Workpackage 1

Policy Scenarios: Demand for innovation

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Executive summary

In the Knowledge Based Economy (KBE), productivity and economic growth are largely related to innovation. Competition compels firms to innovate to reduce production costs. But the factors driving product innovation are more complex and include both technology push and market demand factors.

Firms invest in product innovation based on current or expected demand for innovative goods and services. Without a current or potential market, innovation activity may be compromised. The market can be other firms (business to business), individual consumers, governments, or export markets.

Demand as a driver for innovation activity has attracted increasing policy interest. The report "*Creating an Innovative Europe*" by the European Commission, for example, proposes several policy actions to improve demand as a driver of innovation investments, including the creation of a single market. But other demand related policies can influence innovation.

The development of demand related policies to encourage innovation requires an understanding of demand and relevant indicators to measure its different aspects. This report briefly evaluates the main factors that influence demand for innovations, dividing them into three main groups: domestic demand, foreign demand and the role of government. Moreover, these groups are further divided into sub-groupings for a better understanding of the factors at play. Domestic demand is further divided into quality and quantity aspects.

The groups and sub-groups of factors that may impact demand form an overall picture of demand conditions that helps understanding how demand may influence innovation. This background is then used to identify key demand indicators currently available, plus to identify new indicators that should be developed to better assess demand conditions in a given country. These indicators could be used to evaluate national differences in demand factors and how policy could influence demand in a way that would stimulate innovative activity.

Although not all factors impacting demand could be associated with specific indicators, a first sign that more indicators are required to measure demand conditions, other existing indicators were used as proxies to measure the different factors affecting demand. In order to select indicators that have an impact on demand, we first tested if they correlated to innovation activity output indicators. To be relevant, demand indicators should first be linked to innovation activity. We then correlated proposed demand indicators with each other, reducing them to a set of relevant demand indicators that capturing different factors influencing demand.

We found that demand conditions are influenced not only by domestic demand quality aspects, such as the existence of lead users made up of sophisticated buyers, but also by quantitative aspects including the actual numbers of consumers in such markets. The sophisticated buyer is constituted by highly skilled and educated people, whose higher incomes are a reflection of their level of education. Furthermore, this share of the population consists of prime age adults with the disposable income and interest to purchase sophisticated products.

Moreover, demand can be created if firms can make use of sophisticated marketing tools to capture customers' needs and desires. Unfortunately, we are not able to measure the effect of advertising in creating demand due to a lack of data. It would be relevant to quantify the impact of advertisement in demand creation while breaking down innovation into disruptive and incremental innovation. As most innovations consist of minor improvements, advertisement might play an important role in demand creation.

Not only is domestic demand relevant for local firms, but also foreign demand. It is through proximity, both geographical and cultural and through the creation of international standards, that firms can reach markets beyond local ones. Reaching new markets can be decisive for firms that lack large domestic markets. Domestic markets may not be large enough to permit firms to recoup their investments in innovation.

Government also plays an important role, by not only consuming innovative products through procurement, but also by creating regulations and standards that can free up demand, both by reducing uncertainty and improving quality. Furthermore, governments must intervene in markets to avoid market dominance by few firms, creating incentives for firms to compete and keep fuelling markets with new and innovative offerings.

In summary, we found the following indicators relevant for assessing demand conditions in any given country:

Domestic demand

- Quality
    - Intensity of local competition
    - Extent of market dominance
    - Buyer sophistication
    - Population with tertiary education (aged 24 to65)
    - Quality of education system
    - Brain drain
    - Euro creativity index
    - Gender empowerment measure
- Quantity
    - Fertility/birth rates
    - Youth share of the population
    - Degree of customer orientation

Foreign demand

- Broadband penetration rate
- Breadth of international markets

Government

- Demanding regulatory standards
- Government procurement for advanced technology products

On the other hand, there are large gaps in indicator availability. These include indicators of the different effects of demand by sector, demand structure (monopsony, polypsony and oligopsony), the role of niche markets, the ability of firms to use

foreign markets to replace limited domestic markets and the impact of advertisement in creating demand. All of these should be developed to support policy makers assessing demand conditions in any given country.

1. Introduction

In the Knowledge Based Economy (KBE), productivity and economic growth are largely determined by the application of knowledge to develop, and adopt, new technology and more efficient organizational structures (Chartrand, 2002). Competition compels firms to innovate to reduce production costs, but the factors driving product innovation are more complex and include both technology push factors and market demand factors.

Firms invest in product innovation based on current or expected demand for innovative goods and services. Without a current or potential market, innovation activity may be compromised. The market can be other firms (business to business), individual consumers, governments, or export markets.

A highly skilled and educated population is an essential prerequisite to the ability of firms to develop and implement productivity enhancing innovations. Furthermore, a skilled and educated population can also drive demand as consumers for more sophisticated products. These pools of sophisticated consumers can form national lead markets, defined as the first to adopt a dominant innovation design that is subsequently adopted by other countries.

Demand as a driver for innovation activity has attracted increasing policy interest. The report "*Creating an Innovative Europe*" by the European Commission proposes several policy actions to improve demand as a driver of innovation investments, including the creation of a single market. According to Georghiou (2006), "demand needs to be coordinated or aggregated to create large orders to make innovation worthwhile." Other policies that can influence innovation through demand include support for cluster formation, standard setting, regulations, and public procurement.

Demand is not necessarily a given. For example, consumer attitudes towards innovative products vary by country across Europe. Innobarometer 2005 surveyed Europeans in all 27 Member States about their attitudes to innovative products and services[1] and grouped the respondents into four distinctive categories: 11% were enthusiasts towards innovation, 39% were attracted by innovation, 33% were reluctant to purchase innovations, and 16% were anti-innovation. By country, the percentage of 'pro-innovation' consumers (the first two groups combined) varies from a low of 35% in Poland to a high of 64% in Malta These results suggest that there could be large differences across Europe in the role of consumer demand as a driver for innovation.

The development of policies that can use demand to encourage innovation requires an understanding of demand and relevant indicators to measure different aspects of demand. The purpose of this report is to briefly evaluate the main factors that influence demand for innovations. This information is then used to identify key indicators of demand that are currently available, plus identify new indicators that should be developed to better assess demand conditions in a given country. These indicators could be used to evaluate national differences in demand factors and how policy could influence demand in a way that would stimulate innovative activity.

[1] Innovative products were defined as new or improved ones.

2. Demand and innovation theory

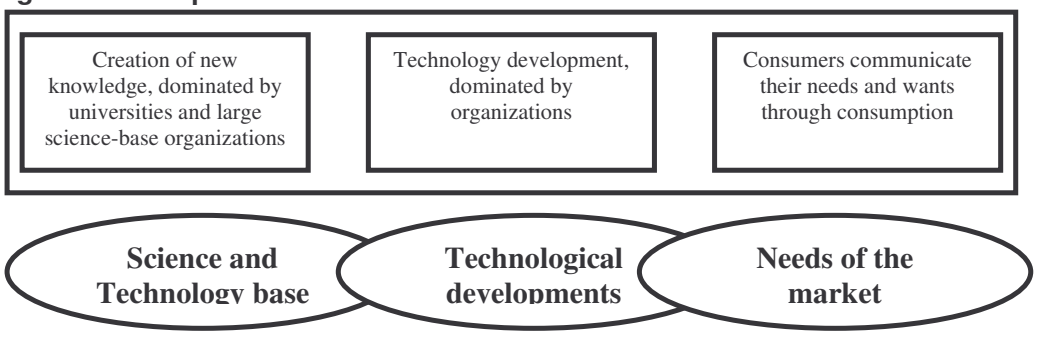
The two main drivers of innovation are technology push and demand. Even though the influence of each driver differs by sector and circumstance, an interactive model that incorporates both drivers has gained relevance in explaining the innovation process.

In the technology push model, technological opportunities are exploited to develop new products and processes. These innovations are then promoted to potential costumers. In this model, the marketplace is seen as a passive agent, merely receiving the benefits of R&D. Furthermore, the pace of innovative activity depends on the rate of advance in science and technology (Kamien and Schwartz, 1982). This model is still relevant to science-based sectors such as the pharmaceutical industry.

In the market-pull model customer needs and expectations drive innovation (Utterback and Abernathy, 1975). Marketing departments can play a key role by identifying new needs as a result of close interactions with customers, and passing on these ideas to the firm's R&D or engineering departments. Consequently, innovative activities are initiated in response to an opportunity.

In an interactive model, advances in basic technology make it possible to exploit new opportunities while market opportunities stimulate research. Technology-push relates more to the long-term, while demand-pull relates more to the short term. The generation of new ideas is dependent on inputs from the three basic components: organizational capabilities, the needs of the marketplace, and the science and technology base (Trott, 1998). There is no starting point: the innovation process is viewed as a complex set of communication paths (Rogers, 1995; Brown and Eisenhardt, 1995), with both internal and external knowledge flows. Innovation is consequently the result of both demand and the development of new applicable knowledge. In the extreme case, consumers not only create a demand for innovations, but can play an active role in their development (Von Hippel, 1976; 2005). Figure 1 illustrates the conceptual framework of innovation as seen today.

Figure 1 Conceptual framework of innovation



Source: Trott, P. "Innovation Management and Product Development"

Market demand is driven both by individual consumers and by firms and governments. Although distinct, both individual and business markets are also linked. A country with a sophisticated business market will be able to supply its individual consumer markets with more novel and complex offerings.

2.1 The role of demand in economic growth

Demand has a fundamental role in economic development. Economic development depends on the ability of an economic system to create new goods and services (growth in variety), which in turn creates new sectors (Saviotti, 1994, 1996). Demand is vital, as these new offerings must be purchased by business, government, or individual consumers.

In the beginning of the life cycle, new goods and services depend on niche markets, with a small number of sophisticated consumers that are willing to purchase novel products. These consumers are fundamentally important to the adoption and further diffusion of innovative products or services. Demand increases when the properties of these products improve and prices fall, with the niche becoming a market (Saviotti, 1994, 1996). The market size depends on the performance of the new product or service, its rate of improvement, and the rate of decline in costs and prices.

Even sophisticated consumers must understand how to benefit from new products and services. Consequently, the producer must effectively communicate information on the new product to the first adopters. Furthermore, consumers must be able to understand the information, which could require continual education and skill development of the consumer base. The greater the novelty, the more uncertainty consumers will face. Such uncertainty can be reduced by observing other consumers and imitating. This process will lead to both a reduction in uncertainty and to a convergence of choice on a single standard. Other factors driving convergence (for instance on a single technological trajectory) are cultural similarities among consumers (Georgescu-Roegen, 1954), status imitation Cowan et al (1997), and economies of scale that drive down prices (Lancaster, 1975)[2].

The initiation of a radical innovation comes from producers, as consumers do not have knowledge of the new offering (Saviotti, 1996). Producers must "educate" or create sophisticated consumers, giving them the necessary tools to evaluate the novelty. Learning by both producers and consumers can lead to product modifications and to the creation of further demand (Earl, 1986). As a product moves along its life-cycle, the importance of technology push gives way to demand pull.

2.2 Theories of demand and innovation

Porter (1990) identified four contributing factors to the competitive advantage of nations: natural, human, and infrastructural factors; the existence of related and supporting businesses; firm strategies and competition; and the *quality* of domestic demand. The latter influences whether firms can and will move from imitative, low-quality products and services to competing through differentiation. Porter recognized

[2] Product differentiation also occurs later during the product life cycle, driven by status seeking behavior and demand saturation.

the need for sophisticated demand that could create lead markets, giving the country a competitive edge in global markets. The concept is based on the premise that market opportunities for innovations are nation-specific because of differences in markets across countries.

Beise and Rennings (2001) extended Porter's ideas on a lead market to include countries that adopt successful innovation quickly, even if they have not invented the technology. Even if users in other countries have adopted other competing designs, under some conditions the innovation design adopted in the lead market will end up dominating and displacing competing designs. The lead market is therefore the country that first adopts a globally dominant innovation design.

The empirical research by Beise and Rennings (2001) on lead markets identified five types of advantages for lead countries: price, demand, transfer, exports and market structure.

