

R&D EXPENDITURE ACROSS COUNTRIES AND SECTORS

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ABSTRACT

R&D activities are often considered as being a main driver of economic development, innovation and growth. They comprise creative work undertaken systematically with a view to increasing the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (Eurostat, 2008: 30). Today innovation performance is a crucial determinant of competitiveness and national progress. For a small country like Croatia Government policy play direct role in fostering innovation across the public investment in biomedicine, manufacturing and innovation research. The literature has convincingly shown that the impact of current R&D on current productivity depends crucially on past R&D. This paper illustrates some recent trend patterns in the Croatia concerning R&D intensity, taking the 3% Barcelona target and the EU average as a benchmark. The objective of this paper is analyzing influence of public R&D and businesses R&D in Croatia on its economic growth. In general, Croatia is still in a process of transition, industrial restructuring and integration into the EU economy. In fact, getting closer to the existing European frontiers in terms of technology, R&D and innovation is quite challenging at national level. This paper presents different indicators, illustrating the increasing importance and the different characteristics of R&D expenditure across countries and sectors.

Keywords: *public R&D, business R&D, the sectoral distribution of R&D, competitiveness, biomedicine, manufacturing and innovation research*

1. INTRODUCTION

R&D activities are often considered as being a main driver of economic development, innovation and growth. Today innovation performance is a crucial determinant of competitiveness and national progress, and is significantly influenced by governmental policy. A common policy trend across EU Member States concerns the important place of R&D investments in the overall policy agendas. The volume of financial resources allocated to R&D is an indicator of the level of commitment to the production and exploitation of new knowledge, as well as an indirect measure of a country's innovation capacity. The national innovative capacity framework seeks to integrate several perspectives regarding the sources of innovation at the national level: (1) ideas-driven growth (Romer,

1990); (2) microeconomic models of national competitive advantage and industrial clusters (Porter, 1990); and (3) the literature on national innovation systems (Nelson, 1993). The objective of this paper is to analyze if public R&D and businesses R&D in Croatia have significant impact on Croatian economic growth.

2. MATERIALS AND METHODS

To analyze the impact of R&D on Croatian economic growth and to compare it to EU-member countries we used indicators of macroeconomic performance, R&D expenditure as national goal; R&D expenditure by sector of performance; and GERD by type of research in Croatia, EU27 and selected countries. The data are provided by TrendChart Croatia 2008, Eurostat; NRPs (National Reform Programmes) by countries, web link at http://ec.europa.eu/growthandjobs/annual-report_en.htm and CBS, Annual R&D Report.

3. RESULTS

Table 1. Indicators of economic performance

Indicator	National performance		EU 27 average	
	2002	2007	2002	2007
GDP per capita in PPS (EU27=100)	48,4	57,5	100*	100*
Real GDP growth rate (% change previous year)	5,6	4,5	1,2	2,0
Labour productivity per person employed (EU27=100)	61,6	71,1	100*	100*
Total employment growth (annual % change)	4,2	0,8^	0,4	1,6
Inflation rate (average annual)	2,2	5,8	2,1	2,3
Unit labour costs (growth rate)	:	:	-0,4	-0,9
Public balance (net borrowing/lending) as a % of GDP	-4,1	-1,6	-2,5	-0,9
General government debt as a % of GDP	40,0	37,7	60,3	58,7
Unemployment rate (as % of active population)	14,7	9,1	8,9	7,1
Business investment as a percentage of GDP	:	:	17,3	18,2^

Source: TrendChart Croatia 2008

Key: (*) EU-25 average; (^) or latest available year (2005); (:) not available

Table 2. R&D expenditures as part of national programs of economic reforms % of BDPs

	2004.	Goal 2010.		2004.	Goal 2010.
EU-25	1,86	3,00	Luxemburg	1,65	3,00
Denmark	2,48	3,00	Nederland	1,78	3,00
Germany	2,49	3,00	Austria	2,24	3,00
Estonia	0,91	1,90	Poland	0,56	1,56
Greece	0,57	1,50	Slovenia	1,45	3,00
France	2,16	3,00	Finland	3,51	4,00
UK	1,79	2,50	Croatia	1,20	to 3,00

Source Eurostat; NRPs (National Reform Programmes) web link

http://ec.europa.eu/growthandjobs/annual-report_en.htm

Table 3. R&D Expenditure, annual average growth rate 2001-2006 (AAGR), by sector of performance in Croatia, EU27 and selected countries

Source: Eurostat, 2008a **Note** Exceptions to the reference period: 2002-2006:HR.

	Total AAGR 2001-2006	Business enterprises sector	Government sector	Higher education sector	Private non profit sector
EU27	3,6	3,2	4,1	4,2	7,4
BE	3,2	-25,1	-22,7	5,1	4,3
BG	11,3	16,2	10,2	5,9	54,7
CZ	16,2	18,4	9,4	16,5	12,8
DK	4,6	3,9	-6,5	11,5	0,4

PT	3,7	8,8	-5,0	2,8	5,4
RO	20,2	14,6	24,6	31,5	:
SI	7,3	8,3	7,4	5,7	-31,8
FI	4,5	4,6	2,7	5,3	3,8
HR	2,4	-1,4	7,0	3,5	:
JP	-3,7	-2,8	-6,4	-6,2	-7,8
CN	16,4	20,2	7,2	14,9	:
RU	16,0	14,8	18,5	19,8	20,9
US	-2,5	-3,1	-2,7	0,8	-0,6

