INNOVATION AS A KEY DRIVER OF COMPETITIVENESS

Rumen Dobrinsky

The important links between innovation and competitiveness have been the subject of an ongoing policy debate that has attracted considerable attention from both policymakers and academics. On the one hand, it is widely accepted that innovation is a key ingredient and driver of competitiveness in the modern economy. On the other hand, there is a considerable overlap between the factors and conditions affecting innovative behaviour and performance and those that determine the firms' ability to compete.[26]

These discussions featured prominently in the recent debates on the UNECE reform, which resulted in the establishment of the subprogramme on Economic Cooperation and Integration. In particular, innovation and competitiveness policies were assigned an important role in the programme of work of the Committee on Economic Cooperation and Integration under the focus area "Creating a supportive environment for innovative development and knowledge-based competitiveness".

This paper seeks to highlight some of the complex links between innovation and competitiveness both at the firm- and at the macro-level, and thereby to contribute to a better understanding and a more informed policymaking process. It reviews some of the important links and the related policy implications, drawing from the extensive literature on these topics as well as from the results of the work undertaken in 2007 within the subprogramme on Economic Cooperation and Integration.[27]

I. THEORY AND EVIDENCE

Innovation and competitiveness of firms

The understanding of innovation as a key driver to competitiveness has its roots in the works of Schumpeter, who described market dynamics as a process of creative destruction. Later he developed further this concept, referring it as a process of "creative accumulation". In this later model, firms have different capacity to accumulate technological capabilities and to generate innovation. The accumulated technological competencies are the key determinants and drivers of firm innovation and competitiveness. The minimum of required technological capabilities is also a barrier to market entry by new firms.

This – already well acknowledged – approach to innovation-based competitiveness emphasizes its characteristic as a dynamic process in contrast to the static understanding of competitiveness based on pricing. It also highlights the fact that innovative firms in fact manage to establish – at least temporarily – a monopolistic position in the market thanks to their innovation-based competitive advantage. The more recent concepts of competitiveness develop further this approach by considering innovative activity as a process in which most innovations are mostly improvements on existing products and processes, based on past experience.

The testing of these, as well as other, theoretical models relating innovation and competitiveness at the firm level requires quantitative measurement of both innovation activity and firm competitiveness. Both notions are rather problematic to measure and despite certain progress, many unresolved issues still remain. The so-called Community Innovation Survey is one of the best known sources of firm-level innovation performance data. This survey is conducted periodically by the statistical offices of EU member states using a uniform methodology. The survey collects data on the innovative characteristics of firms, including measures of innovation-related expenditure, the generation and/or absorption of innovation and factors which have either encouraged or hindered innovation. However, for countries outside the EU such detailed data are not readily available. While widely used as a concept, firm competitiveness is also difficult to measure. Among the most commonly used indicators are firm growth and market share, various productivity measures, and export performance.

While many theories exist, in reality, the links between firms' innovative performance and their competitiveness are extremely complex. Recent research provides evidence for both of the above-mentioned patterns of innovative activities

[26] For further discussion see UNECE, Competitiveness and Innovation, Note by the secretariat presented at the first session of the Committee on Economic Cooperation and Integration, Geneva, September 2006 (ECE/CECI/2006/3).

[27] UNECE, Creating a Conducive Environment for Higher Competitiveness and Effective National Innovation Systems. Lessons learned from the experiences of UNECE countries, New York and Geneva, 2007 (United Nations Publication, Sales No. 08.II.E.3) and UNECE, 'Synopsis of Good Practices in Facilitating the Generation and Diffusion of Innovation" (ECE/CECI/2007/3).

(the creative destruction model and the creative accumulation model) in different technological classes of firms as well as of different types of relationship.