Countries gain price advantage when the relative price of the nationally preferred innovation decreases compared to other solutions. Price reductions are a consequence of economies of scales, such as market size and market growth. Demand advantages develop when countries ahead of a new trend have their innovations adopted by other countries. Transfer advantages develop from the adoption of the national design by users in other nations. This requires strong links with other markets to transfer information on the usability of the innovative design (Takada and Jain, 1991). Export advantage refers to inclusion of foreign demand preferences in domestic designs. This advantage can be due to export experience by local firms or similar local demand conditions compared to foreign markets in terms of culture and social and economic factors. Finally, lead markets tend to be highly competitive, creating market advantages. Buyers tend to be more demanding and consequently local firms are under pressure to adopt new technologies which are 'tested' by domestic consumers.

Even though firms face different demand preferences and market conditions among countries, there are strong economic pressures, such as economies of scale, for firms to develop standardized products (such as the iPod) or semi-standardized products (such as mobile phones) that can be sold globally. Multinationals can use lead markets to generate products with global appeal, either by locating in lead markets or assigning R&D tasks to affiliates located in those markets. This could be one reason why R&D expenditures are concentrated in a few countries, with the ten largest R&D spending countries accounting for 86% of global business R&D in 2002 (UN World Investment Report, 2005).

Lead users

Research has extended the concept of sophisticated domestic demand by taking a closer look at the role of users. Lead users are defined as "being at the leading edge of markets, and having a high incentive to innovate" (Morrison et al, 2002). Lead users adopt a new invention earlier than others. Once the novelty has spread among several users with sufficient purchasing power, a lead market is formed.

Although lead users have requirements that will become general needs in future markets, they have those needs **before** most of the other users in the marketplace (von Hippel, 1986). In fact, research has found that users and not producers are often the

ones to initiate the development of future commercially significant new products (Enos, 1962; Knight, 1963; Freeman, 1968; von Hippel 1988; Shah, 1999).

User needs for products and services are highly heterogeneous. Mass manufacturers tend to develop products that satisfy the needs of large market segments (so as to capture significant profits) or allow users to do the same things they have been doing but in a more convenient or reliable way (Riggs and von Hippel, 1994). Users have more accurate and detailed information on their needs and how they intend to use a product, which can lead them to develop new product capabilities. Demanding users are then confronted with the option to innovate themselves or to convince manufacturers to adjust their product to meet their needs.

Manufacturers can respond to the needs of lead users by using their technical competences to develop customized solutions. This requires a different set of skills than simply 'listening to the voice of the customer' (Dannels, 2004), since the lead user has more complex and demanding requirements. Manufacturers that can successfully meet these needs can sometimes develop products that can be sold to other markets.

The recent work of von Hippel (2005) examines cases in which communities of lead users develop necessary innovations themselves – a process of 'democratizing' innovation. Users develop new products according to their wants instead of relying on manufacturers to translate their needs into products.

Research has shown that the higher the intensity of lead user characteristics present in an innovator, the greater the commercial attractiveness[3] of the innovation (Franke and von Hippel, 2003). An experiment by the firm 3M found that lead user projects generated ideas for new product lines, while traditional market-research methods were found to produce ideas only for incremental improvements in existing product lines (Lillien et al. 2002). Furthermore, empirical research shows that lead users tend to be among the first to adopt new products, fulfilling the function of opinion leaders and facilitating the diffusion of the novelty (Urban and von Hippel, 1988). According to Foxall (1989), lead users are fundamental for discontinuous innovations; they experiment with the new technology before later adopters and play an important role in the "contagion process" that encourages the adoption of novel products by other consumers (Morrison et al, 2002).

There are limits to the potential role of lead users in innovation. In highly technical areas, such as pharmaceuticals, lead users are unlikely to be able to actively participate in developing innovations, although they can be major sources of information on the types of innovations that are required. We can expect more direct customer involvement in product development in industries that are less science based.

Some authors have found that 'listening to customers' can hamper technological advance and that it can be detrimental for a business in the long run. Christensen and Bower (1996) note that firms in industries with constant technological change and

[3] Attractiveness is defined as the novelty of the innovation and the expected future generality of market demand.

opportunities for disruptive (radical) innovation should pursue innovations that are not demanded by their current customers. Disruptive innovation tends to create new markets that can eventually replace present ones. Schmitz (1995) found that inadequate focus on technical activities and too much focus on marketing activities (listening to customer needs) could be myopic, hindering the development of new innovations.

Sector structure

"Sciences based industries" such as electronics and chemicals, generate more fundamental innovations based on new technology inputs than other sectors. Other sectors tend to innovate through incremental improvements driven in part by customer demand.

The work of Malerba (2002) on the impact of demand in different sectors in the US, Japan and Europe concluded that interactions with sophisticated buyers have been particularly important in machine tools, chemicals, and for some segments of software. Malerba found that different demand conditions can affect economic sectors in different ways: *size of market* was relevant for chemicals, pharmaceuticals and packaged software, *quality* was important for machine tools and chemical engineering, *demand composition* for software and machine tools, and *specific requirements* for machine tools, chemical engineering and telecommunications.

Demand structure

There is a long standing debate over the effect of market structure on the rate innovation. Most of the debate concerns market concentration (the relative advantages of monopolies, oligopolies, and dispersed markets), but the structure of demand could also influence the incentives for firms to innovate. Rothwell and Zegveld (1982) point to three types of demand structures with potentially different effects on innovation.

In a **monopsony,** there is only a single buyer that accounts for 100% of demand. Pure monopsony rarely occurs in the real world, but near monopsonic conditions can occur when there is only one telecommunications provider. Under these conditions, the lack of a diversity of demand could hamper further innovation if the buyer fails to require innovative products and services. This is most likely to occur if the monopsonic buyer also acts as a monopolist in its own market.

In a **polypsony**, there are many different buyers, none of whom account for more than an insignificant share of total sales (Bannock et al., 1986). Under these conditions, competition between producers will tend to drive innovation, with a focus on market research or demand pull to develop products that interest consumers, rather than on technology push (Rothwell, 1994). The development of radical innovations could be constrained by a lack of consumer competence in assessing the value of innovations.

In an **oligopsony** purchasing power is concentrated but there are several large buyers, none of which controls demand, although each has a level of buying power. This demand structure could provide good conditions for private or government procurement demands to encourage innovation. The buyer can benefit from efficiencies created through competitive sourcing, but also avoid technological "lock in". In this type of market, suppliers, producers and users can all influence innovation, creating a "distributed innovation process" (Von Hippel, 1988). It is also possible for one oligopsonist to function as a quality leader, setting standards that will

influence other players in the market (Foray, 1989). This structure can also facilitate cooperation among firms, helping to establish standards that support product innovation (Granstrand, 1984).

Proximity
Both cultural (Anderson et al, 1981) and geographical proximity explains some of the advantages of home markets, although globalization and improved communications are probably reducing the advantages of geographical proximity (Fagerberg, 1992).

Von Hippel (2005) argues that the "natural advantage" of local firms to meet the needs of local consumers is being eroded by the internet. In open sources projects, lead users from around the globe can contribute, via the internet, without ever meeting each other. This could also be true in cases of physical products where a pattern of user-based design is followed by custom made production. However, where the technical solutions for how to produce a product are not clear, proximity would still play a role. According to Von Hippel (2005), in such cases, nations would be able to profit from user innovation to create competitive advantages for their domestic firms.

Market size
There has been an ongoing discussion about the relationship between innovation and the *size of the market*: does innovation take place irrespectively of market size or does market size have an influence on the creative process, as argued by Schmookler (1966)? If size of the market is an important factor, then certain industries will be more prone to innovation than others and certain countries will tend to be more innovative than others.

Domestic demand first expands and then tends to saturate, leading firms to both reduce prices and to seek new markets in other countries. The saturation effect will only create national competitive advantage if the composition of home demand either drives foreign tastes or is similar to products and characteristics demanded abroad.

According to Porter, domestic market size is most important in industries with large R&D requirements (aerospace), substantial economies of scale (automobiles), large generation leaps in technology (computing) and high levels of uncertainty (biotechnology). However in each of these examples, investments can be recouped by using foreign markets.

Income and income distribution
The expenditure power of a country's population has an impact on innovation: previous research has indicated that wealth influences the speed of adoption of new products in different countries (Helsen et al, 1993; Rogers, 1995). Because wealthier people attach lower utility to money, they can afford the risks of adopting a new product earlier (Dickerson and Gentry, 1993). Moreover, prices of new products tend to start higher and then decline (Golder and Tellis, 1998) and consequently wealthier people can afford new products when prices are still high. Furthermore, we can expect that a more mature population will have more expenditure power than a young one due to number of years / experience in the work market and consequently higher incomes, which would have a positive impact on consumption.

2.3 Demand policy

Traditionally, governmental policies to influence demand have focused on the quantity of domestic demand through expenditures or the cost of credit. Porter (1998) argues that the main aim of demand-side policies should be to improve the *quality* of domestic demand to force firms to continually improve their products (export-driven models tend to ignore home demand, limiting advancement). Relevant demand side policies include regulations and standards and procurement.

Regulations and standards
The report *"Creating an Innovative Europe"* notes that Europe offers favorable conditions for innovation due to high incomes and willingness to purchase high quality products. However, demand could be improved through harmonized regulations and standards and the use of public procurement to created incentives for innovation.

Regulations and standards can affect demand conditions. Standards are often fundamental for reducing risks for both innovators and buyers. Standards and regulations for product performance, safety and environmental characteristics can pressure firms to improve quality. Regulations can also anticipate standards that will be adopted internationally and encourage the creation of specialized manufacturing and services firms that can compete on international markets.

Procurement
Demand-pull from businesses and governments often takes the form of technology procurement (Nelson, 1994), defined as " the procurement by a buyer of products, services or systems, which at the time being are not available on the market and for which some element of technical development is needed" (Granstrand, 1984). Procurement can reduce commercial uncertainty by setting standards or technical specifications. Technology procurement is often based on a cooperative relationship between the buyer and the producer (Lundvall, 1988: Edquist, 1997).

Both public and private procurement are used to create new markets and to diffuse innovation. Public procurement represents around 16% of European GDP and is concentrated in construction, health care and transport sectors.

Other influences
Government policies can improve demand quality by providing *information to buyers* or requiring firms to do so. Information is fundamental for better and more sophisticated demand choices.

2.4 Impact of demand on innovation

Firms respond to demand for innovative products by increasing investments in innovation activity. This could results in new patents[4], increased sales of new to market products, increased employment in medium and high tech sectors, and increased exports to meet external demand. Relevant indicators for the effect of demand on innovation include the number of EPO patents per million population, employment in R&D intensive sectors as a percentage of the total workforce, exports of high technology products as a share of total exports, the share of total sales from

[4] Although patent is sector related

new to market and new to firm products. **Annex A** gives precise definitions of each output indicator for the effect of demand on innovation.

Furthermore, firms' innovative capabilities differ according to the role that innovation has in their strategies: while for certain firms, innovation is at the very core of their competitive strategy, for others innovation might be limited to the adoption of new technology. Furthermore, other firms simply do not innovate. Data on percentage of firms that use different methods of innovating, or innovation mode, are available from the third Community Innovation Survey (CIS-3). A shift in the distribution of the innovation mode towards strategic innovators (firms that perform R&D in a continuous basis) or to intermittent innovators (firms that perform R&D in house, although not continuously) could be signs of favorable demand conditions. For more detailed explanation on the four innovation modes, please refer to Annex B.