Table 4. GERD by type of research in Croatia, 2000 – 2006 in %

Sector	Basic research					Applied research					Experimental Development				
	02	03	04	05	06	02	03	04	05	06	02	03	04	05	06
All sectors	39	36	35	33	35	34	33	34	43	41	26	30	30	24	24
Business enterprises	0	2	2	5	4	48	35	38	53	48	51	63	60	42	48
Government	73	68	65	60	57	17	28	29	31	36	10	4	6	8	7
Higher education	53	35	52	46	50	17	35	36	40	37	13	12	12	14	14
Non-profit	0	0	0	93	83	0	0	0	7	0	0	0	0	1	17

Source: CBS, Annual R&D Report,

4. DISCUSSION

Table 1 shows that some of macroeconomic indicators in Croatia grow faster than in the EU. In 2007, GDP per capita reached 57.5 % of the EU-27 average. In 2007, the real Croatian GDP growth rate maintained its solid expansion with the overall growth rate reaching 5.6 % (compared to the EU-27 average of 2.0 %). The growth was predominantly based on private consumption and investments, whereas the trade deficit has expanded. The unemployment rate has dropped by 2 percentage points to 9.1 %, but remains higher than the EU-27 average (7.1 %) in 2007. This has much to do with the expansion of the SME sector and the overall growth of the employment rate in the last few years (from 53.4 % in 2002 to 55.6 % in 2006). Labour productivity (GDP over total employment) showed a fast convergence towards EU-27 productivity levels, reaching 71.1 % in 2007. (Trend Chart Croatia, 2008) For the EU-27, plus Norway and Switzerland, the highest levels of R&D investment were seen in the business enterprise sector (BES). On the whole, higher education was the second most important sector investing in R&D after business enterprises, except in some countries such as Hungary, Poland, Romania, Slovenia, Slovakia and Russia and China, where government-sector spending was higher, probably as a result of the interventionist tradition of these governments.

R&D spending by companies in the Croatia was dominated by five sectors: pharmaceuticals & biotechnology sectors, software & computer services, telecommunications, electronic & electrical equipment. The pharmaceuticals sector was by far the largest investor in the HR total. This data show that companies in Croatia follow the trend of investments present in R&D similar to trend in EU and non-EU companies (EC, 2006, 2006a 2006b).

The increase in R&D investment in Croatia, as part of European and global research area is steered towards creating national research market which will be marked by high level of mobility, competition and research excellence. The integration of Croatian research community in ERA and introduction of Lisbon goals into the Croatian S&T policy agendas are highly prioritized within Croatian research community and science policy. Resources allocated to a country's R&D efforts are measured using two indicators, R&D expenditure and personnel (OECD, 2008). The trend of gross domestic expenditures on R&D (GERD) in Croatia for the period 2000 – 2007 is shown in the Table 3. In spite of the slight decline less than 1% of GERD in 2007, Croatia is still among the leading countries in research intensity in the region and the new Member States.

The overall R&D expenditures in Croatia have been constantly growing since the mid-1990s, from 0.71% of BDP in 1998 to 1.2% in 2004. In 2005 is noted decrease to 1% of GDP. The R&D expenditure as a percentage of the gross domestic product (GDP) amounted to 0,93 in 2007. This can partly be explained by develop % and according to BDP. At the same time, Croatia invests more than some of the countries member states of EU27. In both Japan and the EU, R&D intensity (R&D expenditure relative to GDP) picked up in 2005 to 3.3% and 1.82%, respectively, following a drop in 2004. In the United States, R&D intensity declined from a peak of 2.7% in 2001 to 2.6% in 2006.

The current situation of national R&D expenditure shows that Europe is still working to achieve the target set by the Lisbon Strategy of devoting 3% of GDP to research and development activities by 2010. With an R&D intensity around of 1.84% of GDP since 2000 the EU-27 is still below the Lisbon target. The highest R&D intensities, above the 3% target, were achieved by Sweden (3.73%) and Finland (3.45%). All other Member States were below this threshold. The best-performing new Member States in terms of R&D investment were Slovenia and the Czech Republic. R&D investment has increased in the past years to 1.59% and 1.54% respectively, close to the EU- 27 average. Average annual growth rates total R&D expenditures for Croatia was around 2,4% of GDP and showing that AAGR still is under EU average, even country is making efforts to reach the Lisbon Strategy target. Between 2001 and 2006, EU-27 R&D expenditure increased at an annual average growth rate (AAGR) of 3.6%, as shown in Table 3.

Distribution of funds for R&D activities by type of research (table 4.)depends on research resources, either private or public. In 2006, 48% of business R&D expenditure is allocated to development research, 48% to applied research, and only 4% to basic research. This seems logical since the aim of both experimental development and applied research is to produce new goods and services or, at least, modify them for commercial exploitation.

Basic research was the main type of activity in the higher education sector 50,0 %, then follows applied research with 37 per cent (in 2006). Government allocates around 57 per cent of R&D expenditure to basic research, than follows applied research with 36 per cent. The same trend is already noted at EU-27 level. Splitting up GERD (Gross Expenditure on R&D) into financed by government and business sector suggests that the dynamics of BERD (Business Expenditure on R&D) determine the overall trend patterns. Private sector R&D appears to be the key for catching up in terms of R&D figures in Croatia like in the many of EU27 countries, especially in the NMS. Relatively low percent of expenditure to R&D from business sector (private investments) in Croatia, but also in EU are the main obstacle to knowledge accumulation and growth.

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