In general, firms using different technologies, firms belonging to different industries are characterized by different patterns of their innovative activity, moreover when compared across countries. This variety and dissimilarity in firm performance is perhaps the most important feature that characterizes the innovation process at the firm level. For example, it has been shown that in technologically advanced sectors, the threat of new entries to the market spurs innovation, whereas in technologically lagging sectors it discourages innovation. In some industries, market entry by new firms has a positive effect on productivity growth in the industry, while in others entry depresses it. In addition, it has been found that innovative activities tend to be characterized by "persistence", that is, firms with a past record of innovative performance are more likely to continue innovating. There is also evidence that the intensity of innovation performance strongly depends on factors such as involvement in exporting activity, the level of management training and skills, networking by firms, level of research and development (R&D) capability, and firm size in addition to several other factors.

Another important finding is that firm productivity and innovation-related activities are highly intertwined and firm productivity growth is largely dependent on the process of technological change. The productivity effect of a process innovation is as a rule larger than the effect of a product innovation. Firms' R&D spending enhances the firms' capacity to absorb new technologies, both those internally developed as well as those generated outside the firm.

The ability of a firm to export is often considered as one of the major characteristics of the firms' international competitiveness. Research has found that a firm's capacity to innovate fundamentally changes its behaviour and capability to export. In particular, product innovation has been identified as an important determinant of a firm's ability and readiness to export. Moreover, the level and intensity of a firm's export performance are also positively influenced by R&D activity, patenting and successful innovations.

The survival capacity of firms can also be regarded as a characteristic of their competitiveness. In this regard, innovation is also closely associated with the firms' potential to succeed in the market and adapt to changing environments. On the one hand, innovation may boost the firms' competitive position and enhance their potential to survive. On the other hand, being a highly risky endeavour, innovation may also increase the risk of failure and bankruptcy.

Competitive advantage is a specific dimension of competitiveness which is usually associated with the opportunity for a firm to extract economic rents. Most forms of competitive advantage – including innovation-driven ones – are only temporary as the opportunity to extract rents drives competitors to duplicate or imitate the advantage held by the innovating firm. In Michael Porter's classification, there are two main types of competitive advantage: cost advantage (the firm is able to deliver the same benefit at a lower cost) and differentiation advantage (the firm's products deliver benefits that exceed those of the competing firms' products).[28]

Competitive advantage may have different roots and innovation is only one of the possible sources. The relationship between innovation and competitiveness discussed above can exhibit different patterns emerging from two main transmission channels: that of active price competitiveness and that of technological competitiveness. In turn, these channels are rooted in the two models of technological development and the types of innovation: that of creative destruction (largely associated with product innovation) and that of creative accumulation (typically associated with process innovation).

Innovation-driven creative destruction is closely associated with improving price competitiveness of the innovating firm, which can also be achieved through different channels. Thus the introduction of an innovative product can give the firm a temporary monopoly power, which allows for monopolistic pricing and hence higher profits until other firms can imitate the innovation. The benefits of innovation can also be reaped in terms of cost reductions or new markets. The ultimate outcome is that innovation provides a temporary positive boost to the price competitiveness of the innovating firm.

Creative accumulation, which is typically associated with process innovations, increases the firms' productive efficiency. The benefits of this development can be reaped either through cost savings, or through increasing the firms' market share, or both. This approach implies that innovations create an important difference between innovating and non-innovating firms. Hence the two models of innovation-driven competitiveness relate the newly acquired competitive advantage of the innovating firm to its high monopoly profit or to ability to exert higher competitive pressure. From a different angle, the perspective of reaping monopoly profit and acquiring market power are in turn among the main drivers of innovation.

[28] Michael Porter, Competitive Advantage, New York: Free Press, 1985.

Overall, economic research identifies various forms of innovation-related competitive advantage at the firm level. The link between innovation and profitability is often related to the above-mentioned persistence in firm innovation, differentiating such firms from the "occasional innovators". Firms that are systematic innovators and earn profits above the average have a high probability of further innovating and maintaining their competitive advantage and hence earning profits above the average. Conversely, firms that are occasional innovators and earn profit below the average have a high probability of remaining in the same situation. However, very few firms are really persistent innovators; this usually happens only after a threshold level in innovative performance is reached.