3. Indicators for demand

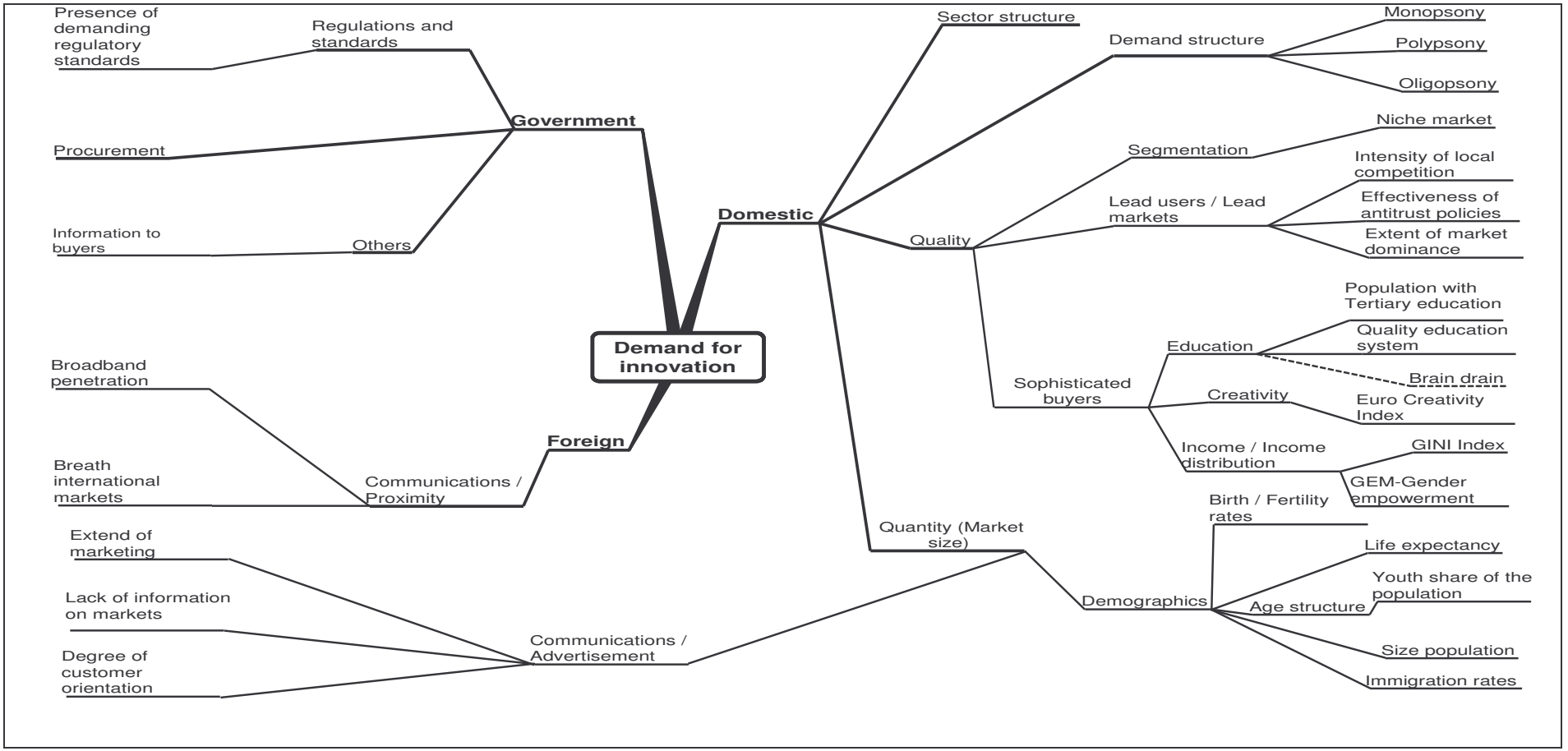
Based on the review of theories of demand, the range of factors that may influence demand for innovative products and processes are illustrated in Figure 2. Demand is split into domestic and foreign markets, as different factors may influence one or another, or a single factor could affect both types of demand, but with different intensity levels. Furthermore, demand is influenced by government policy.

We classify the factors that influence domestic demand into four major groups: ***sector structure***, ***demand structure, quality*** *and* ***quantity*** (market size) of demand. The response of firms to consumer demand is partly mediated by the firm's sector of activity. The demand structure refers to the existence of olipsonic or monopsonic buyers. The quality of demand is further broken down into market segmentation, lead users and lead markets, and sophisticated buyers. The quantity of demand relates to market size, and is affected by both demographics and by communications in terms of advertising.

Foreign demand is influenced by communications and proximity. Furthermore, we consider both individual consumer demand and demand from large buyers such as businesses or governments. Some indicators are specific to one or the other.

Relevant indicators are not available for all of the factors that could influence demand. The section identifies available indicators. A full list description of these indicators and the data source is given in Annex C.

Figure 2: Factors influencing demand



3.1 Domestic demand

The largest number of identified factors is for domestic demand and particularly for the quality of domestic demand. Some of these factors are closely linked. For example, the presence of sophisticated buyers will sometimes be crucial to the development of lead markets.

Two general indicators for the effect of demand on innovation are from CIS-3. Both a lack of demand for innovative products, or highly uncertain demand, can act as serious barriers for firms' investment in innovation. CIS-3 asks firms about the importance of uncertain demand and a lack of demand as reasons not to innovate. The reverse of each of these two indicators gives a general measure of the effect of good demand conditions on innovative activities.

3.1.1 Qualitative demand

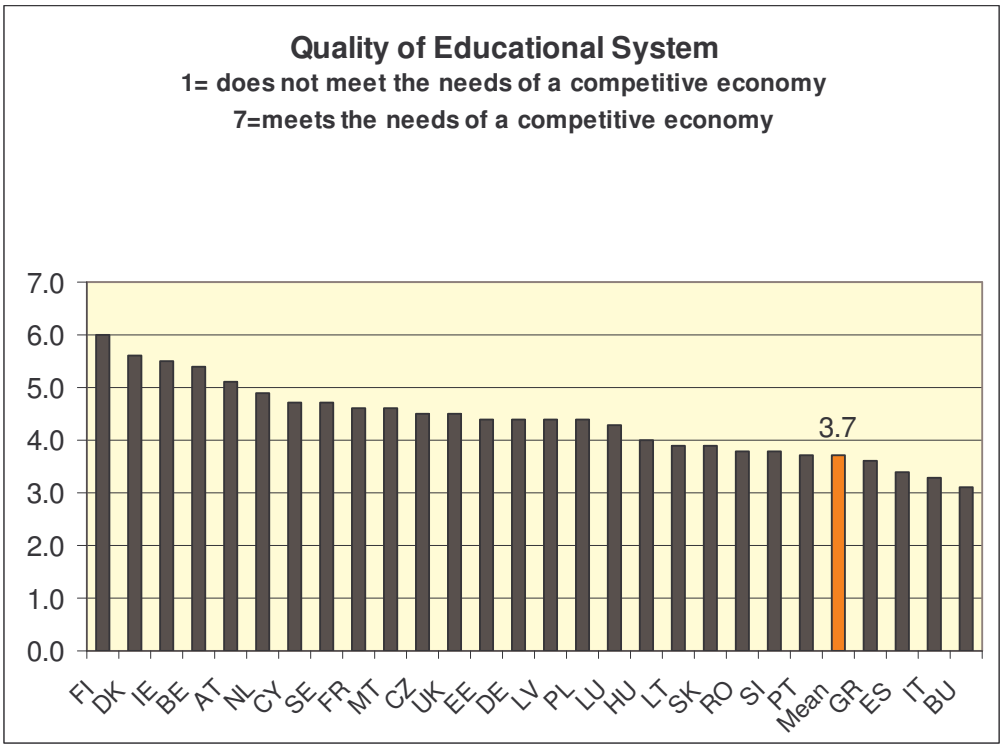
Lead users and lead markets. It is difficult to develop indicators for lead markets because they are often only visible late in the product life cycle. A possible leading indicator is business R&D expenditures. However, this indicator would need to be available at a highly disaggregated sector level that matches specific types of products. This is impractical, given the low level of disaggregation available for R&D statistics. Furthermore, it will be impossible to determine if high R&D intensities are due to the existence of a lead market (innovation partly driven by demand) or to a technology push strategy.

The development of lead markets partly depends on intense competition by producers that will both drive down prices and provide product differentiation, enabling consumer choice to select on optimum designs. Three indicators are available from the WEF for competition: intensity of local competition, extension of market dominance and effectiveness of antitrust policy.

Sophisticated buyers
The preference of individual consumer for innovative products is a key demand factor. Certain consumer characteristics are essential for the formation of sophisticated buyers that are the first to adopt new products. Many of the characteristics of individuals will also influence the demand behavior of firms. For example, a highly educated population should improve both the demand characteristics of individual consumers and the ability of firms to evaluate and successfully implement innovative production and organizational processes.

Education:
Educated consumers are more likely to be comfortable with new ideas, demand sophisticated and novel products and services, and evaluate different options. Education can be evaluated by its quality and by the percentage of the economically active population with a tertiary degree. Figure 3 provides an assessment of the quality of the education system in each EU country. For tertiary education, we use the percentage of the population between 25 and 64 with a tertiary education. The EU countries with the highest quality levels were Finland, Denmark, Ireland, Belgium and Austria, while the highest share of tertiary educated adults are in Finland, Denmark, and Estonia.

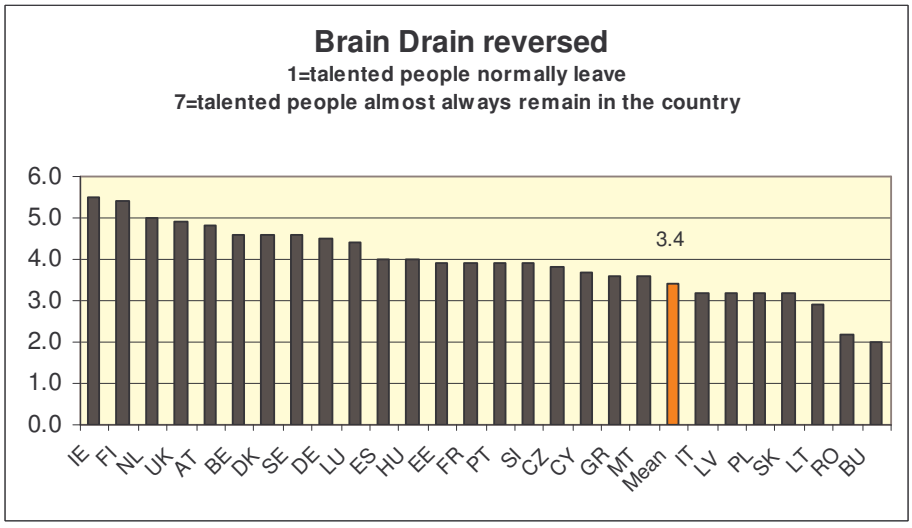
Figure 3



Note: Mean for 125 countries surveyed
Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

In addition, business demand will depend on the ability of talented graduates to work and stay in their countries after they complete their education. This can partly be measured by a reverse indicator for the 'brain drain', which is an indicator of the level of domestic opportunities for talented graduates. Figure 4 gives results for the EU. For comparison purposes, the United States has the highest score (6.1). There were only two European countries among the 10 top countries globally that are the least affected by brain drain (score above 5.0): Ireland and Finland.

Figure 4



Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

Creativity

Florida and Tinagli (2004) created an index to measure creativity that covers three main factors: talent, technology and tolerance. The creativity index was calculated for 14 European countries**.** The creative class represents more than 25% of the work force in seven of the fourteen European countries and about 30% of the workforce in the Netherlands, Belgium and Finland. Apart from the United States, there is a cluster of European countries formed by Finland, Sweden, Denmark, the Netherlands, and Belgium that have invested in developing "talent" in addition to creating an environment with values and attitudes that facilitates the attraction of talent through immigration.

