Statistics in focus

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Innovation in the new Member States and Candidate Countries

Output, barriers and protection

This publication presents results from innovation surveys carried out in the new Member States (except Malta and Cyprus) and Candidate Countries (except Bulgaria and Croatia). Some of the results are compared with an EU average for the old Member States (EU-15 excluding Ireland, Luxembourg and the United Kingdom). The main topics covered by the publication are:

- Sales of new and improved products
- Effects of innovation activity
- Factors hampering innovation
- Protection of innovation

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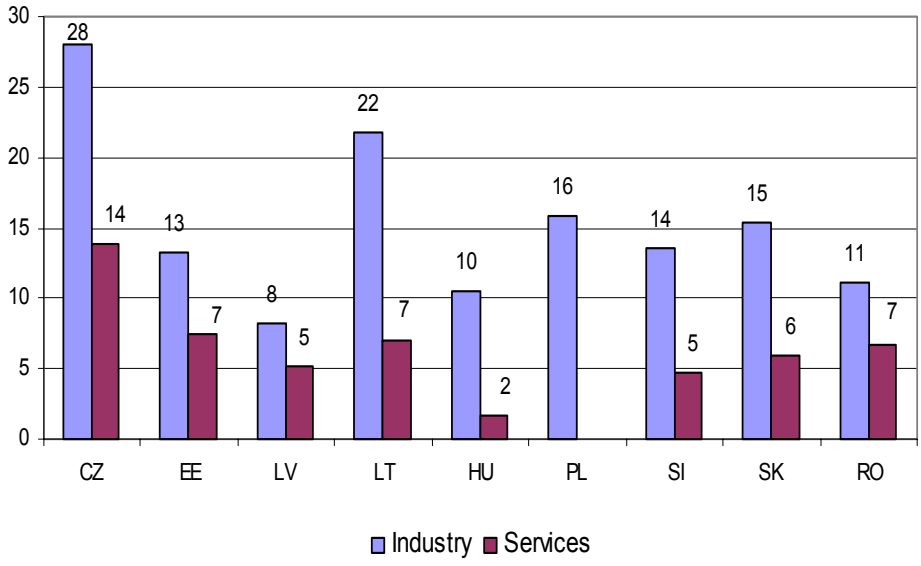
Sales of new or improved products

Figure 1: Turnover of new and improved products, as % of total turnover for all enterprises



Note: Data for Hungary do not include Mining and Quarrying.

A widely used output indicator for innovation is the sales of new or improved products, introduced by the enterprise to the market during the 3 last years (this indicator is only relevant for enterprises with product innovation). One can also distinguish between new products just new for enterprise and new products also new for the market. The data in figure 1 and table 1 relates to enterprises with products new for the enterprise.

There are quite large variations across the countries of the turnover of new or improved products, measured as a percentage of total turnover of all enterprises. In the Czech Republic 28% of industrial turnover was in new or significantly improved products for the enterprises (see figure 1) while in Lithuania it was 22%. In Latvia only 8% of the industrial turnover related to new and improved products.

On average, larger enterprises have a higher share of turnover of new or improved products than smaller enterprises (table 1). The tendency is very marked in some countries, for example in the Czech Republic 39% of the turnover in large industrial enterprises is for new or improved products, while for small enterprises the proportion is only 5%. But in countries like Estonia, Hungary and Latvia there are no large differences between the size groups in the industrial sector.

Every country had a higher percentage of turnover in new or improved products in industry than in services. In the services sector, the Czech Republic again had the highest percentage, with 14 % of turnover in new or improved products, compared to 28% in industry. The rest of the countries' were between 5% and 7%, except for Hungary, which had 2%. One reason for this difference between these sectors is probably that the delineation of new and improved products in the service sector is more difficult.

