share of researchers than peer countries³.

² Only Indonesia, Albania and Peru had lower scores.

³ Excluding Albania, Bosnia and Herzegovina and Serbia, for which data were not available.

Figure 16. Researchers

Per million inhabitants, full-time equivalent

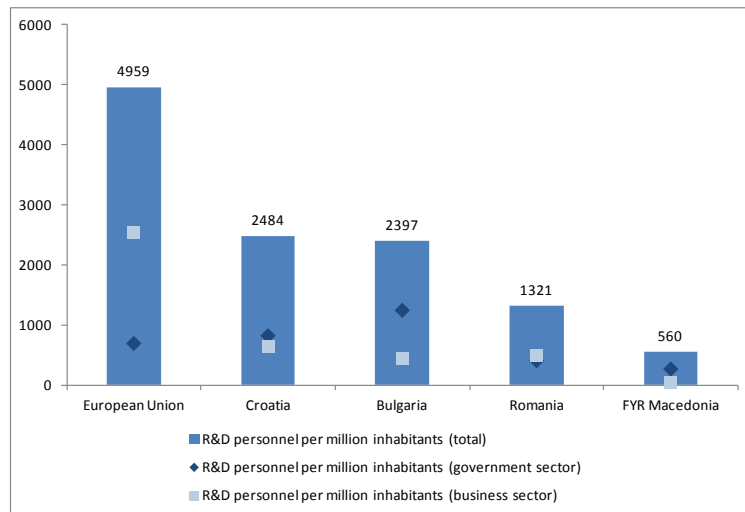


Source: Eurostat

Similar trends can be observed when looking at full-time equivalent R&D personnel, which include managers, administrative staff and office personnel employed in R&D services as well as researchers. R&D personnel fell by 20% between 2005 and 2009, from 1435 to 1147. The Former Yugoslav Republic of Macedonia also has fewer employees in R&D per million inhabitants than peer economies (Figure 17).

Figure 17. R&D personnel, 2009

Per million inhabitants, full time equivalent



Source: Eurostat

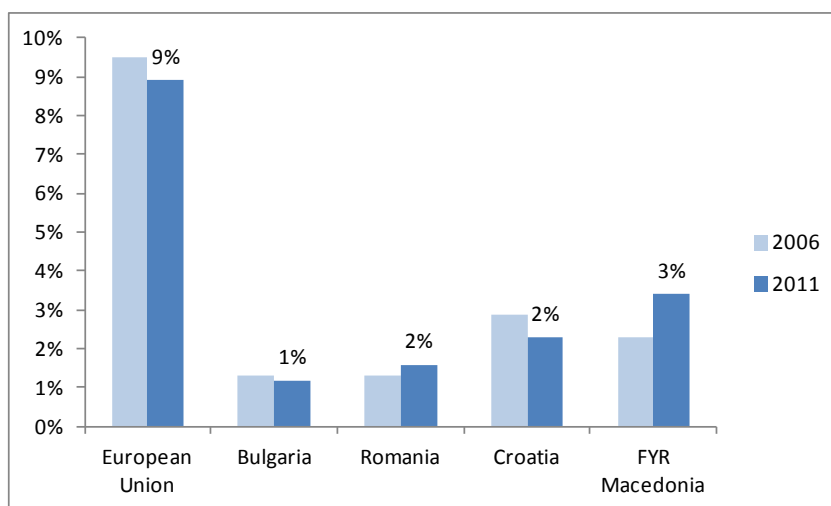
A relatively large share of R&D personnel and researchers work in the public sector. Figure 17 shows that, compared to other European economies in the region, the government in the Former Yugoslav Republic of Macedonia employs a larger share of R&D personnel; only 7.9% of R&D personnel are employed by the business sector, against 51.4% in the EU, 25.9% in Croatia and 38% in Romania. More

particularly, 75.5% of researchers (as opposed to R&D personnel, which is a broader category) are employed in higher education and only 1.5% of researchers in the business sector (Josimovski, 2011a).

Continuing education and life-long learning are important components of a dynamic innovation system. However, only 3% of the population aged 25-64 in the country takes part in any form of life-long learning (Figure 18). This means that the workforce is not directly involved in knowledge transfer and thus not well-prepared for the adoption of new knowledge and technology. As a consequence, the domestic workforce cannot be considered competitive on the global market, in particular, when compared to the EU average of 10% of its population participating in life-long learning programmes. Nevertheless, it is worth noting that life-long learning participation in the Former Yugoslav Republic of Macedonia has been continuously increasing since 2006 and is the highest amongst the Western Balkan economies.

Figure 18. Life-long learning

% of respondents who received education or training in the four weeks preceding the survey



Source: Eurostat

In addition, while vocational education and training (VET) is widespread in the country with approximately 60% of secondary education students in VET (ETF, 2009), its quality and relevance can be further improved. A Council for VET and a Centre for VET have been set up, which aim to increase the links between the VET system and social partners in the field of education policy and to develop the curriculum respectively. However, these institutions are quite new and their overall capacity remains insufficient (EC, 2012). Therefore, further efforts are needed to ensure that the programmes offered reflect the needs of the labour market and that students can develop work experience within the course of their studies (ETF, 2009).

Lack of qualified personnel in the workforce can be a significant predictor of project abandonment or delays in developing innovations according to the Community Innovation Survey of the European Union. Evidence from a recent skills gap analysis performed by the Employment Services Agency of the Former Yugoslav Republic of Macedonia reveals that many companies complain about young graduates lacking ‘practical skills’, in particular. As a result, some initiatives have begun to further integrate studies and work experience. In particular, the Law on Higher Education, enacted in 2008, made internships compulsory for tertiary education students. This is an important first step but is not enough, as internships often only last a month and the actual level of co-operation of each educational institution with the private sector tends to vary significantly.

The skill mismatch problem is further aggravated by the severe loss of youth and skilled labour force to emigration, on the one hand. According to the OECD immigration database, 15.5% of the tertiary-educated population of the Former Yugoslav Republic of Macedonia lives abroad. On the other hand, companies invest little resources in developing the skills of their own employees. Data collected by the World Bank in 2009 shows that only 18% of companies offered some form of formal training to their permanent employees in 2008 (World Bank, 2011b), less than the SEE average of 32%. Among small firms, only 14% offered formal training while 43% of large firms did so. An OECD survey of 492 firms in the Former Yugoslav Republic of Macedonia confirms the lack of training opportunities in the business sector.

2.2 Innovation outputs

While innovation inputs reflect the resources going into R&D and innovation, innovation outputs, such as patents or trademarks, can provide an indication of a country's innovation performance. For example, De Rassenfosse and van Pottelsberghe (2008) have found that countries' patenting activities are correlated to R&D productivity. By filing a patent, research institutions and companies ensure that they have intellectual property rights over an innovation, although not all innovation activities result in formal innovation outputs such as patents.

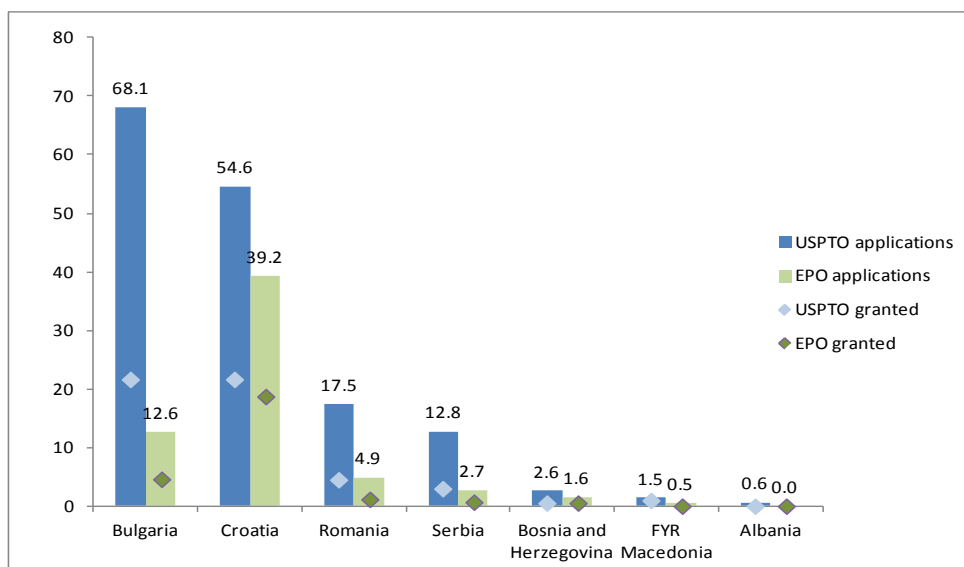
Patents

Patenting activities should, however, be interpreted with caution. Firstly, they reflect the extent to which the economic environment incentivises and facilitates patenting. Secondly, patents do not capture all forms of innovation; organisational and marketing innovations in particular are unlikely to result in patents.

As shown by Figures 19 and 20, the Former Yugoslav Republic of Macedonia is as one of the economies in the region which patents least, with only Albania and Bosnia and Herzegovina performing worse. In fact, the country applied for only one patent at the European Patent Office which was not granted.

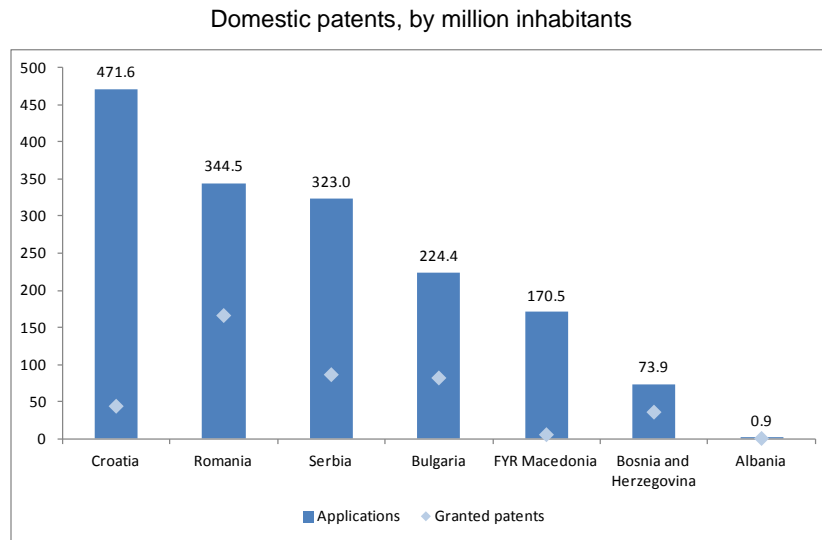
Figure 19. Total patents applications and patents granted 2005-2011

United States Patent and Trademark Office and European Patent Office, by million inhabitants



Source: World Intellectual Property Organisation; World Bank, World Development Indicators for 2008 population data

Figure 20. Total patent applications and patents granted 2005-2011



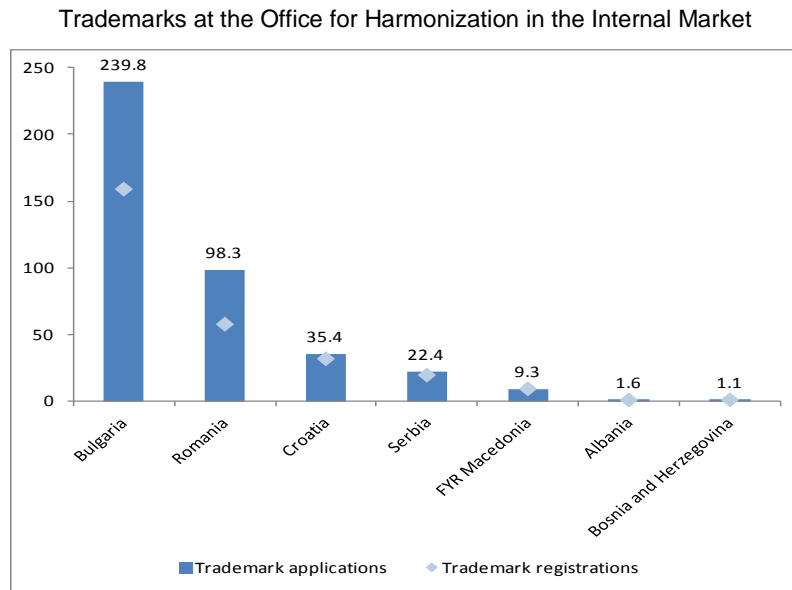
Source: World Intellectual Property Organisation; World Bank, World Development Indicators for 2008 population data

Trademarks

While patents are more an indication measure of products and process innovations, trademarks tend to reflect marketing innovation. Hence trademarks are used to signal some form of novelty in the product, be it a new design or a new form of marketing.

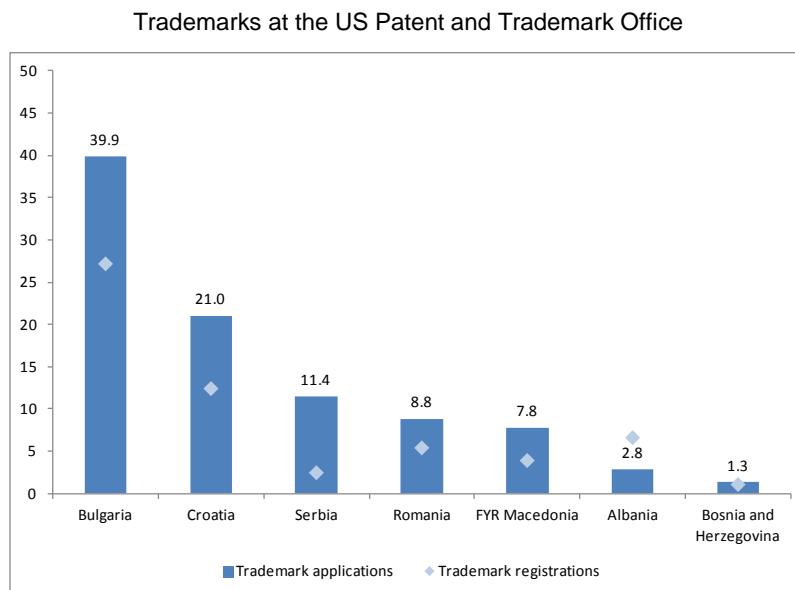
Figure 21 shows that the Former Yugoslav Republic of Macedonia also lags behind with regards to trademarks. The country filed a total of 9.3 trademarks per million inhabitants in the Office for Harmonization in the Internal Market between 2005 and 2011. This is well below the comparator economies, excluding Albania and Bosnia and Herzegovina. In contrast, the trademark-filing activity through the United States Patent and Trademark Office (Figure 22) reveals that the Former Yugoslav Republic of Macedonia performs closer to comparator countries according to this measure. The country was granted total 3.9 trademarks per million inhabitants compared with 2.4 in Serbia, for instance.

Figure 21. Total trademark applications and trademarks granted, 2005-2011



Source: World Intellectual Property Organisation; World Bank, World Development Indicators for 2008 population data

Figure 22. Total trademark applications and trademarks granted, 2005-2011



Source: World Intellectual Property Organisation; World Bank, World Development Indicators for 2008 population data

2.3 Innovation indices

A range of international benchmarking indices have been developed to assess and compare the innovation capacity of economies. These indices follow a variety of methodologies that use quantitative and qualitative indicators.