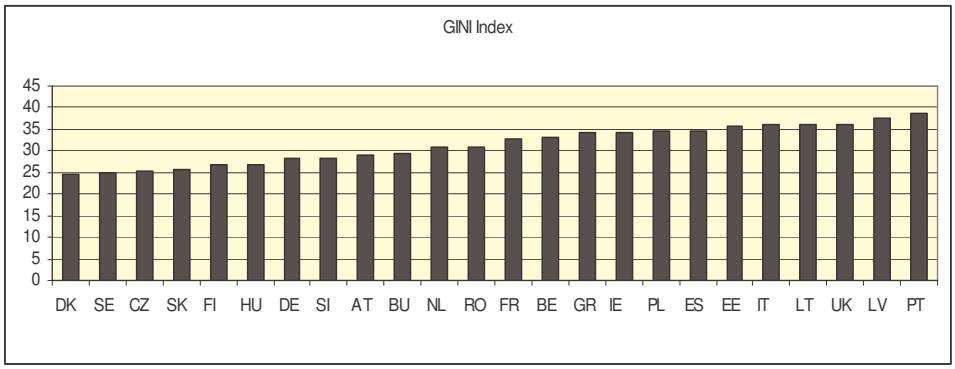
Income and income distribution

Traditionally, Gross Domestic Product (GDP) per capita has been the most important measure of income. Higher levels of GDP per capita are strongly linked to more sophisticated demand and larger markets for innovations. For this reason, per capita GDP is used as a control variable in correlations between demand indicators with innovation activity output indicators and among demand indicators.

Income distribution is also relevant. Income concentration in a smaller number of consumers allows for higher levels of disposable income in this segment. This could have both positive and negative effects on demand for innovation products. It could increase demand for expensive lead innovations, but decrease overall demand for innovations.

The relevant indicator is the GINI index measure of income inequality. A low GINI score indicates a higher level of social and economic equality, with a score of zero indicating perfect equality. In the EU, Denmark and Sweden are the two countries with the lowest disparities in income. Figure 5 depicts the GINI index.

Figure 5



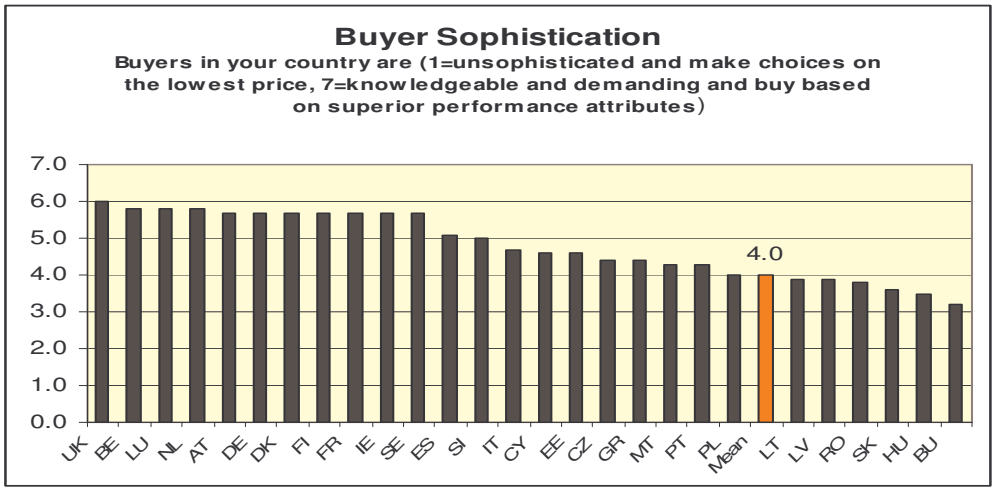
Source: United Nations 2006 – Development Programme Report

The Gender empowerment measure (GEM) captures inequalities between men and women in political participation, economic participation, and power over economic measures. Sweden and Denmark have the highest scores within the EU.

Figure 6 depicts buyers' sophistication. There are 12 leading countries for which the results are very similar. All tend to be high income countries, whereas the countries with the worst performance tend to be lower income countries. From the managerial

perspective (the source of the indicator), buyer sophistication could be closely linked to disposable income, which is a drawback to this indicator.

Figure 6



Note: Mean for all 125 countries surveyed
Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

3.1.2 Quantitative demand (market size)

Demographics
Research has consistently shown that younger cohorts are more rapid adopters of new technologies, such as mobile telephones and the Internet, although older cohorts could more quickly adopt health related innovations. Consequently, demographics could play an important role in consumer preferences for specific types of innovative products. Relevant indicators include fertility rates, life expectancy, and the age structure of the population. Market size is also partially dependent on the size of the population (the other main factor is per capita incomes), which will be determined by fertility, life expectancy and immigration rates.

The *fertility rate* is the number of children born per woman in her childbearing years. In Europe, 2.1 children per woman are considered to be the population replacement level. European fertility rates are below replacement level in all countries, ranging from a high of 1.94 in France to a low of 1.24 in Poland. Fertility rates are below 1.5 in 15 EU countries. Low fertility rates will reduce market size in the future if not reverted or replaced through higher immigration or higher incomes.

Life expectancy has been increasing for all EU countries over time, with the highest levels in Italy and Sweden (81 years) while Latvia is at the bottom at 71 years.

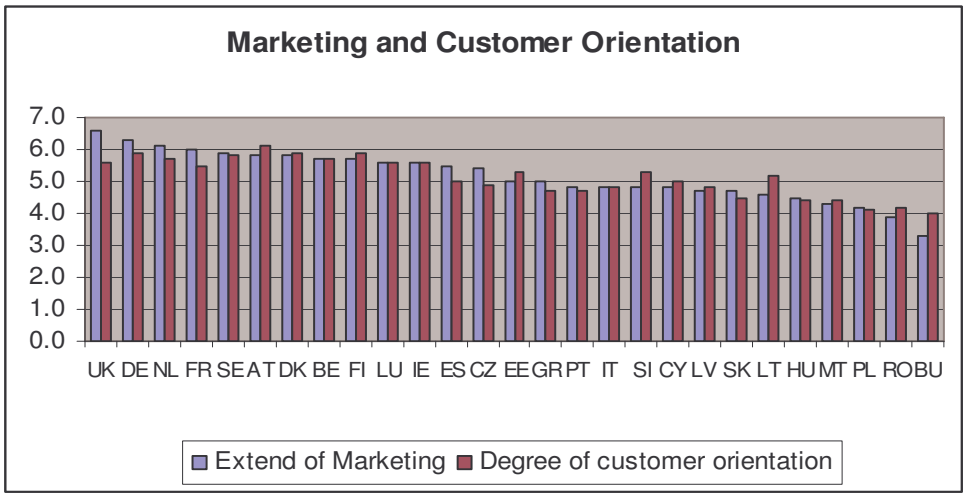
In terms of the *Youth Share of the population*, less developed European countries have higher shares than the more developed European countries.

Communication/Advertisement
Marketing is an important mean for creating awareness of new products among potential adopters (Beal and Rogers, 1960) and of influencing the acceptance of novelty (Katz and Lazarsfeld, 1955). The difficulty for developing indicators for

marketing is to separate marketing activities for innovative products from activities to market minor improvements in existing products or line extensions.

One of the main objectives for advertising is to increase demand. Unfortunately, there are no reliable indicators for advertisement expenditures for new-to-market products. As a proxy, we explore two WEF indicators: the *Extent of marketing* and the *Degree of customer orientation*. These two indicators, shown in Figure 7, are proxies for the level of sophistication of marketing by country and are highly correlated.

Figure 7



Extent of marketing
The extent of marketing in your country is (1=limited and primitive, 7=extensive and employ the world's most sophisticated tools and techniques.
Degree of customer orientation
Customer orientation in your country (1=generally treat their customers badly, 7=are highly responsive to customers and customer retention)

Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

An indicator for communication is obtained from the CIS as the reverse of a 'lack of information on markets' as a hampering factor. In the reverse form, this measures the amount of market information available to firms for their innovative activities.

3.2 Foreign demand

Communications / Proximity
Geographical and cultural proximity are possibly important factors for communicating the needs of lead users to firms and information about innovative product characteristics to consumers.

The internet has an ambiguous link with proximity. It can be used to both create international communities and to strengthen local linkages. However, in both cases the internet can facilitate communication and decrease the cost of developing a community of lead users or user-innovators. This process was called by von Hippel the "democratization of the opportunity to create".

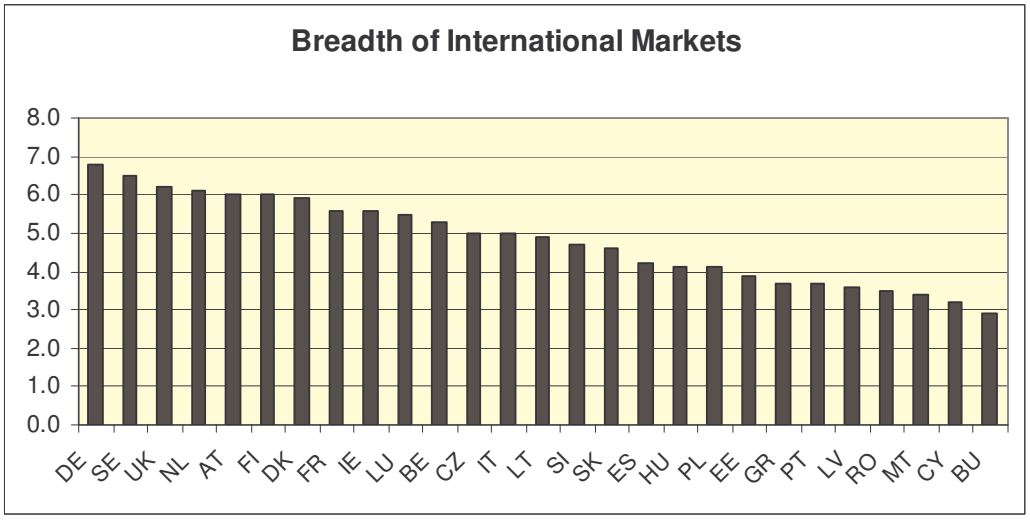
We use the *broadband penetration rate* per 100 population as an indicator of exposure to more information on innovations. More informed consumers are more likely to demand more sophisticated products and services and also be more involved

in the innovation process. There is a large variation in this rate in the EU, from 0.8 in Greece to 22.4 in the Netherlands.

Foreign markets

The ability of firms to exploit national markets gives them access to additional demand. It could also be a marker of the ability of national firms to turn domestic demand into a competitive advantage. Figure 8 shows that firms based in Germany, Sweden, the United Kingdom, the Netherlands and Austria are best able to access demand in foreign markets and/or use national demand as a source of competitive advantage. An alternative indicator is the percentage of GDP due to exports of goods and services, but the disadvantage of this indicator is that almost all exports could go to one or two trading partners, due to close economic integration[5].

Figure 8



Exporting companies from your country sell: 1=primarily in a small number of foreign markets, 7=in virtually all international country markets

Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

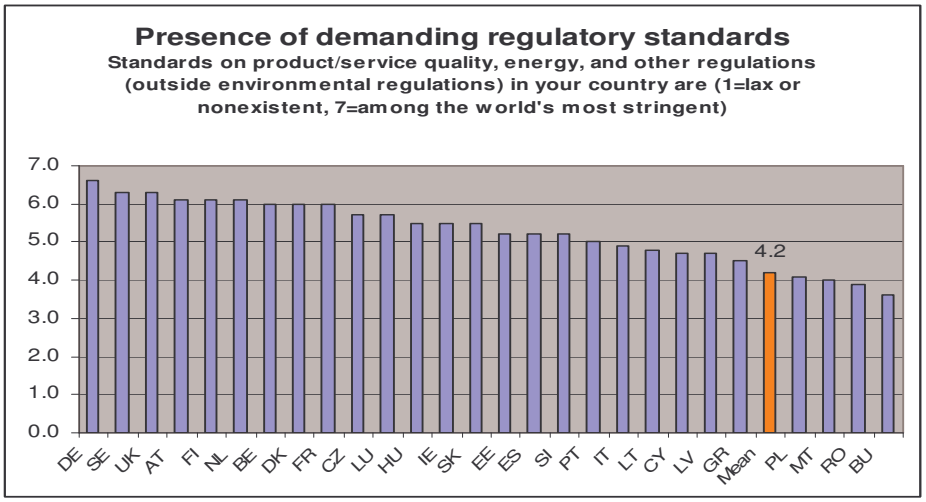
3.3 Role of government

Regulations and Standards

Regulations and standards can have a positive effect on demand by reducing uncertainty. As shown in Figure 9, data are available from the World Economic Forum on the stringency of regulatory standards.

[5] For example, over 80% of Canada's exports go to the United States.