Innovation and competitiveness at the macro level

While economic theory only relates innovation and competitiveness at the firm level, the existence of such a link at the macro level is taken for granted. However, providing evidence of this link is even trickier, as measuring innovation and competitiveness performance is much more problematic when applied at the macro level. There are no universally accepted measures of national innovation and competitiveness performance. Due to their complex nature, attempts to quantify these notions rely on composite measures derived from a variety of lower level indicators.

The European Innovation Scoreboard (EIS) is one of several widely used composite measures of national innovation performance. The most recent 2006 Scoreboard includes innovation indicators and trend analyses for the 27 EU member states, as well as for Croatia, Iceland, Japan, Norway, Switzerland, Turkey, and the United States. This assessment is based on 25 indicators which are assigned to five dimensions and grouped in two main themes: inputs and outputs.

The EIS innovation inputs include three dimensions:

- Innovation drivers (5 indicators), which measure some key aspects of the innovation potential, in particular, related to education;
- Knowledge creation (4 indicators), which measure public and private R&D expenditures;
- Innovation and entrepreneurship (6 indicators), which measure the innovation-related investments at the firm level.

The EIS innovation outputs include two dimensions:

- Applications (5 indicators), which measure innovation-related economic performance;
- Intellectual property (5 indicators), which measure the achieved results in terms of patents, trademarks and designs.

In addition, the 2006 Scoreboard contains a comparison of innovation performance in the EU member states with that of other major R&D performing countries in the world (the so-called Global Innovation Scoreboard (GIS)). This comparison is based on a more limited set of 12 indicators (rather than the set of 25 indicators of the EIS). The overall global innovation index is scaled between 0.0 and 1.0

National competitiveness generally relates to all those factors that impact on the ability of national businesses to compete in international markets in a way that provides people with the opportunity to improve their quality of life. As to its measuring, a number of indicators have been developed by different institutions.[29] In this paper, reference is made to one of such indices, the World Economic Forum (WEF) Global Competitiveness Index, which defines national competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country and includes a wider range of factors that influence growth. It is based on twelve "pillars", including institutions, infrastructure, macroeconomy, health, education and training, market efficiency, financial markets, technological readiness, market size, business sophistication and innovation. The index also reflects the view that not all factors are equally important for all the countries, given the different stages of economic development: a distinction between phases in the development of national competitiveness is made. The global index is derived by weighting the scores attributed to the twelve "pillars".

One possible way of relating national innovation performance to national competitiveness is by juxtaposing these measures on a scatter diagram, as shown on the chart. In order to present a larger number of countries, national innovation performance on the chart is based on the simplified GIS indicator whereas national competitiveness is based on the WEF Global Competitiveness Index. Based on the data for 47 countries in the world, the scatter diagram clearly shows a strong positive association between national innovation performance and national competitiveness. Of course, such a positive association comes as no surprise since – following the arguments outlined above – innovation is indeed regarded as a key

[29] For a more extended discussion on national innovation and competitiveness indicators see Competitiveness and Innovation, Note by the secretariat, op. cit.

ingredient of economic competitiveness. Moreover, composite national competitiveness indices (including the one used to produce this chart) as a rule incorporate indicators reflecting innovation performance.