When we restrict analysis to only products which are also new or improved for the market, the figures are naturally lower (see table 2). The Czech Republic and Romania had the highest percentages in both the industrial and services' sectors (at 9% for industry and 5% for services respectively) while Hungary was the lowest in both sectors (2% and 1%). There is also a tendency to be less variation between the different size groups: the biggest gap was still for the Czech Republic in the industrial sector (2 % for small enterprises versus 13 % for the large enterprises), while Estonia and Hungary both showed a slightly bigger rate for the small size class, as compared to the large enterprises. It is difficult to draw strong conclusions on the reasons for the different structure regarding size class across the countries.

Table 1: Turnover of new and improved products, as a percentage of total turnover of all enterprises, by sector and size-class

Nace	Size-class	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Total	Small	:	5	7	2	4	4	:	4	3	5	:
	Medium	:	14	12	10	8	3	:	8	4	9	:
	Large	:	33	12	7	22	10	:	13	18	11	:
	All	:	22	10	6	15	6	:	10	12	9	:
Industry	Small	:	5	12	7	6	10	:	7	2	7	:
	Medium	:	12	16	10	13	7	11	10	6	12	:
	Large	:	39	11	7	25	11	20	15	19	11	:
	All	:	28	13	8	22	10	16	14	15	11	:
Services	Small	:	6	6	1	4	1	:	3	3	5	:
	Medium	:	16	7	10	5	1	:	5	3	7	:
	Large	:	21	12	7	14	4	:	6	13	9	:
	All	:	14	7	5	7	2	:	5	6	7	:

Note: Data for Hungary do not include Mining and Quarrying.

Table 2: Turnover of new and improved products for the market, as a percentage of total turnover for all enterprises, by sector and size-class

Nace	Size-class	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Total	Small	:	2	4	1	2	3	:	3	1	5	:
	Medium	:	4	5	2	4	1	:	4	3	7	:
	Large	:	11	5	3	5	2	:	7	9	9	:
	All	:	7	4	2	4	1	:	5	6	8	:
Industry	Small	:	2	5	3	4	7	:	4	1	6	:
	Medium	:	3	7	4	7	2	2	4	3	9	:
	Large	:	13	4	2	4	1	7	9	10	10	:
	All	:	9	5	3	5	2	5	7	8	9	:
Services	Small	:	2	3	1	2	1	:	2	1	4	:
	Medium	:	4	3	1	3	0	:	3	2	5	:
	Large	:	7	7	6	8	2	:	1	6	7	:
	All	:	5	4	2	4	1	:	2	3	5	:

Note: Data for Hungary do not include Mining and Quarrying.

Effects of innovation

While the previous section was focused on one specific output indicator (sales of new and improved products), in the survey the enterprises were also asked to indicate the degree of importance of a list of specified effects of innovation. Product oriented effects, in general, ranked highly. In all countries, except Lithuania, improved quality in goods or services was the effect that the enterprises reported as the most important one in the industrial sector (see table 3a) In the table the percentages differ considerably across the countries, but one should focus on the ranking of the specified effects. With only one exception (Hungary), countries ranked improved range in goods or services as the second important effect. Increased market share was also reported as an important effect in many countries.

Of the process oriented effects, increased production capacity was the most commonly reported (of quite high importance for Turkish industrial enterprises), while cost reduction was mentioned less often as highly important. However, in Lithuania, reduced labour costs and reduced cost of materials and energy were reported as important effects.

Meeting regulations or standards was, in general, reported as more important than reduction in costs and improved environmental impact.

This structure of effects of innovation did not change much by sector or size class. The structure did not deviate much from the pattern of effects reported by the EU-15.