Figure 9



Note: Mean for the 125 countries surveyed

Source: The Global Competitiveness Report 2006-2007 – World Economic Forum

Government procurement

There is a lack of indicators for government procurement, even though this is an important factor that can help create new markets or upgrade existing ones. As a proxy for government procurement, we use a WEF indicator that evaluates the role of technical performance and innovativeness in government purchase decisions. Among European countries, France, Germany and Luxembourg tie with the United States on this indicator. The European countries with the lowest performance (procurement based on price instead of advanced technology) were Bulgaria, Latvia and Italy.

4. Identifying key demand indicators

Section 3 above identified 22 potential indicators[6] for measuring the influence of different factors on demand. The purpose of this section is to identify a limited number of key indicators that can be used to track the effect of demand on innovation and to identify major aspects of demand for which there are no suitable indicators.

Two steps are used to identify a set of key indicators. First, we correlate demand indicators with innovation activity output measurements described in Section 2.4, controlling for GDP per capita purchasing power standards (PPS). Controlling for GDP is essential to avoid confounding. This step identifies demand indicators that might be causally linked to innovation activities. Only demand indicators that are positively correlated with three or more of the eight innovation output indicators are selected.

The second step is to reduce the number of key indicators by avoiding repetition, for example by including several indicators that capture the same effect. This is met by correlating the demand indicators with each other. When two or more demand

[6] Three indicators are available for both manufacturing and for services sectors, but are counted as a single indicator: information on markets, uncertain demand, and no demand.

indicators are highly correlated, we select the indicator with the best data coverage and which is available on a regulator basis.

In summary, key demand indicators are selected using the following three criteria:

1. Significant correlation with three or more output indicators.
2. Within each major factor category (see Figure 2), the indicator should not be highly correlated (coefficient > 0.8) with other indicators in the same group. If yes, then the indicator that best captures the factor is selected. Furthermore, the indicator must have significant correlation with three or more other demand indicators.
3. If several indicators are highly correlated, the indicator with best data availability is selected.

4.1 Correlations: Demand indicators and innovation output indicators

Table 1 shows the significant correlations for all suggested demand indicators and the eight innovation output measures. The table only gives statistically significant correlation results ($p < 0.05$).

In total, 18 demand indicators are correlated with three or more innovation output indicators, as indicated in the last column of Table 1.

Table 1: Correlation between demand indicators and innovation output indicators

	New EPO per million pop	Employment medium high tech manufacturing	Employment high tech services	High tech exports	Sales new to market	Sales new to firm	Innovation mode (strategic+ intermittent)	Venture Capital availability	N. significant Correlations
Demanding regulatory standards	0.663	0.552	0.649				0.503	0.615	5
Government Procurement	0.601						0.591	0.627	3
Intensity of Local Competition	0.559		0.555					0.612	3
Extent of market dominance	0.732	0.451	0.598				0.608	0.777	5
Effectiveness of Antitrust policy	0.691		0.573				0.721	0.730	4
Buyers sophistication	0.614		0.566				0.508	0.672	4
Quality of educational system	0.494		0.515				0.599	0.631	4
Percent 25-64 age with tertiary education	0.389		0.525					0.652	3
Brain Drain	0.496		0.556				0.603	0.738	4
Euro Creativity Index	0.830		0.837		0.794			0.597	4
GINI-Income distribution	-0.457	-0.706	-0.433						3
GEM-Gender Empowerment Measure	0.784	0.413	0.738	-0.715			0.568	0.691	6
Birth rates	0.429		0.687	0.650			0.568	0.674	5
Life Expectancy									
Youth share	-0.744		-0.435				-0.741		3
Market information (Manufacturing)									
Market Information (Services)									
Extent of Marketing	0.588		0.573				0.500	0.617	4
Degree of customer orientation	0.698		0.557				0.678	0.610	4
Broadband penetration rate	0.706		0.715				0.710	0.620	4
Breadth International market	0.787	0.582	0.682				0.636	0.628	5
Uncertain or no demand (Manufacturing)									
Uncertain or no demand (Services)									

Note: Partial correlations controlling for GDP per capita PPS. Significant correlations at 0.05 levels.

After controlling for GDP per capita, most of the suggested demand indicators are significantly correlated to the number of EPO patents per million population, employment in high tech services, the share of firms that are strategic and intermittent innovators, and venture capital availability. Demand is not correlated with the share of product sales that are new to the firm and only a few demand indicators are correlated with the share of sales that are new to the market[7], high tech manufacturing employment, and high tech exports.

4.2 Correlations among suggested demand indicators

As shown in the column in Table 1, there are 18 demand indicators that are significantly correlated with three or more innovation output indicators. We now proceed with the second step that is to reduce the number of key indicators by avoiding repetition (including several indicators that capture the same effect). This second step is met by correlating the demand indicators with each other. Table 2 depicts the statistically significant partial correlation results ($p < 0.05$, and controlling for GDP per capita PPS).

Of the total of 18 demand indicators, only the indicator GINI (a measure of inequality) is not statistically significant correlated with at least three other demand indicators, so we drop this indicator.

[7] The lack of positive correlations between the demand indicators and the innovative sales share (either new to market or new to the firm) could be due to a drawback to these two output indicators. What is 'new to the market' in advanced countries such as Finland or Germany probably differs from firms in the new member states. Many firms in the former countries will have global markets, while firms in the latter countries could have local markets. In addition, the indicator for new to firm sales will be affected by the rapid catch up strategies of firms in the new member states.

Table 2: Correlations among demand indicators

	Regulatory standards	Gov. Procur	Local Comp.	Extent market dominance	Antitrust policy	Buyers' sophist.	Quality educ.	Pop. Tertiary education	Brain Drain	Euro Creat. Index	GEM	GINI	Birth rates	Youth share	Extend Mark.	Cust. Orient.	Broad.	Breadth Inter. MK
Regulatory standards	1.000	0.574	0.813	0.785	0.845	0.701	0.448		0.710	0.666	0.716			-0.469	0.876	0.782	0.515	0.841
Gov. Procurement	0.574	1.000	0.578	0.599	0.748	0.482			0.529				0.570		0.579	0.524	0.477	0.541
Local Competition	0.813	0.578	1.000	0.689	0.841	0.696	0.577	0.420	0.748	0.631	0.660		0.487		0.838	0.772	0.521	0.659
Extent market dominance	0.785	0.599	0.689	1.000	0.835	0.810	0.653	0.431	0.716		0.691		0.517		0.801	0.724	0.505	0.799
Antitrust policy	0.845	0.748	0.841	0.835	1.000	0.793	0.650	0.451	0.814		0.623		0.580	-0.488	0.861	0.762	0.643	0.709
Buyers sophistication	0.701	0.482	0.696	0.810	0.793	1.000	0.567	0.425	0.631	0.564	0.643		0.597		0.821	0.674	0.572	0.694
Quality educational system	0.448		0.577	0.653	0.650	0.567	1.000	0.462	0.704		0.505		0.603		0.450	0.603	0.434	0.438
Pop. Tertiary education	0.358		0.420	0.431	0.451	0.425	0.462	1.000	0.457	0.643	0.612		0.588		0.431	0.601	0.455	
Brain Drain	0.710	0.529	0.748	0.716	0.814	0.631	0.704	0.457	1.000		0.541		0.500		0.737	0.697	0.511	0.585
Euro Creativity Index	0.666		0.631			0.564		0.643		1.000	0.795	-0.873				0.596	0.652	0.687
GEM	0.716		0.660	0.691	0.623	0.643	0.505	0.612	0.541	0.795	1.000		0.511	-0.562	0.680	0.720	0.800	0.737
GINI										-0.873		1.000						
Birth rates		0.570	0.487	0.517	0.580	0.597	0.603	0.588	0.500		0.511		1.000		0.473	0.459	0.605	
Youth share	-0.469				-0.488						-0.562			1.000	-0.506	-0.589	-0.712	-0.527
Extend Marketing	0.876	0.579	0.838	0.801	0.861	0.821	0.450	0.431	0.737		0.680		0.473	-0.506	1.000	0.793	0.547	0.782
Degree customer orientation	0.782	0.524	0.772	0.724	0.762	0.674	0.603	0.601	0.697	0.596	0.720		0.459	-0.589	0.793	1.000	0.619	0.759
Broadband	0.515	0.477	0.521	0.505	0.643	0.572	0.434	0.455	0.511	0.652	0.800		0.605	-0.712	0.547	0.619	1.000	0.509
Breadth International MK	0.841	0.541	0.659	0.799	0.709	0.694	0.438		0.585	0.687	0.737			-0.527	0.782	0.759	0.509	1.000

4.3 Key demand indicators per grouping

4.3.1 Domestic demand - Quality

Quality / Lead users and lead markets
All proposed indicators for Lead users / Lead markets (*Extent of market dominance,* Effectiveness *of antitrust policy* and *Intensity of local competition)* proved relevant and significantly correlated with innovation activity output, in particular with Venture capital availability. Lead markets were highly correlated with entrepreneurship activity, indicating that lead markets / lead users tend to attract new and innovative firms willing to take risks to come up with more innovative products.

Furthermore, the three indicators for Lead markets (*Extent of market dominance,* Effectiveness of *antitrust policies and Intensity of local competition)* were not only correlated with most other demand indicators, but they were highly correlated with each other, indicating that they were capturing the same effect. More specifically, effectiveness of antitrust policies was highly correlated with the other two indicators and could be dropped from the analysis, as it is also measuring the intensity of local competition (if antitrust policies are effective, then local markets should be more competitive) and the extent of market dominance (if antitrust policies are effective, then markets are not dominated by only a few firms).

We keep two indicators for this category: *Extent of market dominance* and *Intensity of local competition*, with a 0.689 correlation with each other.

Quality / Sophisticated buyers
Buyer sophistication was significantly correlated with innovation output indicators and with most demand indicators, in particular with *extension of marketing*, which measures the use of sophisticated marketing tools. As seen, the existence of buyers' sophistication goes hand in hand we the use of more sophisticated marketing tools.

When disaggregating sophistication into education, creativity and income distribution, the following observations can be made:

Quality of the education system, Population with tertiary education and *reverse brain drain* were significantly correlated with innovation output measures. The indicator for *reverse brain drain* has the highest correlations, clearly indicating the need to not only educate but to keep highly skilled individuals in the country to engage in innovation activity.

The three indicators were only weakly correlated with each other, with the correlation coefficients below 0.5, with the exception of the moderate coefficient of 0.704 between *reverse brain drain* and *quality of education*. These indicators measure three different aspects of education relevant to innovation outputs, so we keep the three indicators in this category.

Creativity measured by the Euro Creativity index was also significantly correlated with innovation activity output indicators. But most relevant, the Euro Creativity Index was the proposed demand indicator that showed the highest levels of correlation with innovation activity: 0.830 with EPOs patents, 0.837 with employment in high

tech manufacturing and 0.794 with sales new to market. It was the only proposed demand indicator that was significantly correlated to new-to-market sales share, which measures the introduction of new products on the firm's market.

Moreover, the creativity index was significantly correlated with several demand indicators. The most significant correlation was a negative relationship with GINI, which measures inequalities. As previously discussed, countries where most of the innovation activity takes place are the ones where there are less inequalities. They display larger domestic markets with the necessary income to acquire novel offerings. The creative class could be responsible for both the production and the consumption of innovative products.

Income distribution, as measured by the GINI coefficient is also significantly correlated with innovation output indicators. Within Europe, innovation activity is stimulated by less variation in individual income, although the effect is partly due to low income inequalities and high innovation outcomes in the Scandinavian countries. These have small domestic markets, with all Scandinavian countries being export oriented. When correlating demand indicators among each other, the GINI indicator was only significantly correlated with the Euro Creativity Index (negative correlation of 0.873). Consequently, we dropped this indicator, following the criteria that to be relevant, each demand indicator should be significantly correlated with at least 3 other ones.

We also tested *GEM- Gender Empowerment Measure* as a proxy for income distribution. Countries where males and females tend to be more equal in terms of political and economic participation, as well as power over economic measures were significantly correlated with innovation activity output measures. GEM had the highest number of significant correlation with all innovation output measures. Of note, GEM was negatively correlated with exports of high tech products, possibly due to branch plants in high technology manufacturing in new member and Mediterranean member states.