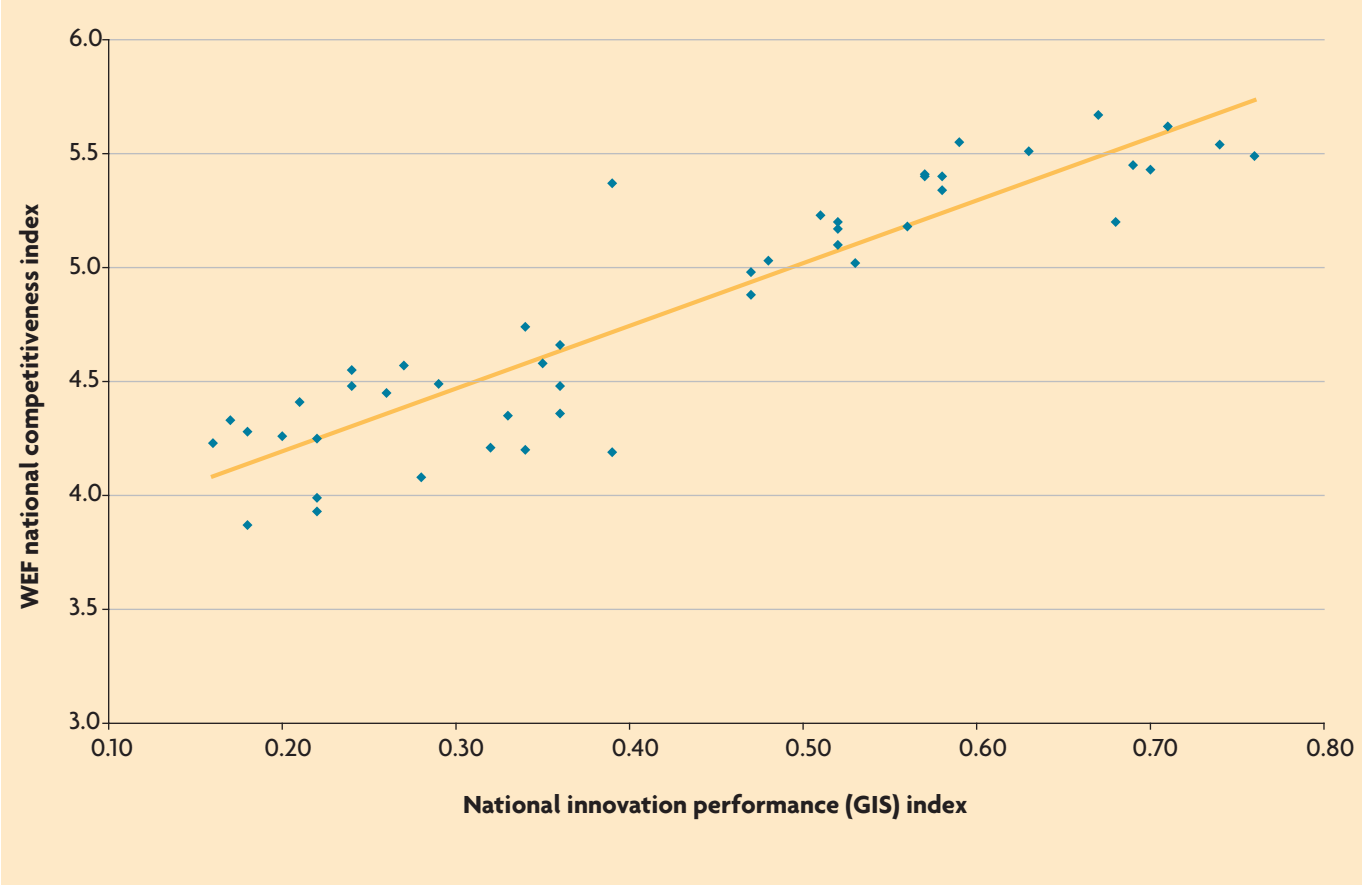
This positive association alone does not imply anything on the direction of causality but the whole discussion above suggests that the main direction of causality is from innovation performance to national competitiveness. By contrast, it can be argued that not all aspects of national competitiveness are necessarily related to innovation performance. Thus, as argued below, framework conditions related to institutions, infrastructure, macroeconomic stability, etc. which are usually incorporated in national competitiveness indexes are necessary but not sufficient conditions for higher innovation performance.