In general, the Former Yugoslav Republic of Macedonia performs poorly on these indices. For instance, while the country ranks 80th in the Global Competitiveness Index overall, it ranks 110th on the innovation pillar more specifically. This shows that innovation is not one of the relative strengths of the country. In contrast, Croatia ranks 74th on the innovation pillar, but 81st on the index.

Some of these indices highlight specific weaknesses of the innovation system of the Former Yugoslav Republic of Macedonia. For example, both the Global Competitiveness Index (Table 7) and the EU Innovation Union Scoreboard (Figure 23) highlight the low expenditure on R&D by businesses (EC, 2011 and World Economic Forum, 2013). In the Global Competitiveness Index, the Former Yugoslav Republic of Macedonia ranks 123rd on ‘Company spending on R&D’ while Croatia ranks 76th and Bulgaria 92nd. In addition, the relatively low rank of the Former Yugoslav Republic of Macedonia on the ‘‘Capacity for Innovation’’ indicator of the Global Competitiveness Index shows that companies are not conducting formal research and developing new products but tend to adapt existing technology instead. These two trends are consistent with the low inputs on innovation observed earlier. The Global Innovation Index also assigns a relatively low score to the quality of linkages in the country (INSEAD, 2012).

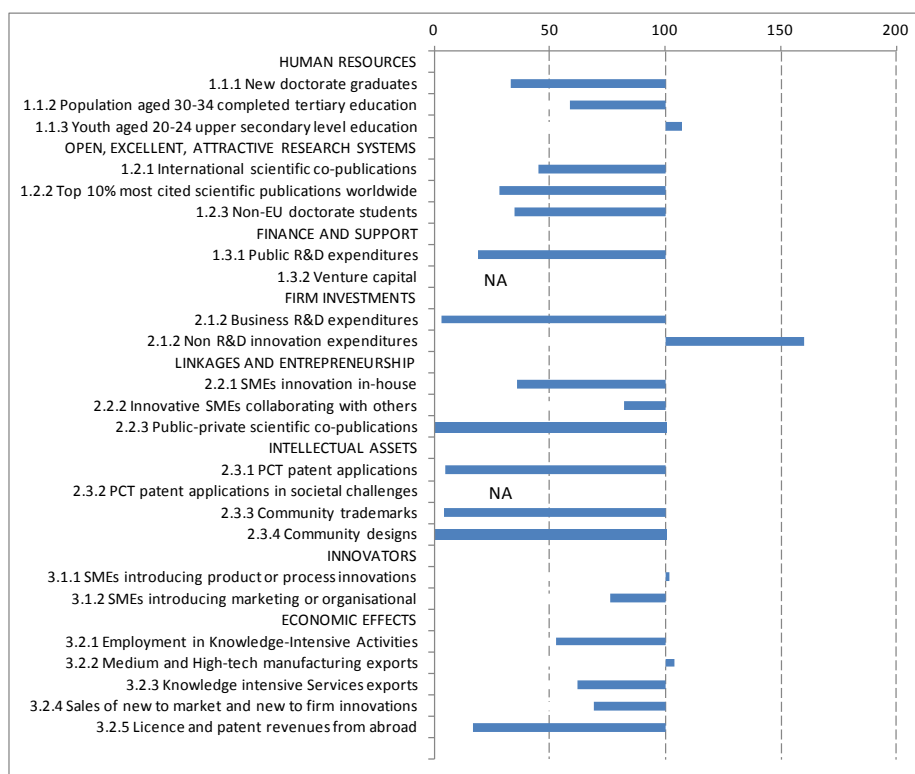
Table 7. Ranking of FYR Macedonia based on the indicators from the 12th pillar of the Global Competitiveness Index - Innovation

Indicator	Rank FYR Macedonia	Rank Bulgaria	Rank Croatia
Capacity for innovation	99	64	72
The quality of scientific and research institutions	100	75	48
Company spending on R&D	123	92	76
University collaboration in R&D	105	117	80
Government procurement of advanced technology products	102	81	129
Availability of scientists and engineers	106	98	86
PCT patents, applications / million pop	59	47	33

Source: World Economic Forum (2013)

The indices also highlight some strengths of the country’s innovation system. For example, the Former Yugoslav Republic of Macedonia performs better than Bulgaria on ‘University Collaboration in R&D’ and better than Croatia on ‘Government procurement of advanced technology products’. The Innovation Union Scoreboard further points out that non R&D business expenditures are higher in the country than the EU average.

Figure 23. Innovation Union Scoreboard, 2013



Source: European Commission, 2013

Whilst there are relatively few trademark and patent applications in the country, firms report introducing more product and process innovations than in the EU. Coupled with high non-R&D innovation expenditures and low R&D expenditures, this could indicate that companies are adapting existing technologies rather than developing new technologies per se. On the other hand, sales of new-to-market and new-to-firm innovation are lower than in the EU, which may indicate that these incremental innovations are not so successful on the market.

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CHAPTER 3: INNOVATION ACTORS

This chapter describes the capacity of the main innovation actors in the Former Yugoslav Republic of Macedonia – the business sector and public research institutions – to innovate, their linkages and main challenges. It highlights the role of government and describes the public support measures for innovation, research and development and co-operation between the actors.

Whilst a sizeable number of companies in the country report being involved in innovative activities, the general picture is still one of rather low absorptive and innovative capacity. Companies tend to adapt or acquire new products, services or processes rather than develop existing ones. Few companies co-operate with universities and other research institutions on innovative activities as the latter suffer from small research capacities. This results in low overall research performance and incremental innovation. The commercialisation and innovative application of research is another glaring weakness. Although various forms of infrastructure for linkages exist, many of these initiatives have proved to be unsustainable after their establishment.

3.1 Business sector

Because most research will not yield profit unless used or commercialised, it is important to evaluate the capacity of the private sector to use existing and new knowledge to create value in the economy. This section explores the innovation behaviour of the business sector in the Former Yugoslav Republic of Macedonia. It is based predominantly on the results of a business survey designed by the OECD Investment Compact and carried out by Gesellschaft für Konsumforschung (GfK) in the country. The survey aims at understanding local firms' innovation activity, resources dedicated to innovations, motivations, barriers to innovate and policy needs. It has been carried out on a sample of 492 companies randomly selected from business registry of the country, which contains more than 60,000 active firms, for the period 2008-2010. The survey has been stratified by firm size and sector of activity.

3.1.1 Innovation activity

Innovation is defined, throughout the survey, as something that is new to the company, new to the market or to the world, consistently with the Oslo Manual (OECD and Eurostat, 2005). Innovative enterprises are those that introduced: i) a substantive product or service innovation (new or improved product/service with new features and functionalities); ii) process innovation (different production process of same product); iii) marketing innovation (same product or service, marketed differently through different distribution channel, pricing, market positioning, advertising, etc.); or iv) organisational innovation (different logistics, storage or procurement).

Based on answers from the OECD survey, enterprises in the Former Yugoslav Republic of Macedonia consider themselves to be innovative. Three fourth of companies answered that they were innovative to some extent and only 23% responded that they were not innovative at all⁴ (Table 8). On the other hand, only 18% tend to be very or extremely innovative. Micro and small-sized enterprises are less often innovators than large or medium-sized ones. Whilst sectors (manufacturing versus non-manufacturing) do not differ much, companies that are exporting consider themselves to be much more innovative (39%) than enterprises targeting only local and regional markets (15%).

⁴ The large number of innovative companies in the survey sample can possibly be explained by a selection bias, since participation in the survey was voluntary and innovative companies were more likely to accept to participate than were non-innovating ones.

Table 8. Innovation activity by firm characteristics

	Companies in sample	Not at all innovative	Somewhat innovative	Very innovative	Extremely innovative
Total	492	23%	56%	19%	2%
Micro	240	31%	56%	12%	1%
Small	153	19%	55%	23%	3%
Medium	80	10%	59%	28%	4%
Large	19	5%	47%	47%	0%
Exporting	125	10%	50%	34%	5%
Non-exporting	367	27%	58%	14%	1%
Manufacturing	164	15%	54%	29%	2%
Non-manufacturing	328	27%	57%	14%	2%

Source: OECD business survey, designed by the OECD Investment Compact for South East Europe and carried out by GfK.

In the period 2008-2010, 65 % of the companies were involved in any or several of the four types of innovation activity. The majority introduced product or service innovations (34.6%), followed by marketing, organisational and process innovations (see Table 9). In particular, the number of SMEs that have introduced different types of innovation largely conforms to the results from the Community Innovation Survey of the Former Yugoslav Republic of Macedonia, as conducted by the National Centre for Development of Innovation and Entrepreneurial Learning and Contesti in 2010 in a sample of 2000 companies. However, almost half of micro firms did not introduce any type of innovation. When compared to the EU-27 average, SMEs in the Former Yugoslav Republic of Macedonia tend to introduce less marketing and organisational innovations.

Table 9. Types of innovation introduced by companies

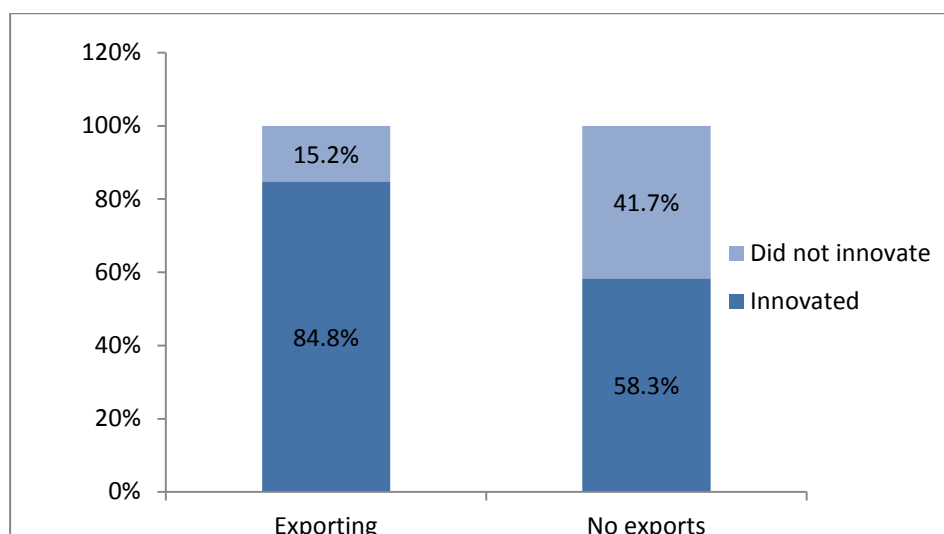
Country	EU-27		FYR Macedonia	
	CIS (SMEs)	CIS (SMEs)	OECD survey (492 companies)	
Types of innovation that companies introduced in previous 3 years				
Product or service innovations	34%	39.2%	34.6%	
Process innovations			23.2%	
Marketing innovations	39%	30.8%	33.3%	
Organisational innovations			23.8% ¹	

1. Companies could provide more than one answer.

Source: Community Innovation Survey (CIS) for EU-27 (first column), CIS for the Former Yugoslav Republic of Macedonia (second column), OECD business survey (third column).

As emphasised above, export activity is a key factor for innovation performance. Figure 24 shows that 85% of exporting companies have introduced at least one type of innovation between 2008 and 2010, while only 58% of non-exporting firms innovated during this period. This higher export propensity of innovating firms is in line with trade theory (Melitz, 2003) and empirical findings (Bernard et al., 2007 for US firms; Mayer and Ottaviano, 2007, for European firms) that suggest that only the most productive firms export. Innovation is crucial for firms to increase their productivity and this increased productivity allows firms to cover the fixed costs associated to exporting. However, causality can also run from exporting to innovation. Exporting may help firms to innovate more, either as a reaction to stronger competition in foreign markets or through learning effects from exporting.

Figure 24. Export orientation and innovative activities



Source: OECD business survey

With regards to sectors, major differences exist between the manufacturing sector and the rest. Half of the manufacturing firms introduced product/service or process innovations, while only one quarter was involved in marketing or organisation related innovation activity (Table 10). In contrast, only up to 28% in the services sector innovated in products and even less so in processes (8%) compared to almost 40% introducing marketing innovations.

Table 10. Number of companies introducing different types of innovation, by sector

Industry	Total number of firms	Product/service innovation	Process innovation	Marketing innovation	Organisational innovation
Manufacturing	164	79	81	46	43
Construction	24	7	7	7	6
Services	286	80	22	110	63
Other sectors	18	4	4	1	5
Total	492	170	114	164	117

Source: OECD business survey

In general, when innovation is measured in terms of patent applications, only 2.4% of the surveyed companies were granted a patent by the State Office for Industrial Property. Even fewer companies obtained a patent right with other national patent offices (1.8%), the USPTO (2 companies) or the EPO (only one company).

The business survey shows that 27% of innovative firms saw no increase in profits and 48% of innovative firms experienced up to a 10% increase in profits. Similarly, the effect on turnover was rather marginal (an increase of less than 10%) for 64% of companies. In contrast, only 7% and 5% of the companies enjoyed a higher than 30% growth in turnover or profit, correspondingly, while one quarter registered an increase of 10-30% (Table 11).

Table 11. Innovation and development of company turnover and profits

Approximate impact of any innovation between 2008-2010	Company turnover	Company profit
over 30%	7%	5%
20-30%	9%	10%
10-20%	20%	10%
5-10%	24%	26%
Less than 5%	17%	22%
No impact/Do not know	23%	27%

Source: OECD business survey

3.1.2 Resources dedicated to innovation

Absorptive capacity, which is defined by Cohen and Levinthal (1990) as the “ability to recognize the value of new information, assimilate it, and apply it to commercial ends” is an important aspect of the ability to innovate. Studies show that having staff dedicated to research, investment and the development of human capital are key aspects of innovation capacity (OECD, 2008). Furthermore, investment in R&D is likely to directly impact absorptive capacity since the more a firm invests in R&D activities, the more it will be able to fully appreciate the value of new external information.

These aspects are very much underdeveloped in the Former Yugoslav Republic of Macedonia. Investment in R&D and innovation is very low. Only 43% of the companies surveyed estimated having some type of expenditure related to innovation activities. These were mainly expenditures for the acquisition of machinery, equipment and software. This result confirms with the recent BERD indicator in the country, which accounted for only 21.1% of total R&D expenditure in the country. Only 19% of surveyed companies have assigned staff to R&D activities. In addition, companies in the Former Yugoslav Republic of Macedonia rarely use external R&D services (5% only).

Almost half of the surveyed companies have never offered any form of training to their employees. Those that do rely mostly on in-house facilities and the training activities focus on developing technical (50%) or management (22%) skills.

Companies that train employees tend to innovate more, as shown by Table 12. 80% of the companies that do offer training have introduced an innovation between 2008 and 2010 and 5% have been granted at least one patent. In contrast, only 44% of the other group of companies were involved in innovation activity (Table 12).

Table 12. Share of companies that innovate in relation to training offered by companies

	Patents	Innovation activities
Companies that offer training	5%	80%
Companies that do not offer any training	0.5%	44%

Source: OECD business survey

Companies in transition economies which try to develop human capital are often confronted with the problem of brain drain. According to the survey, about 20% of companies consider emigration of skilled employees can potentially cause disruption of their business activities. In particular, more than a quarter of the companies report having lost at least one experienced staff member to emigration.