Table 3a: Enterprises indicating the following effects as highly important, as a percentage of all innovation active enterprises in industry

	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Product oriented effects											
Increased range of goods and services	29	26	24	22	12	48	:	43	13	31	40
Increased market or market share	24	18	19	18	15	65	:	29	10	25	35
Improved quality in goods or services	41	31	29	26	7	68	:	44	23	46	64
Process oriented effects											
Improved production flexibility	23	18	21	13	9	34	:	25	13	25	24
Increased production capacity	29	17	23	14	11	30	:	26	12	30	38
Reduced labour costs per produced unit	20	13	11	9	12	25	:	11	6	12	28
Reduced materials and energy per produced unit	11	8	9	9	12	37	:	13	6	12	15
Other effects											
Improved environmental impact or health and safety aspects	18	12	9	14	9	43	:	19	9	20	22
Met regulation standards	21	11	12	19	5	47	:	31	8	15	37

Table 3b: Enterprises indicating the following effects as highly important as a percentage of all innovation active enterprises in services

	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Product oriented effects											
Increased range of goods and services	30	29	30	26	17	52	:	42	12	42	:
Increased market or market share	25	18	24	20	18	59	:	24	4	35	:
Improved quality in goods or services	38	29	30	23	8	51	:	51	17	52	:
Process oriented effects											
Improved production flexibility	15	12	14	8	7	16	:	25	4	22	:
Increased production capacity	16	7	12	18	5	7	:	20	4	22	:
Reduced labour costs per produced unit	11	6	8	7	7	4	:	4	1	12	:
Reduced materials and energy per produced unit	6	4	5	5	8	11	:	10	3	16	:
Other effects											
Improved environmental impact or health and safety aspects	9	7	6	7	3	35	:	10	4	22	:
Met regulation standards	16	9	10	20	3	37	:	27	0	18	:

Note: Data for Hungary do not include Mining and quarrying. Data for Turkey only include Manufacturing.

Hampering factors for innovation

Innovation activity in enterprises may be hampered by various reasons. Table 4 below shows the main hampering factors for enterprises with innovation activity.

Economic factors are generally reported as the most important barriers to innovation activity with problem with sources of finance reported as the most serious hampering factors by most countries: 7 out of 10 in the industrial sector. Too high innovation costs are also ranked as an important hampering factor: the Czech and Turkish industrial enterprises reported this as the most important factor. Economic risks were also an important negative factor hampering innovation. The enterprises in Lithuania are the only ones not reporting economic factors as the most serious ones hampering innovation.

Lack of qualified personnel was not reported as a crucial negative factor and neither were lack of information on technology or markets. The importance of the various hampering factors did not vary much by sector or size class. It is striking that lack of qualified personnel was regarded as a larger problem in the EU countries than in the new Member States and candidate countries.

Table 4a: Enterprises reporting the following hampering factors as highly important, as a percentage of all innovation active enterprises in industry

	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Economic factors											
Economic risks	16	9	14	9	4	16	15	11	14	8	43
Innovation costs	23	22	25	21	0	19	19	21	26	22	44
Sources of finance	17	8	31	27	1	27	21	24	41	31	31
Internal factors											
Organisational rigidities	5	2	3	4	7	6	5	4	3	2	7
Qualified personnel	15	7	13	9	6	8	4	13	4	5	9
Information on technology	5	1	6	6	7	5	4	4	2	3	8
Information on markets	5	3	8	7	6	11	4	8	4	4	7
Other factors											
Regulations and standards	9	3	8	6	5	10	7	4	7	7	13
Customer responsiveness	5	5	10	6	5	18	8	5	9	3	6

Table 4b: Enterprises reporting the following hampering factors as highly important, as a percentage of all innovation active enterprises in services

	EU-15	Czech Republic	Estonia	Latvia	Lithuania	Hungary	Poland	Slovenia	Slovakia	Romania	Turkey
Economic factors											
Economic risks	19	8	11	8	5	7	3	14	6	9	:
Innovation costs	26	16	19	18	1	25	20	22	15	20	:
Sources of finance	22	6	23	22	2	25	14	25	16	28	:
Internal factors											
Organisational rigidities	7	1	6	5	11	1	2	6	3	2	:
Qualified personnel	19	4	14	5	9	6	6	10	3	3	:
Information on technology	4	1	3	3	8	0	2	1	1	3	:
Information on markets	5	2	4	1	8	4	4	2	1	2	:
Other factors											
Regulations and standards	15	3	8	11	8	10	5	5	3	13	:
Customer responsiveness	8	3	9	3	6	8	5	8	10	5	:

Note: Data for Hungary do not include Mining and Quarrying. Data for Turkey only include Manufacturing.