II. POLICY IMPLICATIONS

The strong but complex links between innovation performance and competitiveness have important implications for public policy. Understanding these links is important in designing policies and measures that target the global policy objectives set by the general public. Here attention is drawn to some of these implications, based on the discussion in the previous section.

At the macro level, one could point to one important policy upshot of the close association between national innovation and competitiveness performance, in particular the fact that innovation performance is an important ingredient of national competitiveness. Therefore, policy measures that have a positive effect on innovation performance are likely to improve national competitiveness as well. In consequence, such policy measures, if successful, will de facto enact a mutually reinforcing effect on national economic performance, which will ultimately enhance their welfare effect.

National innovation performance and national competitiveness



Source: Maastricht Economic Research Institute on Innovation and Technology (MERIT) and the Joint Research Centre (Institute for the Protection and Security of the Citizen) of the European Commission, European Innovation Scoreboard 2006 (http://www.proinno-europe.eu/doc/EIS2006_final.pdf), Comparative Analysis of Innovation Performance and World Economic Forum, The Global Competitiveness Report 2007-2008 (http://www.gcr.weforum.org/).

Another important implication is related to the fact that both national innovation performance and national competitiveness depend on a wide array of factors, controlled by various stakeholders, within the public and private sectors, in the business and academic communities, and in civil society. This confluence is both a challenge and opportunity for policymakers. It is a challenge, as multi-stakeholder cooperation is time consuming and can involve lengthy and difficult coordination procedures. At the same time, it opens the opportunity to "hit two birds with one stone", as one and the same set of coordinated policies can address two important policy targets, synergising the efforts involved.

Yet a third important implication is related to the long-term nature of both innovation and competitiveness at the macro level. Related to that, public policies targeting either national innovation performance, or national competitiveness, or both, involve policy measures whose effect stretches well beyond the political cycle. In consequence, the design and implementation of such policy measures requires the establishment of a policy- and decision-making environment, institutions, and mechanisms that take this long-term nature into account and ensure the continuity of policies over the political cycle. In terms of politics, ensuring such continuity implies an ongoing national political dialogue involving the major players from the whole political spectrum, on key national priorities in the areas of innovation and competitiveness policies. The political agreement on such national priorities is a guarantee for the stability in implementing long-term policies.

Civil society including the organized communities of stakeholders also has a key role to play in long-term policymaking. Thus in many countries, there exist national innovation and/or competitiveness constituencies which are largely self-organized communities of stakeholders.[30] The existence of these organized communities also opens windows of opportunity in promoting national long-term strategies and policies and in ensuring continuity in these policies. The opportunity – and challenge – of achieving a multiple policy effect is to mobilize such communities (which often set themselves a rather narrow agenda) into a cooperative effort related to a broader policy agenda targeting national innovation and competitiveness.

Finally, national innovation-based competitiveness is a complex and multidimensional phenomenon. Knowledge generation alone is an important but insufficient condition for innovation based growth. In this regard, the notion of "national innovation capacity" is a useful approach to account for the multifaceted nature of innovation in fully utilizing the potential for enhancing competitiveness and growth at the national level.[31] The underlying idea is that the innovation capacity of an economy depends not only on the supply of R&D and innovation but also on the capability to absorb and diffuse new technology and on the demand for its generation and utilization. From a policy perspective, the innovation capacity also depends on innovation governance, that is, on a set of institutions and rules that affect the innovation process.

At the microeconomic level, the situation is more ambiguous due to the complex links and relationships between firm innovation performance and competitiveness discussed in the previous section. Public policies traditionally support firms' innovation-related activities, the key arguments being those of "market failure" or "public goods". In the globalized modern economy, a firm's innovation activity involves complex links and interactions with other business entities as well as with public institutions, and is dependent on the efficient functioning of these links. This complex environment increases the risk of failures in different parts of the networks. In view of this, the rationale for policy intervention as well as the importance of the different types of policies involved have been changing with the evolution of the innovation processes.