3.1.3 Sources of innovation

Firms with a good access to information are in a better position to identify and develop innovation opportunities. In that respect, developing linkages with other stakeholders is an important step in developing innovation. Landry and Amra (2002), basing their research on Canadian experiences, confirmed that radical innovations benefited from policies promoting stronger linkages between firms and governmental laboratories and universities, while incremental innovation might be more efficiently supported through stronger linkages between companies and other market sources of information such as suppliers, customers and competitors.

Innovation behaviour of enterprises in the Former Yugoslav Republic of Macedonia is mainly market-driven. The majority of companies involved in innovation activity do so to address customers' needs and preferences according to the OECD business survey. Similarly, the pressure to adapt to market change is a major incentive to innovate among companies in the CIS (Contesti, 2011).

According to the CIS (Contesti, 2011), in-house knowledge is the most important source of information for companies, with 43.5% of companies regarding it as very important. While suppliers (34.6%), customers (32.5%) and consultants, commercial labs or private R&D institutes (23.4%) still represent important sources of information for a significant share of companies, other sources such as competitors, universities, government or public research institutes, conferences, trade fairs, exhibitions, scientific journals and trade or technical publications are mentioned as being less significant.

Not only is the use of external providers of knowledge by firms limited but, in general, companies rely on external knowledge only to introduce minor changes to their operations. According to the OECD survey, companies consider possibilities to receive external innovation related assistance mainly for minor modification of technologies already used in house (almost 50%), followed by major modification of technologies already used in house (29%). The fact that only 12% of companies would like to adopt new "turnkey" technologies or make radical changes in technology (5%) shows that most companies in the Former Yugoslav Republic of Macedonia have a relatively conservative attitude towards change.

When identifying opportunities for innovation, companies in the OECD survey rely mainly on the internet (25% of all the sources of information mentioned), customers' advice (17% of all the sources of information mentioned) and suppliers (15% of all the sources of information mentioned) to identify technological and non-technological innovation opportunities. Of the ten companies that described themselves as "extremely innovative", eight used attendance to fairs as the main source of information, seven used the internet, and seven used consultants. Furthermore, by using CIS data, Nestorovski (2011) reveal in their analysis that 96% of companies that increased the speed of their internet service reported some type of innovation. The study also shows that the diffusion of innovation is greater in firms that have better internet access.

One of the main channels for knowledge transfers in the Former Yugoslav Republic of Macedonia seems to be the mobility of employees. According to the OECD business survey, close to 9% of companies have employed people with experience working in a major foreign or multinational firm. Most of them (86%) confirm that those employees are bringing significant benefits to the business based on their previous 'foreign company' experience. For instance, 93% of companies with employees coming from foreign-owned companies have introduced at least one type of innovation in the last three years compared to an overall average of 65%. In addition, 17% of those firms were granted a patent.

3.1.4 Barriers to innovation

Reviews show that a number of constraints can limit innovation activities in the private sector. An extensive study, conducted by Saatçioğlu and Özmen (2010) on companies in Turkey reviewed the various barriers. This review identified more than 30 internal barriers such as financial problems, lack of information on technology, lack of information on markets, inadequate R&D, bureaucracy and resistance to change and 24 external barriers such as lack of access to finance, norms and standards, problems with inputs, macroeconomic condition and government policies.

It is interesting to note that, in the past three years, more than half of the companies in the OECD survey identified some type of innovation which could have improved the company's market position but which could not be introduced. This shows that, although companies are aware of the need to innovate, there is a need for better internal (i.e. from within the company) and external support through state or other institutions.

The OECD business survey also asks about the barriers to innovation. The high cost of innovation activities (37%) as well as the limited access to internal and external funds (32%) are regarded as major barriers. In addition, government regulation (19%) and market dominance of some companies (17%) emerge as major non-financial constraints.

These findings are complemented by a recent study conducted in the Former Yugoslav Republic of Macedonia with focus on SMEs⁵:

- **Lack of financing instruments for innovation support:** few financial instruments for innovation exist and the existing loans from the commercial banks are hardly accessible and very expensive. Banks are very restrictive regarding innovation projects and offer only traditional loans. Business angel support is in its embryonic phase, while participation in EU (FP7, CIP, and so on) and other donor-related projects is very rare among SMEs.
- **Lack of institutional support:** There is a lack of support instruments for innovation development. The most serious problem is the shared and overlapping responsibilities for innovation support amongst institutions. Both the Ministry of Education and Science and the Ministry of Economy have programmes to support innovation projects.
- **Low level of collaboration between SMEs and academia:** direct collaboration between industry and academia, especially the use of research centres and laboratories is very weak. Universities tend to focus on teaching, with few exceptions. There are positive examples of professors getting involved in innovation activities but these are not systematically organised and are usually individually-driven. Moreover, only a few research centres exist and these are not available for SMEs.
- **Lack of awareness and innovation culture:** innovative SMEs mentioned that company culture could be an obstacle to innovation. Furthermore, there is evidence that, although many companies state that they do not innovate at all, they do have some innovative activities in practice. In particular, accountants within companies often do not register R&D investments. More generally, there is a limited recognition of innovative activities.

⁵ On-site analysis was conducted in the period July 2010 – June 2011 for the needs of the Innovation Center and multinational project: INTER VALUE - Inter-Regional cooperation for valorisation of R&D.

- **Lack of management skills:** There are only few innovators which take into consideration the commercialisation of the product or developing line production. A significant problem is the lack of management skills and business expertise of innovators in the Former Yugoslav Republic of Macedonia.

3.1.5 Public support for business innovation

Financial incentives

The innovation-related funds and instruments operate almost exclusively at the national level. Incentives are primarily financial in nature, with a few tax incentives, such as customs tax and a partial Value Added Tax (VAT) exemption for public research institutes importing scientific equipment.

In the Programme for 2011-2015, the following R&D and innovation measures which include fiscal incentives or subsidies are included:

- • Fiscal incentives offered to foreign investors for investments in new technologies within the Technological Industrial Development Zones (TIDZ);
- • Up to 50% financing of the investment for inventions and patents that have the potential to become effective;
- • Up to 50,000€ in grants for encouraging technology transfer;
- Scientific subsidies for all scientific workers who will publish scientific papers in an impact factor magazine; and also creative subsidies for creative activities in the field of music, performing arts, painting, sculpture, acting, film directing and linguistics. (Josimovski, 2011a)

Currently, the Former Yugoslav Republic of Macedonia does not have a special tax subsidy for R&D, but companies are exempt from the corporate tax on all profits that are re-invested into business development including R&D (Svarc et al, 2011). The main tax incentives available are for the development of the TIDZs:

- Ten-year tax holiday: Investors in TIDZs are entitled to a ten-year Corporate Income Tax exemption (10% thereafter) and to exemption from Personal Income Tax for a period of ten years (Public Revenue Office, 2013). Investors are exempt of VAT and customs duties for export production.
- Land: Investors in the TIDZs can negotiate long-term leases for a period of up to 99 years at concessionary rates.
- Infrastructure: Investors are exempt from utility taxes on natural gas, water, sewage and electricity.
- Fees and registration: Investors are exempt from paying fees for land building permits. Rapid business registration is provided by the Directorate for Technological Industrial Development Zones (DTIDZ) to further reduce start-up costs.
- Subsidies: the government contributes to the construction costs of TIDZ investors up to EUR 500 000, depending on the number of new jobs and the volume of investment (Ministry of Economy, 2011a).

However, Invest Macedonia and other associations stress that companies located in the TIDZs have limited or no co-operation with domestic enterprises so far.

Public procurement

The results of the OECD business survey show that the government does little to promote innovation-related practices through public procurement. Out of the 135 companies interviewed by GfK which participated in public procurement, only seven mentioned that a specific innovation was required to respond to the tender. In most cases, the tender was primarily driven by price with limited innovation content (76 firms). Although public procurement procedures do not represent a significant constraint to innovation, these findings show that there may be a missed opportunity to develop innovation.

Indeed, the majority of procurement projects do not tend to stimulate innovation, be it in the public sector or in the delivery of public services. The main procurement criterion is price. Furthermore, there is no public procurement of innovative solutions to improve public services, such as dedicated budgets and joint procurement (Josimovski, 2011a).

The only exception is the Public Procurement of Innovative ICT-based Products and Services in Education, which is an excellent opportunity for the country to experience the benefits of this type of policies. This initiative is open to ICT innovative companies as implementers and educational institutions as beneficiaries. The MISA and MES specify the technical details, the performances of the required products and services, and the selection criteria (Josimovski, 2011b).

There is room for improving the public procurement process in the Former Yugoslav Republic of Macedonia. The Government appears to regularly experience major delays and other difficulties in relation to public procurement (Box 1). The overall procedures need to be streamlined and harmonised with EU directives and other requirements as a top priority.

Box 1. EC progress report 2012 - excerpts from Chapter 5 on Public Procurement

“Some progress was made regarding public procurement. The general principles of public procurement were improved with the amendment of the Law on Public Procurement, which notably makes it mandatory to publish contract notices for contracts below EUR 5000. However, general principles are not yet fully in line with the *acquis communautaire*. There was also an improvement on the award of public contracts as e-auctions for public contract notices are now obligatory. However, training to encourage contracting based on quality criteria, tender specifications and contract management are not in place. In addition, there are still weak capacities in the field of remedies and concessions of public private partnerships.”

Source: European Commission (2012).

3.1.6 Policy needs

Although a number of programmes are in place to support innovation, many companies are not aware of these existing schemes. In addition to this, according to the OECD survey, only about 5% of companies have directly benefited from those measures. This suggests that policy makers need to design more attractive incentives and inform the targeted recipients.

Not surprisingly, given the relative consensus on the difficulties in financing innovation, companies would welcome better-designed government subsidies. They can take the form of tax incentives, as suggested by the majority of surveyed firms, or some other types of financial contributions (43%) such as

grants to reduce the high-sunk cost associated with innovation activity. In addition, support schemes for staff training and measures to foster exchange of know-how between companies would be useful for 21% of the firms.

In particular, companies that consider themselves to be extremely innovative ask for customised consultancy/research support, tax incentives and networking opportunities between companies and with universities and research centres. Similarly, companies that have identified at least one innovation which would improve their market position but have been unable to introduce it, regard tax incentives supporting innovation (88%), other types of financial contributions to reduce the cost of innovation (85%), and measures to foster exchange of know-how between companies (57%) as very or extremely useful.

3.2 Research sector

Given the low expenditure of businesses on R&D, public research institutions, including the Macedonian Academy of Sciences and Arts (MASA) and universities, are where most research takes. Assessing the role and work of these institutions is particularly important in understanding the innovation system in the country.

This section describes the main public research institutions with a focus on their governance, research output, funding resources and commercialisation capabilities. The analysis in this section is largely based on information gained through interviews with diverse stakeholders, including representatives from the University of Ss. Cyril and Methodius, the Centre for Research, Development and Continuing Education (CIRKO), the Centre for Business Development in the University of South East Europe, and the Macedonian Academy of Sciences and Arts. In addition, six other research institutions and faculties participated in a survey designed by the OECD Investment Compact for SEE.

3.2.1 Public research institutions

The Macedonian Academy of Sciences and Arts

The Macedonian Academy of Sciences and Arts (MASA) is a scientific, scholarly and artistic institution in the country, which initiates, co-ordinates and conducts scientific and scholarly research and promotes artistic achievements. Furthermore, as an independent institution, it actively assists the policy making process pertaining to sciences and arts (Erawatch, 2012a). The academy achieves its objectives through basic, developmental and applied research, inter-disciplinary research projects, organisation of scientific and scholarly conferences and symposia and the dissemination of its research. Its mandate also includes support for knowledge transfer and R&D co-operation.

The academy consists of five departments: Linguistic and Literary Sciences; Social Sciences; Mathematical and Technical Sciences; Biological and Medical Sciences; and Arts. It also has five research centres with the Genetic Engineering and Biotechnology and the Energy, Informatics and Materials research centres having gained international recognition.

Universities

Besides MASA, research is also undertaken within the realm of higher education institutions. Higher education institutions in the Former Yugoslav Republic of Macedonia include (Erawatch, 2012a):

- Five state universities: The University of Ss. Cyril and Methodius in Skopje, the University of St. Clement in Ohrid, the University of Goce Delchev in Stip, the State University of Tetovo, and the University for Information Science and Technology ‘St Paul the Apostle’ in Ohrid; and

- Nine private universities, including FON University and the University American College in Skopje as the most renowned private higher educational institutions in the country.

State universities tend to have broader research capacities than private ones. The public University of Ss. Cyril and Methodius is the best example with its 23 departments, all of which are engaged in some form of research, though not necessarily innovation (Erawatch, 2012b). In addition, the university has 60 laboratories, 30 of which are dedicated to biotechnical research (Ss. Cyril and Methodius University, 2011).

While the University of Ss. Cyril and Methodius is a recognised hub of research activities in the Former Yugoslav Republic of Macedonia, the rest of the higher education institutions, both public and private, focus primarily on teaching. Consulting and training services constitute another important part of their activities, while basic and applied research are only marginally represented. Private universities are especially affected, since their budgets for R&D are traditionally limited or non-existing (Polenakovik and Pinto 2010). Indeed, the necessity to fund activities from student fees and to operate profitably precludes intensive R&D efforts.

There are, however, some exceptions such as the University of South East Europe, which developed a Research Strategy in 2005. Henceforth, it promotes the research and publication activity of its academics by making the renewal of annual contracts partly dependent upon the academics' research progress and publication record. Likewise, in order to promote research and inform its faculty about the ongoing in-house research activities, the University American College Skopje established recently the practice of releasing the abstracts of published papers and papers presented at conferences by its faculty.

3.2.2 Funding for research

Despite its broad mandate, MASA has a relatively small research capacity. In 2011, it had only 58 employees, including 43 researchers, and its annual budget amounted to only EUR 2.6 mn (Erawatch, 2012a). The state contributes 50% of the funds while the other half of the budget is equally split between self-financing and donations (Erawatch, 2012a). MASA's low overall budget is reflected in the meagre funds assigned to research activities. Academics received an annual research budget of just EUR 2,000 in 2011. Each academic is supposed to top up that amount from other national and international funds for R&D, which they are able to do with uneven success. The out-dated equipment of the academy and unattractive wages mirror the chronic lack of funds. Under these conditions, and despite the prestige attached to the institution, MASA may experience difficulties attracting the brightest researchers in the country.

Similarly to MASA, the research capacities of universities are also constrained by exiguous budgets. According to Josimovski (2011a), higher education institutions spent a mere EUR 4.31 mn on R&D in 2009. To raise their R&D expenditures, universities are required by the Law on Higher Education to allocate 40% of their income originating from student fees to R&D purposes. However, the poor state of university finances impedes their compliance with the law and leaves them competing for the scarce public funds for research activities.