Moreover, the *GEM index* was significantly correlated with most demand indicators, indicating that more developed societies, where innovation activity is more dynamic, are also societies where women share economic and political power with men.

4.3.2 Domestic demand - Quantity / Demographics

Demand is not only relevant for its quality related aspects, but also in terms of quantities. It is necessary to have enough demand to recover R&D investments. Furthermore, economies of scale are necessary to reduce costs.

Birth rates were significantly correlated with several innovation output measures. A country's capacity to replace its present demand is fundamental in terms of making sure demand will be sustained in the future. This is specifically relevant for European countries, all of them below population replacement levels. *Life expectancy* after controlling for GDP per capita was not significantly correlated with any of the proposed innovation activity indicators. One possible explanation could be that the elderly consume fewer innovative products, except for services (insurance and health). This argument is in line with the idea that younger populations are more

receptive of novelties, while older ones are more reluctant to adopt new and more sophisticated products.

The *Youth share of the population* was significantly and negatively correlated with innovation outputs, possibly due to a lack of buying power. The key could be the share of the population that is economically active and consequently with above average disposable incomes. This group could drive the population of sophisticated buyers.

Both Birth rates and Youth share of the population were significantly correlated with several other demand indicators, but not correlated with each other. Consequently we keep both indicators as relevant for measuring different aspects of demand.

4.3.3 Domestic demand - Quantity / Communications- Advertisement

We assumed that firms can influence demand levels by increasing advertisement expenses, thus creating a broader awareness for their new products. Firms would consequently engage in marketing activities to better know their potential clients and to target advertising campaigns to influence such segments of the population. Surprisingly, adequate *information on markets* was not positively correlated with innovation outputs. This could be because market knowledge might not matter for many types of innovations that are developed as a result of technology push. It would be relevant to differentiate between disruptive and incremental innovation to better understand the role of marketing and advertising in demand creation. Sectoral effects could also play a role here.

On the other hand, the other two indicators in this group (*Extent of marketing and Degree of customer orientation*) were significantly correlated with several innovation outputs. Furthermore, both of these indicators were significantly correlated with each other, indicating that only one of them is necessary to capture the effect of marketing as a component of demand. Of the two indicators, customer orientation has a better fit with theory as it measures the responsiveness of firms to customer requirements.

4.3.4 Foreign demand

Both B*roadband penetration and Breadth of international markets* were significantly correlated with innovation activity output measures. Broadband penetration allows for a better flow of information between foreign and local markets, with a positive outcome in terms consumer awareness and sophistication. It is through this bridge between local and foreign markets that countries are able to customize their offerings to a broader range of markets, with gains in terms of economies of scales, stimulating R&D activity.

Both indicators were significantly correlated with most other demand indicators. Of note, Breath of international market was highly correlated with Presence of demanding regulatory standards. This indicates that demanding regulatory standards at home helps firms to compete on foreign markets, perhaps by improving the quality characteristics of their products.

Broadband and Breath of international markets were weakly correlated with each other (0.509), measuring different aspects of a country's relation to foreign markets, and are both relevant to innovation outputs, so we keep the two indicators in this category.

4.3.5 Role of government

Both government related indicators, *Presence of demanding regulatory systems* and *Government procurement* were significant correlated with several innovation output indicators. Not only the need for regulations and the use of standards are necessary for innovation to take place, but government procurement appears to play an important role in promoting innovation activity. Government procurement showed higher correlations than presence of demanding regulatory systems with both Innovation mode and Venture capital availability. When government procurement is relevant, firms tend to be strategic or intermittent innovators, as they have a strong motivation to develop R&D in house.

Moreover, both government related indicators (*Presence of demanding regulatory standards* and *Government procurement* for advanced technology products) were significantly correlated with most other demand indicators. The two indicators were weakly correlated with each other (0.574), and consequently both are relevant for measuring demand, as they relate to two different aspects of government influence: the first deals with setting up regulations and standards to protect both producer and consumer, while the second one refers to government as a buyer, a consumer of innovative goods and services.

4.4 Key demand indicators - Summary

Table 3 shows identified key indicators for demand for innovative goods and services.

Table 3. Relevant innovation demand indicators

Indicator	Details	Relevance
Part I. Available indicators		
Quality of domestic demand		
Intensity of local competition	Index values (1 to 7) measuring whether competition in the local market is limited or intense (survey data).	Intense competition by producers both drives down prices and provides product differentiation, enabling consumers to select on optimum products/services.
Extent of market dominance	Index values (1 to 7) measuring whether corporate activity at national level is dominated by few firms or spread across many firms (survey data).	Another measure of the development of lead markets (see above).
Buyer sophistication	Index values (1 to 7) measuring whether buyers focus more on price or quality of products and services (survey data).	Preferences of individual consumers for innovative products are a key demand factor. Sophisticated buyers are the first to adopt new products.
Population (aged 24 to 65 years) with tertiary education	Number of persons (by age class) with some form of post-secondary education per 100 population.	Educated consumers are more likely to be comfortable with new ideas, demand sophisticated and novel products and services, and evaluate different options.
Quality of educational system	Index values (1 to 7) measuring whether national education systems meet the needs of competitive economies (survey data).	Another measure of education levels and quality (see above).

Indicator	Details	Relevance
Brain drain	Index values (1 to 7) measuring whether talented people tend to leave to pursue opportunities in other countries or remain in their home country (survey data).	Lack of domestic opportunities for talented graduates can seriously affect national innovation systems and reduce the influence of lead buyers in creating sophisticated demand.
Euro creativity index	Measure of national competitiveness – composite indicator based on several indices measuring talent, technology and tolerance.	Innovative firm clusters tend to form in an environment with values and attitudes that facilitate the attraction of talent, also through immigration.
Gender empowerment measure	Gender inequality measure for political and economic participation and decision-making power, and power over economic resources.	Used as a proxy for income equality between men and women. More demand tends to be created when buying power is distributed among more heterogeneous population.
Quantity of domestic demand		
Youth share of the population	Ratio of the share of population under 30 to the share of the population 65 and over.	Large numbers of young people tend to either create more innovation demand, or conversely correlate with lower incomes and lower levels of demand.
Degree of customer orientation	Index values (1 to 7) measuring whether firms are responsive to customers and customer retention (survey data).	High customer orientation can turn firms towards user based or assisted innovation, which can be expected to increase overall innovation.
Foreign demand		
Breadth of international markets	Index values (1 to 7) measuring whether exporting firms sell in a small or large number of foreign markets (survey data).	A large number of foreign markets potentially increase demand for innovation by domestic firms.
Public sector demand		
Demanding regulatory standards	Index values (1 to 7) measuring stringency of national standards on product/service quality and of energy and other regulations (survey data) .	Stringency of regulations and standards can have a positive effect on demand by reducing uncertainty.
Government procurement for advanced technology products	Index values (1 to 7) measuring whether government purchase decisions for advanced technology are based solely on price or also on technological performance and innovativeness (survey data).	Focus on performance and innovativeness is likely to further increase demand for innovation.
Part II. Potentially relevant, but missing indicators		
Quality of domestic demand		
Demand differences at sectoral level	No data currently available.	Innovation activity is sector oriented; therefore, measurement of sector specific demand conditions would be important.
Effect of demand structure (polypsony, oligopsony)	No data currently available.	Demand structure (many buyers vs. only a few buyers) is considered relevant for innovative activity.
Role of niche markets	No data currently available.	Existence of niche markets considered important for many new and sophisticated products (but can also be a sign of income inequalities).
Quantity of domestic demand		
Impact of marketing of innovative products on demand	No data currently available.	Marketing is a demand driver, but it is not known how effectively it can be used to create demand for innovation products. Adding new questions on marketing to the CIS could help to overcome this limitation.
Foreign demand		
Role of replacing inadequate domestic markets with foreign markets	The only currently available foreign demand indicator on the breadth of international markets does not fully capture this aspect.	Firms can use foreign markets as lead markets or as a source of sophisticated consumers.

4.5 Missing indicators

Even though we know that innovation activity is *sector* oriented, we lack indicators to measure sector specific demand conditions. We also lack indicators to measure *demand structure*. Theory suggests that both *Polypsony* and *Oligopsony* demand structures are beneficial for innovation activity, but we do not have indicators to measure either structure.

We also need to better understand the role of segmentation and niche markets. We do know that income inequalities tend to create market segments. But we also know that demand conditions are only favorable when individual incomes are high enough to absorb new and more sophisticated products, which are more expensive due to R&D costs (plus patent protection).

Furthermore, more needs to be known about economically active adult populations. Although less receptive of novelties when compared to the youth, adult populations have the necessary income to consume more expensive and sophisticated products. Consequently, more indicators related to this specific population bracket should be developed.

Marketing is a demand driver, but we do not know how effectively it can be used to create demand for innovation products. In the future, the addition of new questions on marketing to the CIS could help to overcome this limitation.

Finally, firms can use foreign markets as lead markets or as a source of sophisticated consumers. Currently only one demand indicator is available for foreign markets and it does not fully capture how firms are able to replace domestic lead markets with foreign lead markets.

5. Conclusions

This report looks into demand conditions and the different factors that may have an impact on demand for innovative products within individual countries.

We started by reviewing the literature on factors that were related to demand conditions according to previous research. The literature review led us to a simple model of factors that could have an impact on demand conditions. For simplification purposes, we divided these factors into three groupings: domestic demand, foreign demand and the role of government. We further divided these three groupings, for a better understanding of most relevant influences on demand.

We next looked at available indicators that could be used as proxies for all factors included in our model. Not all factors could be associated with a specific indicator, a first sign that more indicators are needed to measure demand conditions. For example, we could not find indicators for sector and demand structures, neither for segmentation and niche markets. We then run correlations among all suggested indicators (a total of 22) with 8 innovation activity output indicators and retained for further analysis only the demand indicators that were significantly correlated with at least 3 out of the 8 innovation activity output indicators. This first step identified demand indicators that might be causally linked to innovation activities. Out of the 22

demand indicators, 4 were dropped for not satisfying the criteria of at least 3 significant correlations with innovation activity output indicators.

Next step was to run correlations among the 18 demand indicators. This step was necessary to reduce the number of key indicators by avoiding repetition within the three main groups and their sub-groups (for example, by including several indicators that capture the same effect). When a demand indicator was correlated with fewer than 3 other demand indicators, we dropped the indicator (as in the case of GINI – a measure of inequality). Moreover, when two or more demand indicators within their sub-groupings were highly correlated, we selected the indicator that best captures the factor in consideration, if not, the one with best data availability. By using these criteria, we dropped two indicators: *effectiveness of antitrust policies* within the sub-grouping Lead users / Lead markets and *extent of marketing* within the sub-grouping Communications / Advertising. At the end of this step, we had fifteen relevant demand indicators.

We conclude that demand conditions are influenced not only by domestic quality aspects, such as the existence of lead users made up of sophisticated buyers, but also by quantitative aspects including the actual numbers of consumers in such markets. The sophisticated buyer was named by Richard Florida as the "Creative class", which is constituted by highly skilled and educated people, whose higher incomes are a reflection of their level of education. Furthermore, this share of the population consists of prime age adults with the disposable income and interest to purchase sophisticated products.

Furthermore, demand can be created if firms can make use of sophisticated marketing tools to capture customers' needs and desires. Unfortunately, we are not able to measure the effect of advertising in creating demand due to a lack of data. But it would be relevant to quantify the impact of advertisement in demand creation while breaking down innovation into disruptive and incremental innovation. As most innovations consist of minor improvements, advertisement might play an important role in demand creation. This is certainly an area lacking adequate indicators.