One important aspect that needs to be taken into account is the interrelationship – and possible interference – between policies targeting the firms' innovative performance and competition policy. Competition policy aims at preventing the emergence of business structures possessing excessive market power due to the risk of its abuse as well as other possible market distortions. As argued above, competition itself is a powerful incentive for firms to innovate and acquire innovation-based competitive advantage.

One of the tricky aspects, however, is that innovating firms do target achieving market power on the basis of innovation-based competitive advantage. Indeed, such time-limited competitive advantage, implying temporary monopolistic prices and profit, can be regarded as a fair compensation for the investment and effort in generating the product or/and process innovation, in a similar way as patents protect intellectual property rights holders and provide them with a time-limited opportunity to recover the costs invested in their invention. However, safeguarding and tolerating the monopolistic market power of innovative firms – even for a limited period of time – is in conflict with conventional competition policy. In addition to that, due to the complex nature of modern innovation, it may require extensive coordination and exchange of market information among firms involved in a network or cluster. Traditional anti-trust policy may perceive this coordination process as collusive and anti-competitive behaviour. From this point of view, competition policy itself might need significant fine-tuning in order not to become an obstacle to firms' innovative performance.

[30] See UNECE, Creating a Conducive Environment for Higher Competitiveness and Effective National Innovation Systems, op.cit., Box C.2.6.
[31] Slavo Radosevic (2004), "A Two-Tier or Multi-Tier Europe? Assessing the Innovation Capacities of Central and East European Countries in the Enlarged EU", Journal of Common Market Studies, Vol. 42, No. 3, pp. 641-666.

On the other hand, the empirical finding concerning the dissimilarity of firms in their innovative performance also has important policy implications. For example, the finding that entry threat in technologically advanced industries stimulates innovative activity whereas in technologically lagging sectors it discourages innovation has direct implications for the policy debate on market (de)regulation, competition policy, and trade liberalization. This finding suggests that competition policies aiming at decreasing or removing entry barriers alone may not be sufficient to foster productivity growth in all industries. This, in turn, may suggest complementary policies to facilitate the reallocation of factors and resources from less to more technologically developed industries that react more positively to entry threat.

In particular, it is important for the antitrust regulation bodies to be able to discriminate among firms enjoying competitive advantage and hence relatively higher profits: between those who exploit a monopoly position based on market power, and those who own capabilities and competencies that make them systematically better than others. It is also important to differentiate policy actions in different technological classes of firms as firms (and classes of firms) differ in their ability and opportunity to innovate as well as in the potential returns to innovation.

More generally, these conclusions would suggest differentiated policy approaches to facilitate innovation performance. For example, they indicate that policy approaches that stimulate innovation activity in countries that are technological leaders would not necessarily perform well in countries that are still catching up in their technological development. On the one hand, catching up countries need to attract foreign direct investment (FDI) into innovative and high-value added activities in order to raise the overall innovative performance of their economies. Secondly, they face the challenge of identifying and stimulating those linkages between FDI and the domestic economy that generate positive spillover effects, thus spurring a "virtuous circle" of asset accumulation and clustering. Thirdly, as argued above, they may need specific policies to stimulate the innovative performance of domestic firms.

In this regard, however, it should be pointed out that instead of the traditional approaches to industrial policy (such as "picking winners", or import substitution policies) which are notorious for their negative side effects such as market distortions, inefficient resource allocation and corruption, more creative and productive policy approaches to enhancing the firms' innovation performance are more associated with the strand of "new industrial policy".[32]

The new industrial policy paradigm suggests institutional arrangements that engage all the relevant stakeholders (both from the public and from the private sector) in the process of policy design and in its implementation, and steer them towards a common goal. Instead of "picking winners" in the sense of traditional industrial policy, this approach involves a more flexible strategic alliance (that can be of a long-term nature) in which the Government and the private sector exchange information and ideas, and coordinate their actions in the development of new activities, products or technologies. Through strategic collaboration between the parties involved, this policy model seeks to identify the causes of possible market, system or network failures that may depress the entrepreneurial activity pursuing innovation. When properly designed and instituted, the rules of interaction, the shared commitments and responsibilities, the transparency in operation and accountability in the use of public funds within such alliances can help minimize the market distortions and corrupt practices that sometimes taint conventional industrial policy.