A self-evaluation report of the University of Ss. Cyril and Methodius (2011), the most renowned higher education institution in the country, estimated the budget for scientific research, excluding publishing activities, to be only about EUR 73 000 in 2010. About 60% of the total budget relies upon self-financing, while only a third comes from the state and 5% from donations (Erawatch, 2012b). An estimated 7% of the research budget comes from international projects such as Tempus or the Seventh Framework Programme (FP7).

Within the University of Ss. Cyril and Methodius, faculties have the autonomy to secure additional funds for research from domestic and international sources. Domestic sources of funding are mainly the Ministry of Education and Science and the Ministry of Economy but also the Ministry of Agriculture, bilateral donors and the private sector, while international sources are mostly EU funds. The application process is entirely decentralised. The Scientific and Education Council of each faculty makes the decisions with regards to possible applications for additional funds. When successful with these competitive applications, the contracts are signed by the University, but the faculty manages and implements the research projects financed by the grants.

Some faculties have been more successful (*e.g.* Mechanical Engineering, Information and Computer Engineering, Civil Engineering) than others (*e.g.* Arts and Humanities) at augmenting their research funds. The faculty of Mechanical Engineering, for example, has generated significant grant and commercial income through its testing and certification facilities. As a result, it refurbished its facilities, bought new equipment and created institutions such as CIRKO and the Business Start-up Centre (Box 4).

Overall, the tight budgets constrain the development of adequate research infrastructures and the remuneration of researchers (Josimovski, 2011a). For instance, the University of Ss. Cyril and Methodius identifies the poor quality of equipment in the experimental sciences as one of university's weaknesses (Ss. Cyril and Methodius University in Skopje, 2011). In addition, the lack of funds limits the salaries of researchers, the basic salary (determined by the government) of a full-time professor being up to EUR 700 per month compared to an average salary of EUR 339 per month in 2011 in the Former Yugoslav Republic of Macedonia⁶ (Josimovski, 2011a).

Public funds for R&D have been very limited and amounted to only EUR 6.7mn in 2009, the last available data on government appropriations for R&D in the Former Yugoslav Republic of Macedonia (Josimovski, 2011a). They include the science budget line and the budget line for MASA. The science budget line is channelled through direct transfers for institutional support for research institutes and through the main instruments to support R&D financially. About half of the science budget line is allocated on a competitive basis while the MASA budget is based on institutional funding (Josimovski, 2011a).

In addition, there are institutional funds for state universities to cover indirect R&D expenditures. These consist of block budget lines allocated to each university in accordance with the size of its student body and teaching staff.

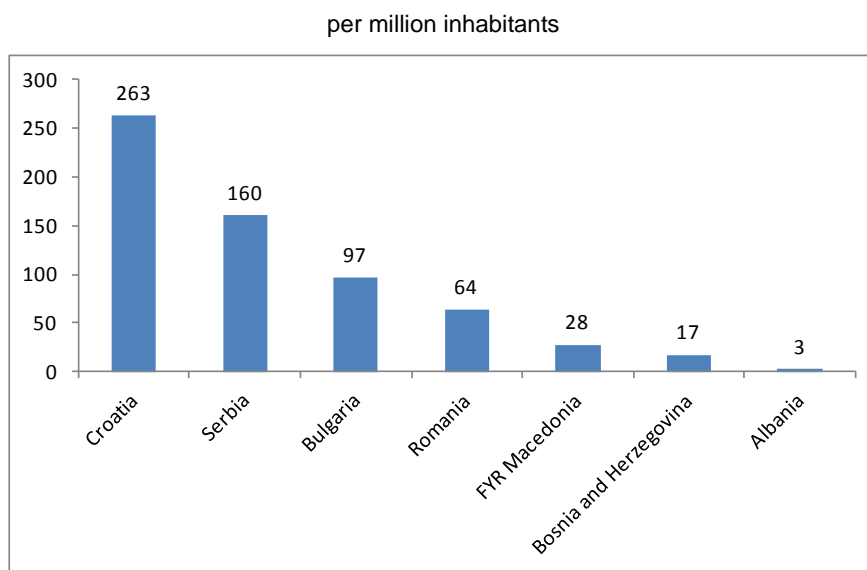
Funding for R&D is expected to increase significantly in 2012 and 2013 as the government invested to equip 190 laboratories by 2014 in order to improve infrastructure for research. Payments amounting to about EUR 60 mn are scheduled over four years (Erawatch, 2013). This investment will certainly improve the infrastructure for research in the country and benefit MASA and the universities. It thus builds an important base for the development of research output.

3.2.3 Outputs from research institutions

The low expenditure on research and development and the lack of capacity of most research institutions in the country are coupled with a rather low research performance. Figures 25 and 26 depict the research output of the Former Yugoslav Republic of Macedonia measured by the number of citable documents and scientific and technical publications per million inhabitants. The figures show that the country publishes less than most comparative economies, with the exception of Albania and Bosnia and Herzegovina. Most importantly, it appears to lag behind, particularly in the scientific and technical fields.

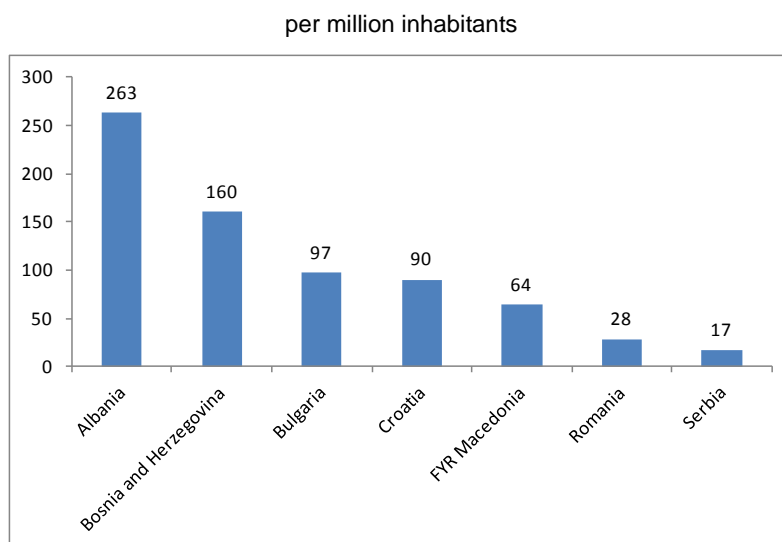
⁶ The faculties can choose to add up to 60% of their own financial resources to employees' salaries.

Figure 25. Citable documents in Elsevier Corpus, 2009



Source: Scimago, 2013 for citable documents data and World Bank, World Development Indicators for 2009 population data

Figure 26. Scientific and technical journal publications, 2009



Source: World Bank, World Development Indicators

Research output from the Former Yugoslav Republic of Macedonia has a moderate impact on the international research community compared to its peer economies. This impact can be measured by the number of citations by document, which is just below the SEE average of 5.5 in the Former Yugoslav Republic of Macedonia. The H-Index, which combines information about quantity (number of published articles) and quality (number of citations per article) of research, positions the country slightly ahead of Albania, Bosnia and Herzegovina and Serbia, but far behind Bulgaria, Croatia and Romania (Table 13).

Table 13. Publication quality and impact indicators, 1996-2011

Country	Citable documents	Citations	Citations by document	H index
Albania	1192	6304	5.3	34
Bosnia and Herzegovina	3436	11353	3.3	40
Bulgaria	4059	50558	12.5	129
Croatia	47854	260491	5.4	132
FYR Macedonia	4282	22124	5.2	54
Romania	75381	338601	4.5	126
Serbia	20543	53270	2.6	53

Source: Scimago, 2013

3.2.4 Commercialisation of research output

The commercialisation of research emerges as another weakness of the research sector in the Former Yugoslav Republic of Macedonia along with its low capacity to conduct research and poor performance. There are no specific institutions or measures to ensure that the outcome of research leads to innovation. Furthermore, none of the key research players consider this a priority. As a result, not a single invention has been patented by a university since independence in 1991.

The majority of research institutions consider the commercialisation of research on average as the least important activity of their institutions. Only in a few cases, for example, the Goce Delcev University and the Faculty of Innovation and Communication Technologies, both of which conduct research in science and technology, report few successful attempts to bring their research output on the market.

A number of factors account for this fact. First, the dominant role of the government in defining the national research priorities hampers the commercialisation of research. Feedback from individual universities and faculties reveals that public research institutions are affected most by the MoES policy. Hence, the strong influence of the government leaves less room to the market to guide the scope of research and for universities to focus on research projects which are aligned with the needs of the private sector and offer high business potential.

Another obstacle is the lack of a strategic vision and supportive policies, formal or informal, at the university level. The only measure, which has systematically been applied by faculties and universities, is that 15% of revenues from consultancy contracts generated by staff should flow to the faculty and 5% to the overall university. Whilst universities may gain some additional funding through this mechanism, it does not directly promote the commercialisation of research output. The fact that individual researchers are able to take on external contracts and keep 80% of the generated amount for themselves creates a strong incentive to sign contractual agreements as individuals, rather than through the university or faculty.

In other countries, universities have set up a formalised process to monitor the time that academics spend on consultancy work and to control the use of university equipment, which may serve as a reference for the Former Yugoslav Republic of Macedonia (Box 2).

Box 2. Consultancy activities of academics

In order to regulate the consultancy activities of academics and to ensure that no conflict of interest arises over the use of their time, many universities have developed specific rules. Particularly in the USA and the UK, universities have drafted guidebooks to consultancy services to inform their members of staff about these rules. These guide books regulate the time that academics can spend on consultancy work, the financial arrangements associated with this type of work and the use of university's facilities.

Time restrictions imposed by universities can vary, but tend to limit members of faculties to 30 days of consultancy work per year, as is the case at the Royal Holloway College of the University of London and at Glasgow University. At Bath University, no formal restrictions exist but the dean has to approve consultancy work. In most cases, university regulations explicitly mention that consultancy work should not infringe on employment duties.

Financial arrangements also vary across universities and faculties. Some universities consider consultancy work as being purely "external activities" that the researcher pursues for their own benefit. For example, UCLA's guidebook, which discusses private consultancy work, simply states that "except for faculty in the health sciences who are members of the University of California Health Science Compensation Plan, academic appointees *may* retain all outside income, including income from consulting earned during their allowable number of outside activity days." Conversely, the Royal Holloway College and the Bath University distinguish between consultancy services carried out via the universities and those undertaken privately. Financial arrangements usually concern only university-based consultancy work. At the Royal Holloway College, the researcher keeps 70% of the income generated from consulting activities, while 20% is flows to the university. At Bath University, the percentage retained by the academic varies across faculties; most departments pledge 20%, albeit the department of education requests 50%.

Universities which consider consultancy as a purely private activity restrict the use of university facilities and equipment for this purpose. For instance, UCLA excludes the use of all university equipment with the exception of the library and personal offices. On the other hand, academics are generally allowed to use facilities for university-based consultancies.

The career progression of researchers, which is determined by seniority and academic achievements (mostly teaching performance) and is not linked to patents, basic and applied research and collaboration with the private sector, presents another major problem. Even the national major research actor, the University of Ss. Cyril and Methodius, does not have a university-wide policy and incentives to promote patenting activity, since faculty tenure is not linked to patents or research performance. This emerges as a significant gap in the national innovation system.

Last but not least, regulations pertaining to patents and other intellectual property rights are not enforced and no clear IPR arrangements exist for joint work between industry and academia, such as the Bayh-Dole Act in the United States of America (Box 3).

Box 3. Bayh-Dole Legislation (1980) and Innovation in the United States

The Bayh-Dole Act, known as the Patent and Trademark Law Amendments Act, regulates intellectual property rights in the US. Bayh-Dole allows universities, small businesses and non-profit organisations to pursue ownership of an invention.

The Bayh-Dole Act has enjoyed widespread recognition for its role in enabling breakthrough innovations in leading-edge sectors, such as electronics, engineering and environmental technologies, and promoting the biotechnology revolution. The Act boosted commercialisation of federally funded research: between 1991 and 2003, more than 25 000 patents were issued; since 1980, 4 081 companies have been created by universities (The Bayh-Dole Act at 25, Bayh-Dole25, 2006, p.17). The same research suggests that the success of the Bayh-Dole framework

rests on three factors: (i) sustained U.S. government funding for basic science education and research, (ii) support for market-based incentives and (iii) strong intellectual property protection.

The Bayh-Dole Act is no panacea. It has been criticised, for example, for offering an exclusively market-based framework. Nevertheless the Bayh-Dole framework has been taken up and adapted to specific needs by numerous policy makers, both in developed and less developed economies.

3.3 Linkages

Co-operation among firms and between business and research organisations is recognised as a key driving factor for innovation. Landry and Amra (2002), basing their research on Canadian experiences, reveal that radical innovations benefit from policies promoting stronger linkages between firms and governmental laboratories and universities, whilst incremental innovation is more efficiently supported through stronger linkages between companies and other market players such as suppliers, customers, and competitors.

3.3.1 Research-industry co-operation

According to the OECD business survey, companies that have established formal links with universities are more successful at innovating and exporting (Table 14). In particular, 82% of those companies have introduced at least one type of innovation in the period 2008-2010 and 5% of them have been granted a patent in the same period. Companies that co-operate with the research sector are also twice as likely to export as their peers who do not have links with universities.

Table 14. Company links with universities and innovation activities

Links with Universities	Share of companies		
	Patents	Export	Innovation activities
Established formal links with specific universities	5%	50%	82%
Did not have links with universities	3%	23%	63%

Source: OECD business survey

Despite the potential benefits of research-industry linkages, the OECD business survey uncovers that companies seldom collaborate with the research sector. Only 14% of companies have ever cooperated with universities (9%) and/or other research institutions (5%). In the very few instances of collaboration, companies used predominantly consulting services (44%) from academics, training courses (26%) and technical facilities at university premises (14%). In contrast, only three companies report participation in the commercialisation of a research output. Even in acquiring intellectual services, companies turn to consultants from the private sector five times more often than to academia.

In most cases, this co-operation between the sectors is channelled through private relations. Firms directly contact an academic whom they know in order to obtain support related to technology transfer or other business matters. This is advantageous for the companies since they build upon existing networks of trust. The academics and their research teams also gain from the process, but the benefit to university itself is less clear. The reason is that the initial informal contact results into an official contractual agreement for consulting services with the researcher themselves instead of a contract with the university, which was discussed in the previous section.

Although often the business sector is the pro-active co-operation partner, certain faculties are better disposed than others to the idea of seeking close and long term linkages with the private sector. Faculties such as mechanical engineering, computer science or civil engineering lend themselves more readily to private sector collaboration. For example, the TEMPUS Programme and support from the Gesellschaft für Internationale Zusammenarbeit (GIZ) resulted in the establishment of technology transfer initiatives with the Faculty of Electrical Engineering, the Faculty of Technology and Metallurgy and at the Faculty of Agriculture at the University of Ss. Cyril and Methodius. The objective of the project was to upgrade knowledge and skills, to establish modern laboratories as well as to initiate R&D projects (Box 4).

Box 4. The Faculty of Mechanical Engineering at the University of Ss. Cyril and Methodius

In 2002, FME established a private company called the centre for research, development and continuous education (Cirko). As implied by the name, Cirko focuses on technology and know-how transfer in mechanical, industrial and production engineering, automotive industry, energy sector, welding and new materials, hydraulics, automation, thermodynamics, mechatronics and transport and logistics.