We have found the following indicators relevant for measuring domestic demand in terms of quality:

- Intensity of local competition
- Extent market dominance
- Buyers' sophistication
- Population with tertiary education per 100 age 24_65
- Quality educational system
- Brain drain (reversed)
- Euro creativity index
- Gender empowerment measure

And those for measuring domestic demand in terms of quantity:

- Fertility / birth rates
- Youth share of the population

- Degree of customer orientation

Not only domestic demand is relevant for local firms, but also foreign demand. It is through proximity, both geographical and cultural and through the creation of international standards, that firms can reach markets beyond local ones. Reaching new markets can be decisive for firms that lack large domestic markets. Domestic markets may not be large enough to permit firms to recoup their investments in innovation.

We found the following indicators relevant for measuring foreign demand:

- Broadband penetration rate
- Breadth international markets

Government also plays an important role. Government not only consumes innovative products through procurement, but the creation of regulations and standards can free up demand, both by reducing uncertainty and improving quality. Furthermore, governments must intervene in markets to avoid market dominance by few firms, creating incentives for firms to compete and keep fuelling markets with new and innovative offerings.

The following indicators were found to be relevant when measuring the impact of government in demand conditions:

- Demanding regulatory standards
- Government procurement for advanced technology products

On the other hand, there are large gaps in indicator availability. These include indicators of the different effects of demand by sector, demand structure (monopsony, polypsony and oligopsony), the role of niche markets, the ability of firms to use foreign markets to replace limited domestic markets and the impact of advertisement in creating demand.

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Annex A: Innovation activity output indicators

1- Summary of Innovation activity output indicators

Indicator	Numerator	Denominator	Description	Data availability	Data Source	Most recent data/ Ref. Year
New EPO patents per million population	Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor.	Total population as defined in the European System of Accounts (ESA 1995).	The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of patent applications at the European Patent Office.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT	2004
Employment in medium-high and high-tech manufacturing (as % of total workforce)	Number of employed persons in the medium-high and high-tech manufacturing sectors. These include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35).	The total workforce includes all manufacturing and service sectors.	The share of employment in medium-high and high technology manufacturing sectors is an indicator of the manufacturing economy that is based on continual innovation through creative, inventive activity. The use of total employment gives a better indicator than using the share of manufacturing employment alone, since the latter will be affected by the hollowing out of manufacturing in some countries.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT	2004
Employment in high-tech services (as % of total workforce)	Number of employed persons in the high-tech services sectors. These include post and telecommunications (NACE64), information technology including software development (NACE72) and R&D services (NACE73).	The total workforce includes all manufacturing and service sectors.	The high technology services provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy. The latter can increase productivity throughout the economy and support the diffusion of a range of innovations, in particular those based on ICT.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT	2004

Indicator	Numerator	Denominator	Description	Data availability	Data Source	Most recent data/ Ref. Year
Exports of high technology products as a share of total exports	Value of high-tech exports, in national currency and current prices. High-tech exports include exports of the following products: aerospace; computers and office machinery; electronics-telecommunications; pharmaceuticals; scientific instruments; electrical machinery; chemistry; non-electrical machinery and armament (cf. OECD STI Working Paper 1997/2 for the SITC Revision 3 codes).	Value of total exports, in national currency and current prices.	The indicator measures the technological competitiveness of the EU i.e. the ability to commercialise the results of research and development (R&D) and innovation in the international markets. It also reflects product specialisation by country. Creating, exploiting and commercialising new technologies are vital for the competitiveness of a country in the modern economy. This is because high technology sectors are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment. The Brussels European Council (2003) stressed the role of public-private partnerships in the research area as a key factor in developing new technologies and enabling the European high-tech industry to compete at the global level.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT	2004
New to firm	Sum of total turnover of new or significantly improved products to the firm but not to the market for all enterprises. (*Community Innovation Survey*)	Total turnover for all enterprises, in national currency and current prices. (*Community Innovation Survey*)	This indicator measures the turnover of new or significantly improved products to the firm as a percentage of total turnover. These products are not new to the market. Sales of new to the firm but not new to the market products are a proxy of the use or implementation of elsewhere already introduced products (or technologies). This indicator is thus a proxy for the degree of diffusion of state-of-the-art technologies.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT (CIS4)	2004
New to market	Sum of total turnover of new or significantly improved products for all enterprises. (*Community Innovation Survey*)	Total turnover for all enterprises, in national currency and current prices. (*Community Innovation Survey*)	This indicator measures the turnover of new or significantly improved products, which are also new to the market, as a percentage of total turnover. The product must be new to the firm, which in many cases will also include innovations that are world-firsts. The main disadvantage is that there is some ambiguity in what constitutes a 'new to market' innovation. Smaller firms or firms from less developed countries could be more likely to include innovations that have already been introduced onto the market elsewhere.	34 countries (32 European plus US and Japan)	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT (CIS4)	2004

Indicator	Description	Data availability	Data Source	Most recent data/ Ref. Year
Innovation Mode	Four mutually exclusive innovation modes: strategic innovators, intermittent innovators, technology modifiers and technology adopters. Classification based on two main criterias: the level of novelty of the firm's innovations, and the creative effort that the firm expends on in-house innovative activities. Four modes are limited to technological product and process innovation.	19 of the 25 EU member states, plus Iceland, Norway, and Romania. Data are not available for Denmark, Ireland, the UK, Cyprus, Malta, and Poland).	EUROSTAT (CIS3)	1998-2000
Availability of Venture capital	Entrepreneurs with innovative but risky projects can generally find venture capital in your country (1=not true, 7=true)	125 countries	The Global Competitiveness Report 2006-2007 – World Economic Forum	2005

2- Comments on innovation activity output indicators

Indicator	Comments
New EPO patents per million population	Although there are some limitations in including patents applications, as patents fillings are sector' dependent, with certain sectors filing more than others, we can assume that countries with a number higher number of fillings would reflect greater R&D efforts in creating new and innovative products and services demanded by either home or foreign markets.
Employment in medium-high and high-tech manufacturing and employment in high-tech services (as % of total workforce)	Countries with larger shares of employment in medium and high tech manufacturing and / or in high-tech services would reflect more sophisticated markets, demanding more complex and innovative offerings.
Exports of high technology products as a share of total exports	This indicator can serve as a proxy for foreign demand. If countries are exporting high tech products, they have found markets outside their home markets to sell their innovative products. This is particular important for small economies that might not have enough home market demand and need to look into foreign markets.
New to firm and new to market	New to firm indicator reflects the intensity of innovation activity within firms and reflect demand markets for these offerings. But it is new to market that most measure demand for innovative offerings, products and services that have not been commercialized yet. We can expect that new to market products also reflect the existence of Lead markets.
Innovation Mode (Strategic and Intermittent Innovators)	For strategic innovators, innovation is at the core of their competitive strategy. These firms perform R&D on a continuous basis, developing novel products. Intermittent innovators perform R&D and develop innovations in-house, not on a continuous basis, but only when innovation activity is necessary or favorable. Consequently, innovation is not at the core of their competitive advantage. They may even adapt new technology developed elsewhere.
Availability of Venture capital and Entrepreneurship	The presence of venture capital and of a class of entrepreneurs reflects favorable demand conditions that need to be satisfied.

Sources: Trend Chart – European Innovation Scoreboard and The Global Competitiveness Report 2006-2007 – World Economic Forum

Annex B: Innovation modes

Innovation Mode	Description
Strategic innovators:	Innovation is at the core of firms' competitive strategy. These firms perform R&D on a continuous basis, developing novel products. They are the main source of innovation and diffuse it to other firms. Strategic innovators could indicate the existence of important domestic demand constituted by sophisticated buyers.
Intermittent innovators:	Firms perform R&D and develop innovations in-house, but not on a continuous basis. They engage in innovation activity only when necessary or favorable and may even adapt new technology developed elsewhere. Intermittent innovators could be associated with some level of domestic demand and existence of sophisticated buyers.
Technology modifiers:	When firms modify existing products through non-R&D based activities. Many firms in this group are process innovators
Technology adopters:	Firms in this group basically innovate by adopting innovations developed elsewhere

Annex C: Demand related indicators

Indicator	Data Availability	Description	Data Source / Ref. Year
Presence demanding regulatory standards	125 countries – Survey data	Standards on product/service quality, energy, and other regulations (outside environmental regulations) in your country are 1=lax or nonexistent, 7=amongst the world's most stringent.	The Global Competitiveness Report 2006-2007 – World Economic Forum
Government Procurement	125 countries – Survey data	Government purchase decisions for the procurement of advanced technology products are (1 = based solely on price, 7 = based on technical performance and innovativeness).	The Global Competitiveness Report 2006-2007 – World Economic Forum
Intensity of Local Competition	125 countries – Survey data	Competition in the local market is (1 = limited in most industries and price-cutting is rare, 7 = intense in most industries as market leadership changes over time).	The Global Competitiveness Report 2006-2007 – World Economic Forum
Extent of market dominance	125 countries – Survey data	Corporate activity in your country is: 1=dominated by a few business groups, 7=spread among many firms	The Global Competitiveness Report 2006-2007 – World Economic Forum
Effectiveness of Antitrust policy	125 countries – Survey data	Anti-monopoly in your country is: 1=lax and not effective at promoting competition, 7=effective and promotes competition	The Global Competitiveness Report 2006-2007 – World Economic Forum
Buyers sophistication	125 countries – Survey data	Buyers in your country are (1 = unsophisticated and make choices based on the lowest price, 7 = knowledgeable and demanding and buy based on superior performance attributes).	The Global Competitiveness Report 2006-2007 – World Economic Forum
Quality of educational system	125 countries – Survey data	The educational system in your country (1 = does not meet the needs of a competitive economy, 7 = meets the needs of a competitive economy).	The Global Competitiveness Report 2006-2007 – World Economic Forum
Pop. Tertiary education per 100 population age 25-64	EU25	Number of persons in age class with some form of post-secondary education (ISCED 5 and 6) per 100 population.	Trend Chart – European Innovation Scoreboard 2006 EUROSTAT, OECD – Ref. 2005
Brain Drain	125 countries – Survey data	Your country's talented people (1 = normally leave to pursue opportunities in other countries, 7 = almost always remain in the country).	The Global Competitiveness Report 2006-2007 – World Economic Forum
Euro Creativity Index	14 EU countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK) and the US	Measure of national competitiveness in the Creative Age. Composite indicator based on Euro-Talent (Creative Class, Human Capital and Scientific Talent); Technology Index (Innovation Index, Technology Innovation Index and R&D Index) and Tolerance Index (Attitudes Index, Values Index and Self Expression Index) .	Europe in the Creative Age by Richard Florida and Irene Tinagli – February, 2004
GINI-Income distribution	126 countries	The Gini coefficient is a measure of inequality of income distribution or inequality of wealth distribution. It is defined as a ratio with values between 0 and 1. A low Gini coefficient indicates more equal income or wealth distribution, while a high Gini coefficient indicates more unequal distribution. 0 corresponds to perfect equality (everyone having exactly the same income) and 1 corresponds to perfect inequality (where one person has all the income, while everyone else has zero income).	United Nations 2006 Development Programme Report