Protection of innovation

There are a variety of methods enterprises can use, in order to try to protect their innovation from competitors (see table 5). The most common formal method, for all countries, was the use of trademarks, with a quarter of innovation active enterprises in the Czech Republic, Estonia, Latvia and Lithuania reporting using this.

There was a more even split in the use of strategic methods, with secrecy and lead time advantage both considered important. Around 40% of enterprises with innovation activity in Estonia used lead time advantage while 44% of similar enterprises in Slovenia used secrecy. Protections through methods such as patents, design patterns or copyright were used much less, with most countries reporting that 10% or less of innovation active enterprises used these protection methods.

There is a clear size effect reported. The larger enterprises are much more concerned with the protection of their innovations than smaller enterprises. In Latvia for example there was generally a difference of between 8 and 21 percent points between the use of protection methods by large and small enterprises, a pattern repeated by all other countries. Estonia was generally the country with the least difference between the different sized enterprises, particularly for strategic methods. One of the plausible reasons for this size effect may be that larger enterprises put more resources into their innovation and introduce more innovations that are new to the market and thus need more protection.

Table 5: Patents and other protection methods used in innovation active enterprises, as a percentage of all innovation active enterprises in all sectors, by size class

	Size-class	Formal methods				Strategic methods		
		Applied for a patent	Registration of design patterns	Trademarks	Copyright	Secrecy	Complexity of design	Lead-time advantage on competitors
EU-15	Small	:	:	:	:	:	:	:
	Medium	:	:	:	:	:	:	:
	Large	:	:	:	:	:	:	:
	All	17	14	21	6	27	19	36
Czech Republic	Small	6	4	19	9	7	7	17
	Medium	7	8	28	12	17	8	15
	Large	16	16	38	11	20	13	19
	All	7	7	23	10	11	8	17
Estonia	Small	7	4	23	6	22	22	40
	Medium	12	4	32	8	21	21	44
	Large	18	9	41	8	27	20	35
	All	9	4	26	7	22	22	41
Latvia	Small	4	4	16	7	21	21	31
	Medium	14	14	30	10	24	22	29
	Large	28	22	47	23	39	29	41
	All	10	9	24	10	24	22	32
Lithuania	Small	7	4	18	9	18	11	26
	Medium	4	8	25	5	25	14	32
	Large	8	17	43	11	35	26	41
	All	6	7	23	8	22	14	30
Hungary	Small	4	7	8	5	10	0	2
	Medium	7	10	7	11	7	0	2
	Large	12	11	22	24	15	0	13
	All	5	8	9	8	10	0	3
Poland	Small	:	:	:	:	:	:	:
	Medium	:	:	:	:	:	:	:
	Large	:	:	:	:	:	:	:
	All	:	:	:	:	:	:	:
Slovenia	Small	7	7	7	3	44	26	46
	Medium	8	8	7	1	40	24	37
	Large	13	13	14	3	51	28	38
	All	9	9	9	2	44	26	41
Slovakia	Small	1	4	9	7	7	4	4
	Medium	10	10	24	8	12	11	9
	Large	14	15	36	9	23	13	23
	All	6	8	18	8	11	8	9
Romania	Small	3	5	9	4	6	4	7
	Medium	8	8	17	4	7	5	9
	Large	14	17	24	5	12	8	9
	All	7	8	14	4	7	5	8
Turkey	Small	:	:	:	:	:	:	:
	Medium	:	:	:	:	:	:	:
	Large	:	:	:	:	:	:	:
	All	:	:	:	:	:	:	:

Note: Data for Hungary do not include Mining and Quarrying.