Cirko has actively engaged with various international partners, including USAID, GIZ and UNIDO. It was successful in obtaining EU/international funding and is constantly seeking new opportunities. In 2006, with the support of the Austrian Development Agency, it created the business start-up centre to assist students and graduates in improving their business skills and establishing and running their own businesses. The centre serves as an incubator of innovative technology for students, recent graduates and staff through the provision of entrepreneurial training, support and networking.

Finally, members of the private sector almost never actively participate in government bodies of research institutions and universities. Instead, businesses occasionally provide advice through memoranda for co-operation (Josimovski, 2011a).

3.3.2 Business collaboration

It is well-established in the literature on innovation that co-operation among companies is beneficial to their business performance. However, the CIS of the Former Yugoslav Republic of Macedonia (Contesti, 2011) shows that 51% of product innovations are developed in-house and only 14.5% arise from collaboration with other companies. In contrast, the OECD business survey reveals that the majority of companies, both innovators and non-innovators, collaborated with their business partners, albeit not exclusively on innovation. Half of the companies cooperate with their suppliers (59%) and/or customers (55%). Competitors as well as companies belonging to the same network (32%) present another major linkage opportunity.

Although there are about 20 national, local, sectoral and bilateral formal business associations in the Former Yugoslav Republic of Macedonia, the majority of companies belong to none of them. However, innovative companies are much more likely to be part of such an association. Every other company that defines itself as extremely innovative is a member of a formal domestic or international association. In contrast, only 13% of non-innovative companies belong to any network. Among those that are members of either formal or informal networks, the satisfaction is high. 63% consider their membership as useful and extremely supportive for their innovation activities.

The major business associations at the national level increasingly recognise the importance of an active R&D and innovation policy. For instance, the Economic Chamber of Macedonia, through its 19 sectoral associations, is trying to raise awareness on innovation matters among its member firms. Similarly, the Macedonian Chambers of Commerce agree on the critical importance of innovation for the

competitiveness of enterprises and acknowledges the need to raise awareness, and train and support its members to become major players in the national innovation system.

The Former Yugoslav Republic of Macedonia has a relatively long history of establishing consulting services. A number of initiatives to help firms identify service providers include:

- *Macedonian Agency for Entrepreneurship Promotion APPRM network of business centres*: a network of 12 business centres has evolved from various forms of donor support, including the DFID Enterprise Support Agencies (Tetovo, Gostivar and Ohrid) and the EC's Regional Business Support Centres (Skopje, Veles, Bitola, Strumica and Kumanovo). This network is supplemented by others such as the Roma Business Information Centre, the Crafts Chamber and the Economic Chamber of Macedonia (all three located in Skopje) and the EVRO Centre in Sveti Nikole. These have qualified and experienced, albeit generalist, business consultants.
- *APPRM network of consultants*: a database of business consultants exists that is regularly updated to reflect the priorities that are being funded through APPRM's calls for proposals. There are 283 consultants registered in the database and it is open to new applications.
- *Network of Certified Management Consultants (CMC)*: with EBRD support, a network of 52 Certified Management Consultants has been created, whose certification process is consistent with international standards. The CMCs are members of the ICMCI-accredited Macedonian Consultants' Association (MCA2000).
- *Chamber of Economy's Centre for Implementation of Development Ideas (CIRI)*: CIRI has recently developed a database of consultants with technical skills required to support applications to EU programmes. The CIRI network has around 35 technology, innovation and generalist independent consultants.
- *Innovation Centre*: the centre is in the process of developing an ecosystem of consultants (around 20 experts) able to support entrepreneurs in various aspects of innovation- adoption and/ or commercialisation of research. The centre has further created the first Business Angel Network.

3.3.3 Intersectoral mobility

Although mobility across research institutions and businesses can be a cost-efficient way to increase linkages and foster knowledge transfer, no administrative framework for inter-sectoral research mobility is currently in place (Josimovski, 2011a). However, universities are given freedom to develop their own framework for mobility of professors, researchers, and graduate students.

For instance, faculties in the science and technology fields, like the faculties of mechanical and chemical engineering, actively cooperate with enterprises and even negotiate Memoranda of Understanding with private firms to facilitate internships and job placements for their students. There is often a work experience requirement as part of the academic course, which forces faculties to be proactive in seeking co-operation with the private sector on behalf of their students. Some companies are reportedly very good at providing mentoring and support, including participation in the official examination process. In return, the participating firms gain the prospect of recruiting an employee with adequate skills.

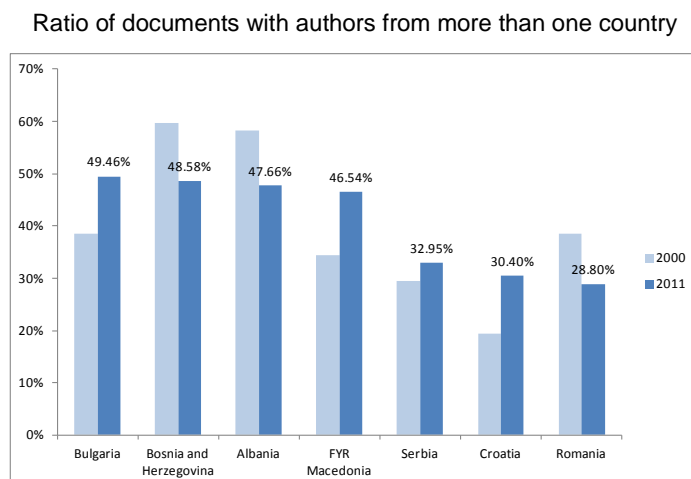
3.3.4 International co-operation

While there are few linkages amongst firms and between firms and research institutions, co-operation between researchers in the Former Yugoslav Republic of Macedonia and researchers abroad appears to be

relatively more frequent. The EC Progress Report (2013b) notes an increasing participation in the FP7 programme, the Competitiveness and Innovation Framework Programme (CIP) and EUREKA, possibly due to a better capacity to organise promotion activities, workshops and conferences. The participation of organisations from the former Yugoslav Republic of Macedonia in EU-funded programmes increases the cross-border knowledge circulation and enables them to get involved in activities through which they support and develop their innovation capacities. In the period 2007-2010, organisations from the former Yugoslav Republic of Macedonia have shown large interest for the FP7 inter-government scheme. They have submitted 271 eligible proposals, with 47 proposals retained for funding for the total amount of EUR 7.51mn (Josimovski, 2011b).

In addition, Figure 27 shows that the ratio of research documents whose affiliation includes institutions and individual researchers from more than one country is higher in the Former Yugoslav Republic of Macedonia than in some comparative economies. The figure should however be interpreted with caution as most countries with high ratios of international co-operation are rather small countries that produce fewer citable documents. Although there has been a sharp increase in international co-operation between 2001 and 2007 according to this indicator, recently the trend has been declining (Figure 28).

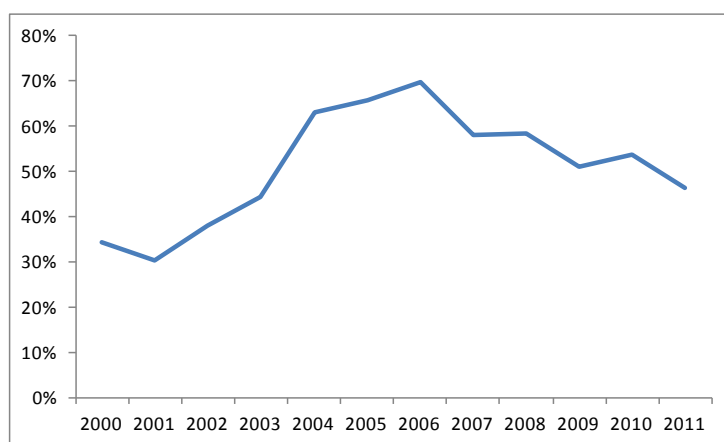
Figure 27. International co-operation



Source: Scimago, 2013

Figure 28. International co-operation

Ratio of documents whose affiliation includes more than one country address



Source: Scimago, 2013

A challenge to be addressed is the lack of incentives to attract leading international talent in the Former Yugoslav Republic of Macedonia. Research infrastructures are inadequate and salaries tend to be low, even though special packages can be negotiated for foreign professors (Josimovski, 2011a). In addition, while foreigners can apply for research positions, most universities require knowledge of Macedonian or Albanian to teach, which limits opportunities for foreigners to work in the country (Josimovski, 2011a). Attempts by the University for Information Science and Technology "St. Paul the Apostle" in Ohrid to attract international faculty have not, so far, been successful.

3.3.5 Infrastructure for linkages

Different forms of infrastructure for linkages are present in the country. These include clusters, business incubators and technology parks.

Currently, there are around 18 clusters in the country (Svarc et al., 2011) as well as supporting measures for them. The clusters cover a wide range of sectors including information technology (IT), automotive industry, textiles, fashion design, wine, agricultural mechanisation, wood processing and food processing. More recently, new clusters have arisen, such as snails and confectionery. However, some are also known to have stopped operating, such as lamb and cheese and the national tourism cluster.

Although entrepreneurs perceive some clusters, such as the Automotive Cluster of Macedonia, to be of use in stimulating innovation, no impact evaluation of the clusters has ever been carried out⁷. Therefore, it is neither possible to assess which of the clusters are functioning effectively nor whether they are conducive to innovation. Nonetheless, it is interesting to note the statement made by the Industrial Strategy of the Ministry of Economy:

"The key weakness that all existing Macedonian clusters share is a lack of potential for innovation, new products and services development to better compete in the global market. Existing clusters have... done much less in the area of sharing and creating economies of scale in purchasing, R&D and innovation...Analysis of clusters around the world shows that successful clusters gather, apply and expand

⁷ On the other hand, the Ministry of Economy, in co-ordination with clusters, evaluated the capacity of companies in clusters.

knowledge and create innovative solutions to business challenges. These qualities of clustering still need to evolve in the Former Yugoslav Republic of Macedonia.” (Ministry of Economy, 2009)

In addition to clusters, business incubators are also in place in the Former Yugoslav Republic of Macedonia. Three business incubators are currently operating, including the SPARK incubator in Bitola (Dutch/USAID support), the Youth Entrepreneurship Service incubator in Skopje (originally set up with the support of the Ministry of Foreign Affairs of Norway) and the World Bank incubator in Strumica. In addition, two start-up centres (embryonic incubators) are operating in Tetovo (SINTEF) and Skopje (Austrian Development Agency).

The Agriculture Business Development Centre – Strumica (ABDC) is one of the successful incubators in the country. It was founded by the World Bank, as a “Strumica” Incubator to provide various services such as training, consultancy, accountancy and other financial services and legal and managerial services. The incubator currently helps farmers, traders and food processors. The list of its most prominent services includes advice regarding EU support programmes, a web portal with current prices of agriculture products, trainings, and laboratory services (Wbc-inco-net, 2011)

The sustainability of these services is however a challenge. The Strumica incubator is the only surviving incubator out the nine incubators originally created by the World Bank. This illustrates the challenges that these initiatives face once donor funding ceases. Business incubator managers receive no funds from the public authorities or from universities and rely on donor funding. In addition, despite the low cost of business incubation services, companies also have difficulties paying for these services.

In general, companies located within the majority of business incubators do not succeed in establishing innovation activities, particularly in technical fields. To further promote the development of spin-offs for students and academics, business incubators should establish stronger links with education and research institutions. In particular, they could provide training to faculty on entrepreneurship related issues.

A recent positive development, however, has been the construction of the first private technology park by SEAVUS, the biggest IT company in the country. SEAVUS established the Seavus Educational and Development Centre (SEDC) in 2010, an IT centre. There are also four technology transfer centres. In addition, the USAID-funded Competitiveness Project also planned to build another nine centres and the APRM and the Economic Chamber provide technology transfer services as part of the Enterprise Europe Network. (Svarc et al, 2011).

While all these initiatives are diverse in nature, they share some common characteristics in terms of their various phases of development:

- Strong development: consistent with significant donor funding and technical assistance;
- Stagnation and/or stabilisation: programmes go through a process of adjustment to the economic realities of operating without sustained donor support. Often initiatives “wither on the vine” and seek state and or donor support, which is often irregular and insufficient to assist them in their next stage of development;
- Closure: in certain cases, the initiatives, whether clusters (*e.g.* lamb and cheese), business centres, incubators (*e.g.* eight of the nine World Bank funded incubators have stopped operating) or parks (*e.g.* Bitola Technology Park) simply stop operating due to lack of funding;

- Take-off: a subset of the initiatives, especially those that are truly demand-driven and private sector-oriented, achieve financial sustainability and positively thrive in the post-donor or state support phase. One of the few examples of such initiatives is the CIRKO centre.

Since many initiatives are supply-driven, they either fail or struggle to survive, with the support of state, EU or other external funds. Moreover, they often deliver insufficient services or reorient their services away from the initial target groups due to financial imperatives.

3.3.6 Policy support for linkages

To foster linkages in the economy, the government and donors put in place a number of measures; however, their effectiveness and impact on the overall innovation system performance are disputable. For instance, the Ministry of Education and Science funds ‘scientific’ as well as ‘development’ projects. Development projects are projects co-financed by an SME leading the project and the Ministry of Education and Science. However, while these projects are theoretically co-financed – 50% by the Ministry of Education and Science and 50% by enterprises - in 2010 the contribution of the Ministry of Education and Science covered only 30% of the costs incurred by participants in the programme.

In 2011, only 45 applications were filed for development projects, and the same trend is evident in the case of scientific projects, which do not involve linkages. The steep decline in applications is attributed to the more demanding application process by the Ministry of Education and Science, the necessity for applications to be submitted on-line and the requirement for applications to be made in Macedonian and English to include both domestic and international experts in the selection panel. This is expected to raise the quality of funded development (and scientific projects) over time, but in the short term there may be a detrimental effect on the number of applications.

An innovation voucher scheme is also available for companies, implemented by the Macedonian Agency for Entrepreneurship Promotion (APPRM), but this programme is not deemed very effective by business associations, partly due to restricted funds. The scheme involves competitive applications in the following areas: Total Quality Management; Just in Time; new product development; R&D; and IPR. The goals of the programme are i) increasing the number of entrepreneurs to start up their own business; ii) creating new working places; iii) increasing the number of companies that survive the initial critical years; iv) increasing the number of companies with higher growth rates; and v) supporting the development of the consultancy industry (Josimovski, 2011b). The beneficiaries of this programme are SMEs and potential entrepreneurs with the aspiration of self-employment. The SMEs receive a subsidy of 50% of the consultation costs, to a maximum of EUR 750. For innovation projects, which propose development of new products/services/processes, the maximum subsidy is EUR 1,500. For the purpose of self-employment the voucher covers 100% of the consulting costs, up to EUR 500. However, demand from SMEs highly exceeds supply thanks to the highly restricted funds of this measure.

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CHAPTER 4: STRATEGIC DIRECTIONS

This chapter provides policy recommendations and strategic directions for the government of the Former Yugoslav Republic of Macedonia to address in its National Innovation Strategy. The overall goal is to improve the innovation system and performance of the country so that it becomes a driver of competitiveness and economic development, thereby creating high value employment and prosperity for the citizens of the country.