Indicator	Data Availability	Description	Data Source / Ref. Year
GEM-Gender Empowerment Measure	177 countries	Gender inequality measured in three areas: political participation and decision-making power; economic participation and decision-making power; power over economic resources.	Human Development Report – 2005
Fertility Rates	EU25	The mean number of children that would be born alive to a woman during her lifetime if she were to pass through her childbearing years conforming to the **fertility rates by age** of a given year. It is therefore the completed fertility of a hypothetical **generation**, computed by adding the fertility rates by age for women in a given year (the number of women at each age is assumed to be the same). The total fertility rate is also used to indicate the replacement level fertility; in more developed countries, a rate of 2.1 is considered to be replacement level.	Eurostat - 2005
Life Expectancy at birth	192 countries	The average number of years of life expected by a hypothetical cohort of individuals who would be subject during all their lives to the mortality rates of a given period. It is expressed as years.	World Health Organization, The World Health Report, 2006 World Bank – Data related to 2004
Youth share of population	EU25	Youth share: Ratio of the share of the total population under 30 to the share 65 and over	Eurostat: Demography statistics
Lack information on markets - Manufacturing.	29 countries	Lack of information on markets, high important factor of hampering innovation activities – Manufacturing (D)	CIS-4 Eurostat Based on 2004 data
Lack information on markets - Services	29 countries	Lack of information on markets, high important factor of hampering innovation activities – Core Services (INN_G_TO_K) (NACE sections I, and J and NACE divisions 51, 72, 74.2 and 74.3)	CIS-4 Eurostat Based on 2004 data
Extend of Marketing	125 countries – Survey data	The extent of marketing in your country is (1=limited and primitive, 7=extensive and employs the world's most sophisticated tools and techniques)	The Global Competitiveness Report 2006-2007 – World Economic Forum
Degree of customer orientation	125 countries – Survey data	Customer orientation: Firms in your country (1=generally treat their customers badly, 7= are highly responsive to customers and customers retention)	The Global Competitiveness Report 2006-2007 – World Economic Forum
Broadband penetration rate	EU 25	Number of broadband lines per 100 population. Broadband lines are defined as those with a capacity equal to or higher than 144 Kbit/s.	Trend Chart – European Innovation Scoreboard 2006 – EUROSTAT – REF. 2005
Breadth International MK	125 countries – Survey data	Exporting companies from your country sell 1= primarily in a small number of foreign markets, 7= in virtually all international country markets	The Global Competitiveness Report 2006-2007 – World Economic Forum
Uncertain or no demand Manufacturing.	29 countries	Uncertain demand for innovative goods or services, high important factor of hampering innovation activities plus No need to innovate because no demand for innovations, high important factor of hampering innovation activities – Manufacturing (D)	CIS-4 Eurostat Based on 2004 data

Indicator	Data Availability	Description	Data Source / Ref. Year
Uncertain or no demand Services	29 countries	Uncertain demand for innovative goods or services, high important factor of hampering innovation activities plus No need to innovate because no demand for innovations, high important factor of hampering innovation activities - Core Services (INN_G_TO_K) (NACE sections I, and J and NACE divisions 51, 72, 74.2 and 74.3)	CIS-4 Eurostat Based on 2004 data
Note: Global Competitiveness Report – Survey data - 11,232 responses in the 125 economies (including 1,000 leading enterprises in the world). Samples adjusted by size of economies. Data related to 2005			

Annex D: Country abbreviations

Country	Abbreviation
Austria	AT
Belgium	BE
Bulgaria	BU
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MT
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK

Annex E: Data

EU27 – Innovation activity output indicators plus control variable (GDP per capita)

	GDP_capita	New_EPO	Emp_medhightech_manuf	Emp_hightech_serv	Exports_hightech	New market	New firm	Innov_Mode	Vent. Cap.
Austria	124.10	195.10	6.50	2.70	14.70	5.20	5.40	20.00	4.40
Belgium	117.80	144.50	6.50	3.70	7.10	4.80	8.20	20.00	4.40
Bulgaria	35.70	4.30	4.70	2.90	2.90	8.50	4.10		3.30
Cyprus	89.90	16.40	1.20	2.00	15.90	1.90	3.70		3.50
Czech Republic	75.90	15.90	9.40	3.10	13.70	7.70	7.80	12.00	3.20
Denmark	122.10	235.80	6.30	4.70	13.30	5.20	5.80		5.00
Estonia	64.70	15.50	4.80	2.80	10.10	4.40	7.60	17.00	4.10
Finland	112.20	305.60	6.80	4.50	17.80	9.70	5.10	32.00	5.40
France	108.80	153.70	6.30	3.90	20.10	6.20	5.60	20.00	4.20
Germany	109.00	311.70	10.40	3.40	15.40	7.50	10.00	25.00	4.80
Greece	85.20	11.20	2.10	1.70	7.10	4.80	6.20	13.00	3.20
Hungary	63.00	18.90	8.20	3.00	21.70	4.20	2.50	10.00	3.80
Ireland	138.60	77.30	6.00	3.60	29.10	5.60	4.50		5.10
Italy	100.00	87.30	7.40	2.90	7.10	6.30	5.60	18.00	3.00
Latvia	53.80	5.90	1.50	2.70	3.20	3.50	1.60	10.00	3.60
Lithuania	55.70	5.80	2.60	2.10	2.70	4.40	5.30	12.00	3.50
Luxembourg	268.30	200.50	1.40	3.30	29.50	6.40	9.10	24.00	5.10
Malta	73.80	8.80	6.60	2.70	55.90	13.60	8.70		3.50
Netherlands	125.90	244.30	3.30	4.10	19.10	4.00	4.30	22.00	5.40
Poland	51.00	4.20	5.10	2.20	2.70	8.10	5.40		3.80
Portugal	71.80	7.50	3.30	1.80	7.50	4.40	5.60	18.00	3.80
Romania	36.30	1.20	5.40	1.40	3.80	7.10	9.50	11.00	3.00
Slovakia	60.50	8.10	9.40	2.70	4.60	12.80	6.40	9.00	3.70
Slovenia	83.60	50.40	9.60	2.90	5.20	7.40	6.90	16.00	3.40
Spain	98.20	30.60	4.70	2.80	5.70	3.80	10.00	8.00	4.10
Sweden	116.00	284.90	6.50	5.10	14.10	8.30	5.10	25.00	5.00
U. Kingdom	114.60	121.40	5.60	4.30	22.80	6.40	7.60		5.20

EU27 – Demand indicators – Part 1

	Regulatory_ standards	Gov_ procuremen	Local_ competition	Ext_Market_ dominance	Antitrust	Buyer_ sophistication	Quality_ education	Pop_tertiary education	Brain drain	Euro Creativity	GINI	GEM
Austria	6.10	4.40	5.60	5.70	5.70	5.70	5.10	17.80	4.80	0.42	29.10	0.82
Belgium	6.00	3.60	5.80	5.30	5.50	5.80	5.40	31.00	4.60	0.53	33.00	0.86
Bulgaria	3.60	3.20	4.10	3.40	3.10	3.20	3.10	21.60	2.00		29.20	0.60
Cyprus	4.70	3.50	5.40	4.10	5.00	4.60	4.70	28.80	3.70			0.58
Czech Rep	5.70	3.90	5.50	4.60	4.90	4.40	4.50	13.10	3.80		25.40	0.62
Denmark	6.00	4.50	5.60	5.80	5.90	5.70	5.60	33.50	4.60	0.58	24.70	0.86
Estonia	5.20	4.20	5.40	4.40	4.90	4.60	4.40	33.30	3.90		35.80	0.61
Finland	6.10	4.70	5.70	5.90	6.20	5.70	6.00	34.60	5.40	0.72	26.90	0.85
France	6.00	4.80	5.70	5.30	5.80	5.70	4.60	24.90	3.90	0.46	32.70	
Germany	6.60	4.80	6.20	6.20	6.10	5.70	4.40	24.60	4.50	0.57	28.30	0.82
Greece	4.50		4.70	4.10	4.60	4.40	3.60	20.60	3.60	0.31	34.30	0.61
Hungary	5.50	3.90	5.40	4.00	4.70	3.50	4.00	17.10	4.00		26.90	0.56
Ireland	5.50	4.30	5.60	5.50	5.40	5.70	5.50	29.10	5.50	0.37	34.30	0.75
Italy	4.90	3.40	4.60	3.80	4.20	4.70	3.30	12.20	3.20	0.34	36.00	0.65
Latvia	4.70	3.40	5.00	3.80	3.90	3.90	4.40	20.50	3.20		37.70	0.62
Lithuania	4.80	3.70	5.20	3.60	4.20	3.90	3.90	26.30	2.90		36.00	0.64
Luxembourg	5.70	4.80	4.90	5.20	5.60	5.80	4.30	26.60	4.40			
Malta	4.00	3.80	5.40	3.60	4.30	4.30	4.60	11.40	3.60			0.49
Netherlands	6.10	4.50	5.80	5.90	6.10	5.80	4.90	30.10	5.00	0.67	30.90	0.84
Poland	4.10	3.60	4.20	4.30	4.00	4.00	4.40	16.80	3.20		34.50	0.61
Portugal	5.00	4.40	5.10	3.90	5.10	4.30	3.70	12.80	3.90	0.19	38.50	0.68
Romania	3.90	3.60	4.90	3.90	3.60	3.80	3.80	11.10	2.20		31.00	0.49
Slovakia	5.50	3.50	5.00	4.60	4.50	5.00	3.90	14.00	3.20		25.80	0.60
Slovenia	5.20	3.60	5.10	4.20	4.20	3.60	3.80	20.20	3.90		28.40	0.60
Spain	5.20	3.90	5.30	4.30	4.50	5.10	3.40	28.20	4.00	0.37	34.70	0.78
Sweden	6.30	4.50	5.90	4.90	5.70	5.70	4.70	29.20	4.60	0.81	25.00	0.88
U. Kingdom	6.30	4.20	6.10	5.90	6.00	6.00	4.50	29.60	4.90	0.52	36.00	0.76

EU27 – Demand indicators – Part 2

	Birth_rates	Life_exp	Youth_share	Lack_Info_ manufact	Lack_Info_ services	Ext_ Marketing	Degree_ cust_orient	Broadband	Breadth_ Int Market	Uncertain_ dem_manuf	Uncertain_ dem_serv
Austria	1.40	79	18.48	8.92	10.28	5.80	6.10	11.60	6.00	25.57	27.36
Belgium		78	18.46	7.61	14.26	5.70	5.70	17.40	5.30	25.30	24.70
Bulgaria	1.31	72		0.00	9.35	3.30	4.00		2.90	50.15	30.84
Cyprus	1.40	79	22.66	5.91	9.20	4.80	5.00	2.70	3.20	22.17	25.29
Czech Re	1.28	76	23.11	6.29	7.94	5.40	4.90	4.30	5.00	27.70	30.48
Denmark	1.80	78	18.01	8.65	7.68	5.80	5.90	22.00	5.90	37.92	41.34
Estonia	1.50	72	21.84	7.08	1.68	5.00	5.30	11.10	3.90	23.69	25.08
Finland	1.80	79	18.62	13.74	10.73	5.70	5.90	18.70	6.00	29.76	28.45
France	1.94	80	19.53	9.40	8.44	6.00	5.50	13.90	5.60	31.51	34.96
Germany	1.34	79	17.18	9.02	10.33	6.30	5.90	10.20	6.80	35.13	29.60
Greece	1.33	79	21.32	15.46	15.71	5.00	4.70	0.80	3.70	24.71	28.44
Hungary	1.31	73	22.10	6.38	9.98	4.50	4.40	4.50	4.10	37.97	37.91
Ireland	1.86	78	24.29	12.83	27.77	5.60	5.60	4.40	5.60	21.81	22.03
Italy	1.31	81	18.26	9.20	4.66	4.80	4.80	9.50	5.00	28.60	33.73
Latvia	1.31	71	21.80	15.98	15.10	4.70	4.80	3.70	3.60	25.14	25.67
Lithuania	1.27	72	21.58	12.43	10.75	4.60	5.20	5.00	4.90	14.16	28.06
Luxembourg	1.70	79	18.25	1.03	1.85	5.60	5.60	11.70	5.50	43.45	43.58
Malta		79	22.09	20.00	15.38	4.30	4.40	10.40	3.40	37.50	34.62
Netherlands	1.71	79	18.42	13.45	10.93	6.10	5.70	22.40	6.10	31.39	31.97
Poland	1.24	75	24.46	7.95	14.15	4.20	4.10	1.90	4.10	38.65	33.56
Portugal	1.40	78	21.58	17.54	16.75	4.80	4.70	10.10	3.70	24.39	23.64
Romania	1.32	72		0.00	0.00	3.90	4.20		3.50	30.18	27.99
Slovakia	1.25	74	25.27	10.67	9.17	4.70	4.50	1.50	4.60	25.11	38.33
Slovenia	1.26	77	21.60	46.20	11.61	4.80	5.30	7.80	4.70	31.01	18.71
Spain	1.35	80	22.06	10.73	8.67	5.50	5.00	10.00	4.20	32.77	35.12
Sweden	1.77	81	18.12	8.52	5.16	5.90	5.80	17.10	6.50	28.19	29.19
U. Kingdom	1.78	79	19.15	10.84	10.18	6.60	5.60	13.50	6.20	29.71	28.28