Apart from these general considerations, the rationale for policy intervention to support innovation in catching up and emerging market economies is to address some structural weaknesses in their national innovation systems (see also the table):

- The intensity of innovation performance (as approximated by the intensity of R&D expenditure) in the emerging market economies is still well behind that in the developed market economies;
- The links between knowledge generation (science) and marketable innovation (industry) are rather weak;
- The national innovation systems are still largely dominated by publicly funded research whereas the business contributes relatively little to national R&D expenditure (see table);
- Generally weak and poorly functioning linkages in the national innovation systems (including the links between large and small firms, and those between domestic and FDI firms), which hinders the diffusion of innovation;
- Generally very low innovation capacity in traditional domestic firms and, especially, in small and medium enterprises;
- Inadequate innovation and managerial skills in the firms;
- Underdeveloped and poorly functioning institutions promoting innovation.

Many catching up economies in the UNECE region have made considerable progress in addressing some of these weaknesses through a range of innovation and competitiveness policy instruments. However, their innovation performance is still relatively weak and further efforts are needed to develop fully-fledged and efficiently functioning national innovation systems.

[32] See Dani Rodrik, "Industrial Policy for the Twenty-first Century", London: Centre for Economic Policy Research, CEPR Discussion Paper, No. 4767, November 2004. These policy approaches mostly target economic diversification but can be equally be applied to targeting innovation performance at the micro-level.

Research and development expenditure in selected countries, 2001-2005

	National research and development expenditure			R&D expenditure financed by the business sector
	(per cent of GDP)			(per cent of the total)
	2001	2004	2005	2004
Austria	2.04	2.23	2.36	47.2
Belgium	2.08	1.85	1.82	60.3[a]
Bulgaria	0.47	0.51	0.50	28.2
China	0.95	1.23	1.34	65.7
Croatia	1.11[b]	1.22	..	43.0
Cyprus	0.25	0.37	0.40	18.9
Czech Republic	1.20	1.26	1.42	52.8
Denmark	2.39	2.48	2.44	59.9[a]
Germany	2.46	2.5	2.51	66.8
Greece	0.64	0.61	0.61	28.2[a]
Estonia	0.71	0.88	0.94	36.5
Finland	3.30	3.46	3.48	69.3
France	2.20	2.14	2.13	51.7
Hungary	0.92	0.88	0.94	37.1
Iceland	2.98	2.83	..	43.9[a]
Ireland	1.10	1.21	1.25	57.2
Italy	1.09	1.10	..	..
Japan	3.13	3.18	..	74.8
Latvia	0.41	0.42	0.57	46.3
Lithuania	0.67	0.76	0.76	19.9
Luxembourg	1.65[c]	1.66	1.56	80.4
Malta	..	0.63	0.61	18.6[b]
Netherlands	1.8	1.78	..	51.1[a]
Norway	1.6	1.62	1.51	49.2[a]
Poland	0.62	0.56	0.57	26.9
Portugal	0.8	0.77	0.81	31.7[a]
Romania	0.39	0.39	..	44.0
Slovakia	0.63	0.51	0.51	38.3
Slovenia	1.55	1.45	1.22	58.5
Spain	0.91	1.06	1.12	48.0
Sweden	4.25	..	3.86	65.0[a]
Turkey	0.72	..	..	41.3[b]
United Kingdom	1.83	1.73	..	44.2
United States	2.76	2.68	..	63.7

[a] 2003; [b] 2002; [c] 2000; .. not available.

Source: Eurostat News Release 6/2007, 12 January 2007.