In the recent past, the government of the Former Yugoslav Republic of Macedonia successfully introduced reforms to improve the business environment and to attract foreign direct investment. The economy is now open to trade and investment. Despite remaining weaknesses such as insufficient access to finance, a sound business climate is generally in place. The government is now increasingly mobilising efforts to enhance competitiveness and to foster research and innovation through targeted export and investment promotion, cluster development, and the adoption of the Law on Higher Education and the Law for Innovation Activity.

Although still at an early stage, the innovation system of the country is gradually maturing, providing the groundwork for knowledge-based economic development. The capacity and performance of the innovation actors need to be further enhanced, as the country lags as regard to innovative outputs. In particular, firms tend not to invest in innovation and there are few linkages between the public research sector and businesses and between innovation actors more generally. In addition, the education system is not aligned with the needs of the labour market, resulting in a significant skills gap. The government efforts to develop an innovation policy are also hampered by the lack of co-ordination amongst institutions.

To improve the innovation system, reforms and policies will need to strategically focus on increasing businesses' propensity to innovate and strengthening linkages between innovation actors. In addition, enhancing the human capital base, improving the regulatory framework and the governance of the innovation system would constitute other strategic objectives.

4.1 Enhancing the business sector's propensity to innovate

The investment climate in the Former Yugoslav Republic of Macedonia provides overall favourable conditions for business development. In particular, the economy is open, procedures to start a business are not burdensome and corporate taxes are low. This is reflected in the country's performance on the Doing Business Index 2013 which positions the Former Yugoslav Republic of Macedonia 23rd out of 185 economies.

Reforms are slowly improving the industrial capacity of the economy, but there is still a long way to go. For instance, even though there are few barriers to investment, FDI inflows remain predominantly directed to non-tradable sectors and there are few greenfield ventures. In addition, the country's exports are still geared towards low-technology industries; however, this is deemed to improve following the most recent export promotion initiative for ICT.

Firms in the Former Yugoslav Republic of Macedonia also dedicate very few resources to innovation. Whilst the share of firms which claim to have introduced at least one type of innovation between 2008 and 2010 is similar to the EU-27 average, the low propensity to file patents and trademarks in the country implies that little R&D-based innovation takes place. All these suggest that firms are adapting technologies or acquiring new products, services or processes rather than developing those.

Obstacles such as the lack of financing instruments, the lack of institutional support and the low levels of collaboration between SMEs and academia hamper further innovation. The most pressing barriers to innovate for firms in the Former Yugoslav Republic of Macedonia are, however, limited in-house and external funds.

Measures will therefore need to strategically focus on fostering investment in innovation in the business sector, notably by raising awareness of the benefits of innovation and facilitating access to finance for businesses. Providing an effective regulatory environment and fostering linkages between various innovation actors will further encourage innovation in the business sector.

Raise awareness of SMEs of the benefits of innovation and of existing support measures

To increase the propensity of the private sector to innovate, the innovation programme of the Former Yugoslav Republic of Macedonia will need to consider some elements of awareness raising as part of its wider framework to promote innovation. Seminars, conferences and media campaigns can be used to inform companies about the benefits of innovation, including information about measures to facilitate investment for innovation. Furthermore, it will be important to emphasise that innovation goes beyond R&D and encompasses product, process, organisational and marketing innovations.

The Estonian Innovation Awareness Programme which aimed to increase the awareness of firms and other stakeholders on the benefits of innovation and on innovation methods and tools could constitute a useful example. The programme included studies, education seminars and workshops, roundtables, television and radio programmes and competitions. While the programme has not been formally evaluated, it has received attention in reports and articles. Furthermore, innovation has become more central in Estonia although it is unclear to what extent this can be attributed to the awareness raising efforts. Programmes developed in Brazil or the VIS programme in Flanders, Belgium also provide examples of a structured approach to awareness campaign on innovation. (Barboza, 2009; OECD, 2010a; European Commission, 2009)

Facilitate access to finance and encourage private investment in R&D and innovation

The risk and time horizon of innovation projects mean that bank loans may not be the best instrument to cover the associated sunk costs. Therefore, it will be important to put in place measures to facilitate access to finance of innovative companies and entrepreneurs. In particular, credit guarantee scheme programmes need to be considered to provide incentives for banking institutions to grant loans to high-potential companies. In addition, credit information services, export guarantee schemes and factoring would also improve access to finance in general and to finance innovative projects.

Measures to increase investment readiness could also be developed. In particular, the available infrastructure for business angels should be mounted and venture capital funds attracted to the country. Additionally, SME and innovation vouchers, grants or conditional loans for innovation-related expenditures, as well as R&D tax credits can be considered.

Tax rebates, for example, can be powerful incentives for companies to invest in R&D and were introduced in many OECD countries. However, they may not be particularly appropriate in the case of the Former Yugoslav Republic of Macedonia. The country already has low tax rates on business profits and special incentives exist in Technological and Industrial Development Zones (TIDZs) and additional tax incentives may not contribute substantially to innovation. Furthermore, in order for fiscal incentives to be effective, authorities need to have a well-developed fiscal system that can allow them to discriminate between R&D costs and other types of expenditures. Otherwise, tax incentives on R&D could result in simply relabeling standard expenditures and not in increased R&D activities.

As subsidies, in form of grants and loans, might result in additional research and innovation activities, they may be a more suitable choice for the Former Yugoslav Republic of Macedonia. However, before any decisions are made detailed cost benefit analysis should be performed to see whether the national authorities have the resources to provide subsidies.

4.2 Strengthening human resources for innovation

There is a good basis for developing a skilled labour force in the Former Yugoslav Republic of Macedonia. The completion rate for secondary education is in line with European standards and the enrolment of students in tertiary education has increased over the past years, even though it remains low by regional standards. In addition, vocational education and training is widespread. The establishment of a Council for Vocational Education and Training and a Centre for Vocational Training seeks to improve its quality and relevance and ensure its alignment with schools curricula.

Despite the relatively good basis for developing a skilled labour force, many challenges remain to be addressed to strengthen human resources for innovation. For instance, a skills gap analysis conducted in 2008 shows that employers seek to recruit employees with more work experience and that there is a shortage of employees with information technology literacy and the ability to speak foreign languages.

Improving the quality and relevance of the education system needs to become a strategic priority. Adequate policies need to be developed and implemented to ensure that education at all levels prepares people for the labour market, notably by providing competencies that will help firms be innovative and competitive. In particular, policies should aim to adapt education policy to develop the skills needed for innovation, improve the quality of vocational training, promote lifelong learning, and make the education at universities more relevant for innovation.

Adapt education policy to develop the skills needed for innovation

Tertiary education should promote innovation through entrepreneurial learning and closer links to the private sector. At present, entrepreneurial learning is not widely provided in the tertiary education system. Measures to achieve this could include providing innovation and entrepreneurship classes, developing internship programmes, cooperative industrial diplomas, Masters' degrees and PhDs and setting up advisory boards at universities.

Further efforts are needed to align the curricula of vocational training to the needs of the labour market. Measures to achieve this could include developing skills and training needs analysis, creating a skills council and adjusting curricula and quotas.

The Employment Services Agency's assessment of skills should be continued and further improved. Indicators of cognitive, behavioural and technical skills for innovation could notably be included. This will help the government define educational programmes that are aligned with the needs of the labour market and conducive to innovation. In particular, measures to improve VET and promote lifelong learning could include improving the competencies of teachers and trainers, increasing the capacities of the VET centre and Adult Education Centre and providing financial incentives for training. For instance, SME vouchers to co-finance training in firms could be envisaged as an incentive to firms to provide training to their employees. Tax incentives for training-related expenditures could also have such an effect.

4.3 Creating a regulatory framework in support of innovation

The Former Yugoslav Republic of Macedonia made progress to improve the business climate, as reflects the country's favourable ranking on the ease of Doing Business Index. In particular, it is easy to set up a business in the country and corporate taxes are low.

However, many aspects of the regulatory framework are insufficiently developed. For instance, intellectual property rights regulations in universities and public procurement are not designed to be conducive to innovation. In addition, research funds to universities and research institutions are not allocated on a competitive basis and the capacity and propensity of academics to publish as well as commercialise research results are very low.

Incentivising innovation through regulations should be a strategic objective of the Former Yugoslav Republic of Macedonia. This will involve providing an effective regulatory environment for academics and research institutions, with a greater emphasis on results, and adapting public procurement to support innovation while continuing efforts to further improve the business climate.

Provide an effective regulatory environment for academics and research institutions

Universities and the Ministry of Education and Science recognise the importance of technology transfer, commercialisation and IPR. However, a framework should be defined to better regulate IPR of academics and their consultancy work. Measures could also address the allocation of research funds, the incentive structures around salaries and career paths of academics, and the regulation of entrepreneurial leave and spin-off support.

Adapt public procurement practices to encourage innovative solutions

Public procurement practices can be modified to encourage incremental innovation. This can notably be done by introducing functional requirements rather than detailed specifications. These functional requirements and making the contractor responsible for the lifecycle of the project will incentivise innovation.

The Small Business Innovation Research Programme (SBIR), established in the USA, and similar programmes developed in countries such as Australia, the United Kingdom and the Netherlands show how public procurement can be used to foster innovation. The US SBIR programme, introduced in 1982, allows government agencies to use 2.5% of their funds for competition based awards to small innovative firms (OECD, 2010b). Evaluations suggest that the SBIR programme has led to increased growth and employment as well as greater likelihood to attract venture financing (NRC, 2008). On the other hand, critics of the programme have questioned whether it simply crowds out private investment (Wallsten, 2000) and pointed out that SBIR-like programmes do not provide sufficient funds for the successful commercialisation of innovations (NRC, 2008).

Provide for a competitive business environment

Competition can stimulate companies to differentiate their goods and services by innovating. It can be encouraged through low barriers to entry and an efficient public administration and rule of law. The Former Yugoslav Republic of Macedonia should keep striving to improve its business climate, notably by monitoring and improving the business environment for SMEs and implementing competition policy.

4.4 Increasing knowledge flows and interactions between innovation actors

There is already some effort to develop knowledge flows in the economy. The government is taking measures to foster linkages, for instance, by providing funds for the development of clusters and by co-financing projects that involve collaboration amongst research actors. These efforts are welcome particularly in light of the results from the OECD survey which shows that co-operation with other innovation actors raises the innovation and export performance of firms.

However, linkages between universities and public research institutions and the private sector are almost non-existent. The moderate FDI inflows in the manufacturing sector also imply that there are fewer opportunities for knowledge transfers from foreign firms. In addition, while the government and donors put in place programmes and measures to support linkages, these tend to often lack sustainable funding.

A strategic priority will need be to foster knowledge flows between innovation actors and further facilitate linkages by building on existing infrastructure such as business networks and clusters (following an evaluation of existing clusters), increasing linkages between public research institutions and the private sector, embedding FDI and innovative companies in the innovation system and building and strengthening links with the Diaspora.

Foster business networks and clusters

Policies to support co-operation between businesses include evaluating and prioritising cluster support, developing or supporting business networks and trade fairs. Business clusters, incubators and science parks are examples of policies to develop networks. In addition, the government could develop measures such as brokerage events, training sessions and participation in international firms to support inter-firm networks and to increase the contribution of these associations to innovation. In the Former Yugoslav Republic of Macedonia, significant initiatives have been developed, in particular with the support of international donors. However, these programmes, which are generally under the responsibility of the Ministry of Economy, need to be reviewed and in some cases reformed:

Indeed, the Ministry of Economy should undertake an independent evaluation of the performance of existing clusters. It may also be necessary to focus the limited funds on the clusters offering greatest potential for development, export and innovation. Clusters do not have to be limited to high technology sectors. They should, in general, help firms increase their competitiveness by fostering the co-operation between customers and suppliers, tying in FDI, creating supporting institutions and providing a pool of specialised labour.

Increase knowledge flows and interactions between research institutions and businesses

Currently, as part of its support to research institutions, the Ministry of Education and Science is funding R&D-oriented projects. The development projects aim to improve the collaboration between public research institutes and the private sector. This represents a very positive initiative. On the other hand, the structure of this programme could be improved. The public contribution to joint research efforts represents on average 30% of the total cost of the project, which may leave an excessive cost burden for certain companies. In addition, the eligibility criteria for this type of public funding would need to be monitored to ensure that they do not fund research that would have occurred anyway.

Other measures to increase knowledge flows and interactions between research institutions and businesses could include conducting public research oriented towards the needs of the business sector, creating a database to register laboratories and researchers, creating a web portal for science-industry co-operation and building technology centres and technology transfer offices and incubators.

Creating a database of laboratories, their fields of research, equipment and research staff and an interactive web portal could be a relatively inexpensive way to facilitate business' access to information on potential research partners. The database and the platform could therefore contribute to increasing co-operation between research institutes and businesses.

Technology transfer offices and incubators could be set up in universities to provide support for patenting, spin-off and technology licensing. These technology transfer offices should be set up based on

existing initiatives of technology transfer, notably to ensure that the offices reach a critical mass of projects. An adequate IPR framework should also be defined for these technology transfer offices.

Embed FDI and innovative 'stars' into the national innovation system

The Former Yugoslav Republic of Macedonia should consider measures such as matching MNEs with domestic suppliers, matching FDI with domestic skills, facilitating labour mobility and science and technology parks to better embed FDI and innovative stars into the national innovation system.

For instance, the comprehensive programme including both training and networking aspects which was developed in the Czech Republic in 1999 can be used as a benchmark. In an effort to establish linkages between MNEs and local suppliers, CzechInvest, the FDI promotion agency, launched a Supplier Development Programme. This programme was composed of three pillars: i) Making available information on Czech component suppliers' capacities and products to enable MNEs to contact potential future suppliers; ii) Matching potential suppliers to MNEs through "Meet the Buyer" events between foreign investors and local suppliers, seminars and exhibitions and concrete proposals to encourage MNEs to work with local suppliers; and iii) Improving Czech suppliers through consultancy, training support and management operations (Potter, 2002).

Measures such as matching MNEs with domestic suppliers can also be taken to integrate foreign firms into regional networks. For instance, foreign firms can be encouraged to meet local suppliers or research institutions and programmes can help local firms and institutions achieve standards required by foreign affiliates (Potter 2002). For instance, based on a study of Irish companies, Görg, Hanley and Strobl (2009) show that while financial incentives may help MNEs build linkages with local suppliers, policies to encourage networks and matching companies are indispensable.

Furthermore, linkages can be fostered through the development of training initiatives. In an effort to attract more innovative companies in the 1980s, Singapore implemented the Skills Development Fund (SDF) to facilitate the appropriate training of the work force. The fund, which is financed by a tax on low-wage labour, can be used to train employees. All companies with more than ten workers used the fund and 33% of firms with less than ten employees used it (Ritchie, 2002).

In addition to this initiative to develop formal training, knowledge transfers have been promoted. In Singapore, a scheme was developed to transfer skilled managers from international companies to local companies to help these companies develop the technologies and knowledge necessary to supply the mentoring multinational enterprise (Ritchie, 2002). Similarly, in Wales, Japanese investors provided training to local SMEs in their supply chain networks. Other steps were taken to increase knowledge transfer from FDI such as placing local engineers in the foreign customers' plant, disseminating best practice and joint problem solving.