➢ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

In all the countries the innovation survey has been based on the Community Innovation Survey (CIS), and except for Poland, on the last survey implemented, CIS3. The national questionnaires are very close to the common CIS 3 questionnaire worked out by Eurostat, but in some countries there are some minor deviations. The survey in Poland is mainly based on CIS2, but also for Poland many variables are comparable with CIS3. CIS is based on the Oslo manual (second edition from 1997), which gives methodological guidelines and defines basic innovation concepts. The reference period for the innovation survey presented is mostly 1998-2000 (Estonia, Poland, Slovenia and Turkey) or 1999-2001 (the Czech Republic, Hungary, Latvia, Lithuania and Slovakia). For Romania the reference period is 2000-2002. Bulgaria has launched a survey for the period 2001-2003, but the results are not available yet. In all the acceding countries it is the national statistical institute that was responsible for the innovation survey. For a majority of the countries this was the first full scale survey on innovation done.

Target population

The enterprise was the statistical unit for observation in all countries, except for Turkey. In Turkey the establishment (local-kind-of-activity unit) was used. The main reason for this is that the statistical business register did not have the necessary information on enterprises. All countries covered enterprises with all least 10 employees and the results presented are grossed up national totals for this size group. Most countries have strictly followed the recommended coverage of NACE-classes in the Eurostat-recommendations for CIS3 (see box). Only Turkey has excluded several NACE-classes in its survey, mainly in the service sector. In Hungary section C (Mining and quarrying) has been left out, in Poland division 73 (Research and development) and in Slovakia group 74.3 (Technical testing and analysis).

Mining and quarrying	Section C
Manufacturing	Section D
Electricity, gas and water supply	Section E
Wholesale trade	Division 51
Transport, storage and communication	Section I
Financial intermediation	Section J
Computer and related activities	Division 72
Research and development	Division 73
Architectural and engineering activities	Group 74.2
Technical testing and analysis	Group 74.3

Survey method

The survey method used is normally a combination of census of large enterprises and a stratified sampling of the smaller enterprises. In Estonia, Slovenia and Turkey (service sector) a census has been undertaken for all enterprises (>10 employees). In all countries the innovation survey was a postal one. In most countries the survey was mandatory for the enterprises, except in Estonia, Hungary and Turkey. For Hungary and Turkey the response rates are below 40 %. For the other countries the response rates vary from 63 to 88 %. This is on average considerably higher than in CIS 3 for the EU Member states where the response rate was approximately 55%.

Innovation

An *innovation* is a new or significantly improved product (good or service) introduced to the market or the introduction within an enterprise of a new or significantly improved process. Innovations are based on the results of new technological developments, new combinations of existing technology or the utilisation of other knowledge acquired by the enterprise. Innovations may be developed by the innovating enterprise or by another enterprise; however, purely selling innovations wholly produced and developed by other enterprises is not included as an innovation activity. Innovations should be new to the enterprise concerned; for product innovations they do not necessarily have to be new to the market and for process innovations the enterprise does not necessarily have to be the first to have introduced the process.

A *product innovation* is a product (good or service), which is either new or significantly improved with respect to its fundamental characteristics, technical specifications, incorporated software or other immaterial components, intended uses, or user friendliness. Changes of a solely aesthetic nature are not included.

A *process innovation* includes new and significantly improved production technology, methods of supplying services and of delivering products. The outcome (of the process) should be significant with respect to the level of output, quality of products or costs of production and distribution. Purely organisational or managerial changes are not included.

Enterprises with innovation activity

Enterprises that have had any kind of innovation activity during the survey period, i.e. have introduced or implemented new products and/or processes and/or have had on-going and/or abandoned innovation activity.

Successful innovators

Enterprises that have introduced or implemented new products and/or processes.

Size classes

The following size classes, based on the number of employees, were used for the compilation of aggregated results:

Small enterprises	10 to 49 employees
Medium-sized enterprises	50 to 249 employees
Large enterprises	250 or more employees

In this publication: : not available

The data used for this publication were extracted on 15 June 2004.

Further information:

- **Databases**

  EUROSTAT Website/Science and technology/Survey on innovation in EU enterprises

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