Strengthen linkages with the Diaspora

Because an estimated 20% of the population of the Former Yugoslav Republic of Macedonia lives abroad, strengthening linkages would provide a way to leverage their skills and networks. Policies to strengthen links with the Diaspora could include creating scientific networks, encouraging short-term stays in the home country, joint research projects and return programmes. A policy such as the UNDP Transfer of Knowledge through Expatriate Networks (TOKTEN) programme, which encourages emigrants to provide free short-term consultancy services in exchange of a return ticket and a daily allowance, could also be relevant to increase knowledge transfer in the country (OECD, 2007).

4.5 Co-ordinating the policy design, implementation and monitoring of innovation policies

There is a consensus amongst governmental bodies and business networks in the Former Yugoslav Republic of Macedonia on the importance of innovation to foster economic growth and competitiveness. Innovation is therefore addressed by many government documents, including the country's industrial policy and most recently the Law for Innovation Activity.

Prior to 2012, there was no comprehensive approach to innovation, one that took into account both the R&D aspect of innovation and its economic aspects. Currently, the Deputy Prime Minister on Economic Policy leads the innovation policy agenda and the responsibility for the implementation of innovation policy is assigned to the Ministry of Education and Science.

To make the most of this consensus on the importance of innovation, a continuous inter-institutional dialogue needs to be established between actors within the government and between the government and the private sector. In the longer term, this could be achieved by setting up an institutional structure to co-ordinate innovation policies. Finally, the implementation of innovation policies should be monitored and impact assessments of measures should be conducted when possible, in particular for measures that involve significant public funds.

Agency for Technology and Innovation

In the longer term, an institutional structure should be adopted to ensure that sufficient consultation occurs on innovation-related issues. Experiences in OECD economies (OECD, 2005) show the importance of setting up a whole-of-government approach to innovation policy, for example through specific institutions and advisory councils.

In several countries in South-East Europe and in the OECD, independent agencies responsible for the implementation and the monitoring of the various measures to support innovation have been set up (OECD, 2005). For example, the Finnish agency TEKES (Box 5), which distributes funding for R&D, provides support for SMEs and develops linkages between academics and companies. By including private sector representatives in the governance structure of these agencies, policy makers have introduced a way to ensure that programmes are adequately answering the needs of the private companies and that, if needed, measures would be quickly adapted. Developing such an institution or modifying the status of an existing body to centralise innovation measures and improve public-private consultation would help to develop a responsive institutional framework.

Box 5. Innovation Agencies and Departments

Some OECD countries, such as Sweden and Finland, have set up agencies which focus on designing and or implementing pro-innovation policies. Similarly to an Innovation Fund (Annex 1), these agencies also link businesses and science through a variety of co-funding initiatives; however, they have a stronger policy-making role. In Finland, the innovation agency Finnish Funding Agency for Technology and Co-operation (Tekes) was created to help Finland through an economic recession in the 1970s (Tekes 2011). Most of the agency's funds are dedicated to SMEs and less than 3% of the agency's R&D funds go to companies with more than 500 employees (OECD, 2010e). In Sweden, Vinnova is a governmental agency under the Ministry of Enterprise, Energy and Communication. It facilitates research and innovation, creates networks and fosters stronger linkages between the business sector and research institutions. It co-finances all projects with a budget of about EUR 220 million, about 10% of which is dedicated to SMEs (OECD, 2010d).

An alternative to an agency attached to a lead ministry, is the creation of a separate government institution to ensure an efficient inter-institutional dialogue. In Australia, for example, the national innovation system is currently managed on a ministerial level. The Department of Innovation, Industry, Science and Research co-ordinates projects and administers funds in order to link industry, science and research. The Department was created after a federal

election in 2007, replacing the former Department of Industry, Tourism and Resources and taking over some of the areas of the departments of Education, Science and Training Department, Employment and Workplace Relations and Communications, Information Technology and the Arts. (Australian Government, 2008) This governmental restructuring occurred in order to strengthen the industrial sector, enhance economic and social benefits and maintain the knowledge-based economy. This highest level of administrative restructuring seems to have been efficient given that the annual evaluations of the programmes under the auspices of the Department show that in some cases the achieved results exceeded annual targets. (Australian Government, 2009)

Dialogue between the public and private sectors and academia

Besides ensuring that the perspectives from the various institutions in charge of innovation policy are taken into account, policy makers need to ensure that some degree of public-private consultation is carried out. Currently, in the Former Yugoslav Republic of Macedonia, very limited dialogue occurs at the phase of policy design or of implementation.

In OECD countries, the level of formalisation of public-private consultation varies. In countries where public-private dialogue is very developed, contacts occur informally through consultative committees that influence policy making. In other cases, a formal consultation process has been developed and specific institutions, for example the Finnish Science and Technology Policy Council, the German Science Council and the Italian National Assembly for Science and Technology, have been set up. These councils ensure that policies in the innovation area are adopted with a sufficient level of consultation.

In the Former Yugoslav Republic of Macedonia, further efforts are needed to increase the public-private dialogue on innovation policy. The National Entrepreneurship and Competitiveness Council (NECC) was originally designed as a forum where public and private stakeholders could discuss policies on competitiveness. The Committee for Technological Development, as anticipated by the Law to Encourage and Facilitate Technological Development (2011), should be established.

Assessing the implementation and effectiveness of support measures for innovation

A number of measures have been developed to support innovation in the Former Yugoslav Republic of Macedonia, in many cases with the support of donor organisations, but no monitoring of the various measures and of their contribution to innovation has been conducted. For example, regarding the development of clusters and industrial zones, it has been decided to expand the scope of pilot measures without conducting a thorough assessment. In addition, while in principle laws regulate public support measures, the selection basis for some individual measures appears unclear.

Besides monitoring the implementation of policies, impact evaluations of programmes should be carried out, highlighting the benefits or potentially identifying gaps in programmes. Monitoring and impact evaluations would help the government draw the right lessons from existing initiatives and allocate government funds more effectively.

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APPENDIX A: GOVERNMENT IN ACTION

This appendix presents the most recent institutional setting and policy framework for innovation in the Former Yugoslav Republic of Macedonia established after the adoption of the National Innovation Strategy in 2012. It looks at the role of the government and how it shapes the innovation system in the Former Yugoslav Republic of Macedonia. It considers the general direction of the policy agenda, institutions that frame the innovation system, their mandate, and frameworks for dialogue between institutions.

A.1 Innovation in the economic programme of the government

In 2012, the Former Yugoslav Republic of Macedonia adopted the National Innovation Strategy which presents the most comprehensive framework for developing a national innovation system so far. The strategy foresees the introduction of many regulatory reforms and policy measures addressing the governance of the system, and the low capacity and propensity of the business, education and research sectors to innovate.

The key reform resulting from the Innovation Strategy is the development of the Law for Innovation activity which regulates the principles, objectives and subjects of the innovation activity, the scientific-research activity, and the transfer of technological know-how; the intellectual property rights of the relevant stakeholders; as well as the establishment, the statute, the competences, the management and administration, the financing, the work supervision, and other issues related to the work of the Fund for Innovations and Technological Development. The Law was adopted in May 2013.

Box 6. Development of the National Innovation Strategy 2012-2020 of the Former Yugoslav Republic of Macedonia

Innovation strategies, whether they include innovation by companies or not, follow broadly similar structures:

- Review of the innovation system;
- An introductory section to the strategy generally includes a review of the performance of the innovation system, highlighting the challenges to be addressed;
- Vision and strategic objectives: Based on the assessment, a set of general objectives and challenges for the implementation period are identified;
- Specific objectives: Within each of the policy domains that frame the strategic vision, specific objectives are defined. In some cases, instruments to achieve the objectives are listed and quantitative targets are sometimes set.
- Action plan: Most strategies include an action plan detailing the measures to be put in place, the timeline for implementation and the entity responsible for the implementation of the measure.

The OECD Investment Compact for South-East Europe followed a similar process when providing the Former Yugoslav Republic of Macedonia with intellectual support for the development of an innovation strategy and its action plan. The OECD also provided similar support to Croatia and Kosovo⁸, which resulted in the development of innovation strategies.

The OECD team initially conducted an assessment of the innovation system of the Former Yugoslav Republic of

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

Macedonia, based on desk research, surveys and consultations with relevant innovation stakeholders, including the business community, the academia and government institutions.

Following the completion of the assessment of the innovation system, the OECD jointly with the Ministry of Economy organised an innovation forum to prioritise the objectives of the innovation strategy and discuss potential specific objectives. The innovation forum included panel discussions and break-out groups where stakeholders from the business sector, the research sector and the government were invited to provide their views on the innovation strategy.

Based on the outcome of the review of the national innovation system, the conclusions of the innovation forum and further consultations with stakeholders, the OECD provided expertise for the drafting of "The Innovation Strategy of the Republic of Macedonia for 2012-2020" which is coupled with an action plan for 2013-2015. The action plan outlines the measures that the government will implement to achieve the strategic objectives, setting for each measure the responsible institution, a time frame, a target, expected results, activities, indicators for the implementation and realisation of the measure and the expected budget. The main objectives of the National Innovation Strategy 2012-2020 are:

- **Enhance the business sector's propensity to innovate**
- **Strengthen human resources for innovation**
- **Create a regulatory environment in support of innovation**
- **Increase knowledge flows and interactions between innovation actors**
- **Coordinate the policy design, implementation and monitoring of evaluation policies**

Both the strategy and the action plan were drafted in close consultation with the project team, whose members represented a wide range of institutions in the country including the Ministry of Economy, the Cabinet of the Deputy Prime minister in charge of economic affairs, the Ministry of Education and Science, the universities, MASIT and other institutions.

Prior to 2012, several initiatives that seek to improve innovation and research outcome were adopted by the government. Those included the National Development Plan for 2008-2013, the Strategy on Industrial Policy, the Strategy for Intellectual Property, the Action Plan on Competitiveness, the Export Promotion Strategy as well as initiatives related to small and medium-sized enterprise (SME) policy. In addition to these documents related to economic development, some reforms were carried out in the research areas, in particular through the Law for the Development of Research and Scientific Activity, the Law to Encourage and Facilitate Technological Development, the Act to Encourage and Facilitate Technical Education and the Law on Encouragement and Support of Technical Culture.

Increasing the competitiveness of business in the Former Yugoslav Republic of Macedonia is a key objective of the government. In the area of economic reform, improving various aspects of the business climate and support to FDI development were identified as key priorities for the country. In particular, the National Development Plan 2008-2013 includes investment in education to enhance individual creative and productive capabilities as one of its four major objectives. Furthermore, developing linkages between universities and the private sector and improving the participation of the private sector to the research effort are recognised in the general programme as essential measures to foster competitiveness. Finally, based on the Global Competitiveness Report 2012 of the World Economic Forum, the government drafted and recently adopted an Action Plan on Competitiveness.

Box 7. European Union 2020 Strategy

Europe 2020 is the growth strategy of the EU. It builds upon the Lisbon strategy for growth and jobs, launched in 2000. The strategy sets clear and measurable targets (both at EU and national level) and robust surveillance. It aims to foster new models of growth, promotes stronger governance and tighter economic co-ordination.

Europe 2020 aims to foster smart, sustainable and inclusive growth within the Union. Smart growth means bridging the European productivity gap through improving education, research and innovation, and the digital society. Sustainable growth means promoting a more resource efficient, greener and more competitive economy through building a more competitive low-carbon economy, protecting the environment, developing new green technologies, introducing efficient smart electricity grids, harnessing EU-scale networks, improving the business environment, and helping consumers make well-informed choices. Inclusive growth means fostering a high-employment economy delivering economic, social and territorial cohesion through creating more and better jobs, investing in skills and training, modernising labour markets and welfare systems, ensuring an equal dispersion of the benefits of growth. These three mutually reinforcing priorities are to deliver high levels of employment, productivity and social cohesion.

The EU has strategic objectives in five target areas: employment, innovation, climate and energy, education and poverty and social exclusion. The primary strategic goals set by Europe 2020 are to increase employment of the 20 to 64 year olds to 75%; to invest 3% of the EU's GDP (public and private combined) in R&D/innovation; to reduce greenhouse gas emissions to 20% (or potentially 30%) lower than 1990 levels; to use 20% of energy from renewable resources; to increase energy efficiency with 20%; to reduce school drop-out rates below 10%; to ensure that at least 40% of 30 to 34 year olds complete third level education; and reduce the number of people in or at risk of poverty and social exclusion by at least 20 million.

Each individual Member State will adopt its own national targets in order to achieve the objectives of the Union by 2020. Concrete actions will be undertaken both at EU and national level. The strategy has introduced seven flagship initiatives: Digital Agenda for Europe, Innovation Union, Youth on the Move, Resource Efficient Europe, an industrial Policy for the Globalisation Era, an agenda for New Skills and Jobs, and European Platform against Poverty. The strategy emphasizes the need to use more effectively existing cross-cutting policies and tools, such as the single market, the EU budget and the external policy tools.

The monitoring process will review macroeconomic factors, growth-enhancing reports and public finances. Progress will be assessed through an annual growth survey, the spring meeting of the European Council, the National Reform Programmes and Stability and Convergence Programmes. The Commission will propose country-specific recommendations each June and, where recommendations are not acted on within the given time-frame, there will be policy warnings with enforcement through incentives and sanctions in the case of excessive imbalances. Ministerial Meetings in the Council of the EU will peer review and monitor progress towards EU headline targets, and advance Europe 2020 flagship initiatives. Every stage of the process will be accompanied by the European Parliament.

Source: EC, 2010a

A.2 Institutions

A.2.1 The Cabinet of the Prime Minister

The Cabinet of the Prime Minister is directly involved in supporting the initiatives of the National Innovation Strategy. The Prime Minister is the Chairman of the Committee for Entrepreneurship and Innovation, which determines further directions and commitments in accordance to the National Innovation Strategy.

A.2.2 The Cabinet of the Deputy Prime Minister for Economic Policy

The Cabinet of the Deputy Prime Minister for Economic Affairs and Co-ordination of Economic Recourses is responsible for economic policies, structural reforms and investment. The Cabinet also took the responsibility for the innovation policy agenda following the adoption of the National Innovation

Strategy in 2012. For this purpose, an Advisory Body for Innovation, consisting of high level representatives of a range of institutions, was appointed by the Committee for Entrepreneurship and Innovation. This body is responsible for guiding, monitoring and co-ordinating the implementation of the Action Plan of the Innovation Strategy.

A.2.3 Ministry of Education and Science

The Ministry of Education and Science is the key governmental institution concerning education, science, technology, research and innovation. The Ministry of Education and Science remit covers higher education, vocational education and international scientific-technical co-operation. It plays a significant role in identifying the research priorities of public research institutions, even though international projects and the academic community also appear to be important. However, before the adoption of the National Innovation Strategy, its focus and impact on innovation activity in the Former Yugoslav Republic of Macedonia was rather limited.

The evolution of resources allocated shows that R&D had not been the primary objective of the government, though there are signs that this may be changing as policy makers become increasingly aware of the importance of innovation to long-term economic development and competitiveness. In 2011, the Ministry of Education and Science prepared a new draft R&D Programme, which is in line with the EU 2020 Strategy and does indeed place greater emphasis on innovation. The draft R&D strategy reportedly seeks to raise the levels of investment in R&D from the current 0.225% to 1.8% by 2020. The approval of the new draft R&D Programme is expected in 2013⁹.

The Ministry of Education and Science, as the leading implementing body of the activities defined in the National Innovation Strategy, was in charge of developing the Law on Innovation Activity.

The Ministry of Education and Science envisages the development of a Department for innovation, competitiveness and entrepreneurship which will monitor the development and commercial exploitation of innovations. More specifically, this Department will:

- Participate in the preparation of action plans based on the Innovation Strategy;
- Submit proposals to the Government on policy in the area of innovation activity, and innovation activity programmes;
- Monitor and analyse European and global trends and standards in innovation activity;
- Monitor the implementation of existing operations in the innovation activity and propose measures in accordance with the development potential of the Former Yugoslav Republic of Macedonia;
- Steer and engage in international cooperation;
- Conduct research, surveys and economic and technological inquiries in order to assist the shaping of government policy in aid of Innovation activity;

⁹ The programme was presented on 29 October 2012 and should be adopted by Government following a six-month public consultation, according to the Government website <http://www.vlada.mk/?q=node/4808&language=mk> accessed on Nov 1, 2012

- Initiate amendments to laws and other regulations in this area in order to encourage innovation activities.

A.2.4 Ministry of Economy

The Ministry of Economy is responsible for the national strategies for SME development, clusters, FDI and industrial policy. As such, it is an active policy maker in relation to innovation matters. The four afore-mentioned policy areas have their own strategies and annual programmes, all of which touch upon aspects of competitiveness and innovation, albeit with a strong emphasis on enterprise development. The Ministry of Economy's industrial policy focuses on a series of priorities, one of the most prominent of which is "Applied R&D and Innovation."

The ministry has developed a number of initiatives to enhance the competitiveness of SMEs. The general orientation of SME policy in the Former Yugoslav Republic Macedonia was defined in 2002 when the Ministry of Economy published its SME strategy for 2002 to 2013. This strategy, which was updated in 2007, included among others the objective to develop the innovation capacity of SMEs. Several programmes have been developed that aim to translate the orientation provided by the strategy into concrete policy measures. The latest four-year programme covered the years 2007 to 2010. Following this programme, the strategy was implemented through annual programmes.

The SME programmes aim to address the policy areas included in the Small Business Act developed by the European Commission (EC, 2008), including innovation. The main focuses of the programme are (i) to set up an adapted institutional architecture, (ii) to improve the business environment, (iii) to facilitate access to finance (iv) and to better develop innovation and competitiveness of SMEs. Measures that explicitly target the innovative capacity of the private sector include support to the creation of an "innovation voucher", the development of the IUS and the support of commercial application of knowledge developed in the universities.

In 2011, the Ministry of Economy set aside MKD 3 million for cluster and network development, as well as approximately 11 million for a variety of industrial policy initiatives. These include support for technological development and for employment of young researchers, support for commercialisation of patented innovations and building institutional capacity for participation in international projects and programmes. Some of these measures continued to be funded in 2012 through the Programme for Implementation of Industrial Policy of 2012.

In addition, the Ministry of Economy implemented a programme to support the development of cluster associations with a budget of about EUR 40,000 in 2012. It also put in place measures to support clusters and cluster projects in 2013, including the preparation of an atlas of clusters and an assessment and evaluation of clusters and cluster policies.

In 2013, the Ministry of Economy developed an integrated programme to address competitiveness, innovation and entrepreneurship which merges the Programme for the Implementation of the Industrial Policy, the Programme for the Development of Entrepreneurship, Competitiveness and Innovation in SMEs and the Programme supporting cluster associations. This inclusive document is expected to improve the visibility and awareness of the measures undertaken by the Ministry. In 2013, the programme was allocated a budget of about MKD 13 mn, approximately EUR 216,000: MKD 8 mn will support the development of SMEs, about MKD 3 mn will be used to implement measures for industrial policy and about MKD 2.5 mn will support cluster development.

The new Programme for Stimulating Investment 2011-2014 does not focus on innovation in particular but, being a wide ranging reform agenda designed to improve the general business climate and to stimulate investment, it contributes to making domestic firms more innovative and competitive.

A.2.5 The State Office of Industrial Property

SOIP is responsible for acquiring and protecting industrial property rights. This entails a variety of tasks such as establishing procedures for national and international recognition of property rights, keeping registers (patents and trademarks), harmonising national legislation, providing access to information and promoting industrial property protection. It is responsible for coordinating the implementation of the Strategy for Intellectual Property, which develops the capacity of IPR holders and the business community in protection and enforcement of IPR, but it does not have a specific role in relation to innovation policy.

A.2.6 Local government

The activities of the local authorities are largely restricted to local economic development work, with a focus on entrepreneurship, competitiveness and investment. With some exceptions, such as the largest cities and the current and designated Technological and Industrial Development Zones (TIDZs), innovation-related instruments are not a policy priority for the local government in the Former Yugoslav Republic of Macedonia.

The key players at the local level are the Local Economic Development Offices (LEDOs) operating in each of the 84 municipalities. In addition, the network of Business Centres (partly financed by APPRM) is also active in supporting the local economic development agenda, including a general focus on start ups, competitiveness and innovation.

A.3 Institutional dialogue

The level of institutional dialogue in the Former Yugoslav Republic of Macedonia is currently being developed. The main arrangements are highlighted below.

A.3.1 Committee for Entrepreneurship and Innovation

The Committee for Entrepreneurship and Innovation, chaired by the Prime Minister, is responsible for:

- Co-ordinating the governmental policies and measures to support innovation and competitiveness;
- Co-ordinating the budget according to government priorities;
- Monitoring the work of the Fund for Innovation and Technological Development;
- Reviewing and approving programmes to support development projects and programmes of the Fund;
- Providing recommendations to the government regarding programmes and projects by international organisations to support and develop innovation activities;
- Monitoring policies and measures of the European Union and reviewing best practices in the field of innovation;
- Making recommendations and proposals to the ministries on innovation-related activities;

- Making recommendations and suggestions to the government regarding the business environment, IPR and the support for innovation activities.

The Committee proposed the creation of the Advisory Body for Innovation mentioned in section A.2.2. This body is responsible for guiding, monitoring and co-ordinating the implementation of the Action Plan of the Innovation Strategy.

A.3.2 Ministry of Education and Science

Within the Ministry of Education and Science, As a result of the Law to Encourage and Facilitate Technological Development (2011a), a Committee for Technological Development, composed of several members (the Deputy Minister of Economic Affairs, Minister of Finance, Minister of Economy, Minister of Education and Sciences, Minister of Information Society and Administration, Minister of Agriculture and Forestry and Minister of Environment and Physical Planning) is to be established. It is expected to monitor trends and make proposals for technological development among other duties.

A.3.3 Ministry of Economy

The Ministry of Economy has a variety of mechanisms for dialogue, though not all of them are actively used.

The National Entrepreneurship and Competitiveness Council (NECC) was initiated with USAID support to act as an inter-institutional forum for dialogue on various aspects on economic policy, including clusters and competitiveness, but it proved to be unsustainable. The Deputy Prime Minister's Office has sought to resurrect the NECC with core Government funding in order to ensure sustainability. A proposal for the new NECC was circulated in October 2010 to all business associations and universities, and the NECC was reactivated in April 2012. The founding assembly of NECC was held on April 5th 2012. Representatives of the public sector, chambers of commerce, banking sector, business associations and clusters, and education institutions in the country took part on the Assembly. The activities of NECC focus on competitiveness and the prioritisation of measures pertaining to competitiveness.

The Ministry of Economy has established the SME forum as a mechanism for public private dialogue specifically for the SME sector with a focus on business associations active in the Former Yugoslav Republic of Macedonia. Despite initial interest and activity, once EC project support came to an end, the SME Forum failed to maintain its activities. Since business associations appear to have ready access to ministers, there appears to be little desire on their part to participate in a common institutional dialogue forum.

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APPENDIX B: METHODOLOGY

The methodology for the background research for the report involves both a quantitative and a qualitative analysis.

B.1 Quantitative analysis

The main sources of the quantitative analysis of this report were two surveys, one by the OECD and one by the EU, data provided by the Central Registry and the State Statistical Office of the Former Yugoslav Republic of Macedonia, as well as a variety of indicators from international sources.

B.1.1 Business Survey

This survey was developed with the purpose of addressing the problems that the private sector faces when dealing with innovation issues. The survey was conducted via face-to-face interviews by GfK, Skopje from May to June, 2011.

The OECD survey on the innovative activities of business enterprises stratified companies in three clusters according to their number of employees: small (less than nine employees), medium (ten to 49 employees) and large companies (more than 50 employees). It should be noted that the standard EU definition is micro (less than nine employees), small (ten to 49 employees), medium (50 to 249 employees), and large (more than 250 employees).

From the targeted 500 companies, 492 were successfully surveyed (224 small, 162 medium and 106 large). Companies were almost equally represented among the four sectors: trade (28%), services (20%), manufacturing (20%), and construction (28%). 439 companies had private ownership, 15 companies had dominant (>50%) foreign investors, only seven were owned by foreigners, eight firms were still in state ownership and 23 in mixed ownership.

A modified version of this survey was submitted to research institutions. The survey was distributed to universities by the Ministry of Education and Science. Since the number of responses that were collected was only eight, the survey was not used for a quantitative analysis; rather it provided more substance to the one-to-one interviews at universities, conducted for the analysis of the part for innovation in research institutions.

B.1.2 Community Innovation Survey (CIS)

In 2010, the innovation capacities within the Former Yugoslav Republic of Macedonia were evaluated using the CIS which is conducted annually in the EU. In the EU, the questionnaire is carried out following Commission Regulation (EC) No. 1450/2004 and the Decision No. 1608/2003/EC. NCDIEL and Contesti, Srl. conducted the CIS in the Former Yugoslav Republic of Macedonia between May 2010 and September 2010, using version four of the Community Innovation Statistics a sample of 2000 companies were surveyed.

The questionnaire focused on all companies that had economic activities in the period 2006 to 2009 and the sample was extracted equally from all eight statistical regions in Macedonia. The CIS sample consisted of 1980 companies in total, grouped in: 1394 small (one to nine), 428 medium (10 to 49) and 158 large (more than 50) companies.

B.2 Qualitative Analysis

The qualitative analysis includes on-site interviews with government institutions and business sector and a focus group discussion with business representatives.

The OECD also prepared a questionnaire for research institutions. It was distributed by the project team via the Ministry of Education and Science to seven research institutions and faculties. The answers to this questionnaire provide the basis for illustrating some of the activities of the universities and research institutions.

B.2.1 On-site interviews

The OECD conducted on site interviews within the Ministry of Economy, the Ministry of Education and Science, a variety of government institutions and businesses. The full list of the institutions is provided in Appendix 3.

B.2.2 Focus group

GfK, Skopje conducted a focus group in the premises of the Best Western Hotel, Skopje on 12th May, 2011. The basic research method was a group discussion with seven companies. The discussion was facilitated by a trained moderator (a psychologist), in accordance with the structured discussion guide, developed by the OECD, and approved by the participants in the discussion. In addition to the written report, an audio recording of the focus group discussion was made and is available upon request (in Macedonian). The sample included both innovative and non-innovative companies from a variety of sectors.

APPENDIX C: LIST OF KEY COUNTERPARTS

Project Team

Imerali		Ministry of Economy, Department for Entrepreneurship and Competitiveness of SME
Baftijari	Head of Department	
Suzana		
Arsova-		Ministry of Economy, Department for Entrepreneurship and Competitiveness of SME
Kostadinova	Deputy Head	
Elizabeta		Ministry of Economy, Department for Entrepreneurship and Competitiveness of SME
Todorova	Head of Unit	
Jasmina		
Majstoroska	Advisor	Industrial Policy Department
Stanka		
Petkovska	Advisor	Ministry for Education and Science
		Faculty of Mechanical Engineering and National Center for Development of Innovations and Entrepreneurial Training
Radmil		MASIT, Information and Communication Technology Chamber of Commerce
Polenakovik	Professor	
Anita Nikova	Project Coordinator	

Public Institutions

Metodij		
Hadzivaskov	Vice Minister	Ministry of Economy
	Head of Industrial Policy Department	
Kiro Spandzov		Ministry of Economy, Industrial policy department
Jasmina		
Majstoroska	Head of Unit	Ministry of Economy, Industrial policy department
Suzana		
Ignatovik-		Cabinet of the Vice Prime Minister in charge of Economic Affairs, Economic Policy Unit
Aleksova	Economic Policies Advisor	
Mrs.		Cabinet of the Vice Prime Minister in charge of Economic Affairs, Economic Policy Unit
Romanela		
Jelena		
Dimitrijevic		Ministry of Education and Science
Mitko Aleksov	Executive Director	Association of Chambers of Commerce
Jasna		
Petkovska	Coordinator/ Assistant	Association of Chambers of Commerce
Natasha		
Petkova	Project Coordinator	YES Incubator
Danco Petrov	Assistant Director	Technological Industrial Development Zone
Igor Velevski		Invest Macedonia
Jadranka		
Arizankovska	Director	Macedonian Chambers of Commerce
Frosina		
Jovanovska	Coordinator	Macedonian Chambers of Commerce
Vahida		
Redzepagic	Managing Director	Agency for promotion of entrepreneurship - APPRM
Mrs.Gabriela	Managing Director	Management and Industrial Research Foundation-

Kostovska

SINTEF

Universities

Pece

Nedanovski Vice-Chancellor

University of Saints Cyril and Methodius
Scientific Council - Centre for Research, Development
and Continuing Education (CIRKO)

Atanas Kocov General Manager

Dragi

Dimitrijević Dean

Faculty of Agriculture

Ljupco Pejov Assistant Professor

Institute of Chemistry

Centre for business Development - University of
Southeast Europe

Lumni Ajvazi Professor

Pop-Jordanov Professor

Macedonian academy for science and art

Business

Sector

Verica Verica Verica

Kliker Marketing, Skopje

Petar

Golaboski Managing Director

Lihnida, Ohrid

Bozo Lazetic Managing Partner

Microtel, Skopje

Sonja

Todorova Head of Marketing

Pivara Skopje

Vladimir

Parleev General Manager

REMA Computers, Skopje

Joze

Anakievski General Manager

Ruen, Kocani

Vasil

Gocevski Chief Production Officer

Seavus, Skopje

Rados

Vukicevic Head of Marketing

Tikves Winery, Kavadarci

Martin

Kochmanovski Department Manager

Tinex, Skopje

Elena Head of Marketing and

Mladenovska- Product Development

Jelenkovic Department

TTK Bank, Skopje

Todor

Georgievski Executive Director

World Wide Bakery, Skopje

Marta

Naumovska

Grnarova General Manager

Zavar Company, Skopje

Daniela

Lazaroska Managing Partner

Zoki Rol, Skopje

Aleksandar

Mazni Managing Partner

Zoom Consultancy, Skopje

