



**Differences in socio-economic conditions and  
regulatory environment:  
explaining variations in national innovation  
performance and policy implications**

INNO-Metrics Thematic Paper

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## Executive summary

The European Innovation Scoreboard (EIS) is the instrument developed at the initiative of the European Commission, under the Lisbon Strategy, to provide a comparative assessment of the innovation performance of EU Member States. Innovation performance is measured by 25 indicators capturing different aspects of the innovation process. Innovation drivers measure the structural conditions required for innovation potential, Knowledge creation measures the investments in R&D activities, Innovation and entrepreneurship measures the efforts towards innovation at the firm level, Applications measures the performance expressed in terms of labour and business activities and their value added in innovative sectors, and Intellectual property measures the achieved results in terms of successful know-how. Overall innovation performance is summarised by the Summary Innovation Index (SII). Performance in the SII and each of the five innovation dimensions varies significantly between EU Member States.

This report analyses seven categories of the wider innovation environment (Demand conditions, Social capital, Institutional framework, Market efficiency, Technology flows, Social equity and Governance) for explanations for the observed variations in innovation performance. The main results and policy conclusions are as follows:

- The two categories that seem to explain most of the differences in overall innovation performance are social capital and technology flows. These categories are also highly significant for the Innovation and entrepreneurship aspect of innovation performance. This is important because this aspect is not highly correlated with GDP, meaning that factors other than overall income level are important in determining country performance. This finding suggests that policies that build trust and collaboration - such as promoting innovation networks and collaborations - should be relevant for countries at various income levels that perform below average on innovation and entrepreneurship.
- Social capital and technology flows are also highly correlated with innovation drivers, but in this case the causality may be in the other direction. For example investments in innovation drivers (education, public research, broadband access) may help build social capital which in turn improves technology flows and innovation performance.
- The other five categories investigated also appear to have some influence on overall innovation performance, but here the linkages are less clear. Within the demand category, the indicators for government procurement and demanding regulatory standards appear to be most important, suggesting an important role for government in raising innovation performance through these mechanisms. These indicators are not strongly correlated with any of the innovation dimensions, suggesting that their impact is diffused over various parts of the innovation process.
- Most indicators of market efficiency and the institutional framework have some correlation with differences in innovation performance, of which price stability, intensity of local competition and flexibility of wage determination appear to be the most important. These results stress the importance of macroeconomic stability and strong competition for raising innovation performance. The indicator for burden of administration is particularly correlated with the innovation drivers and innovation & entrepreneurship dimensions, suggesting the need for governments to reduce administrative burdens in order to foster innovation and entrepreneurship.

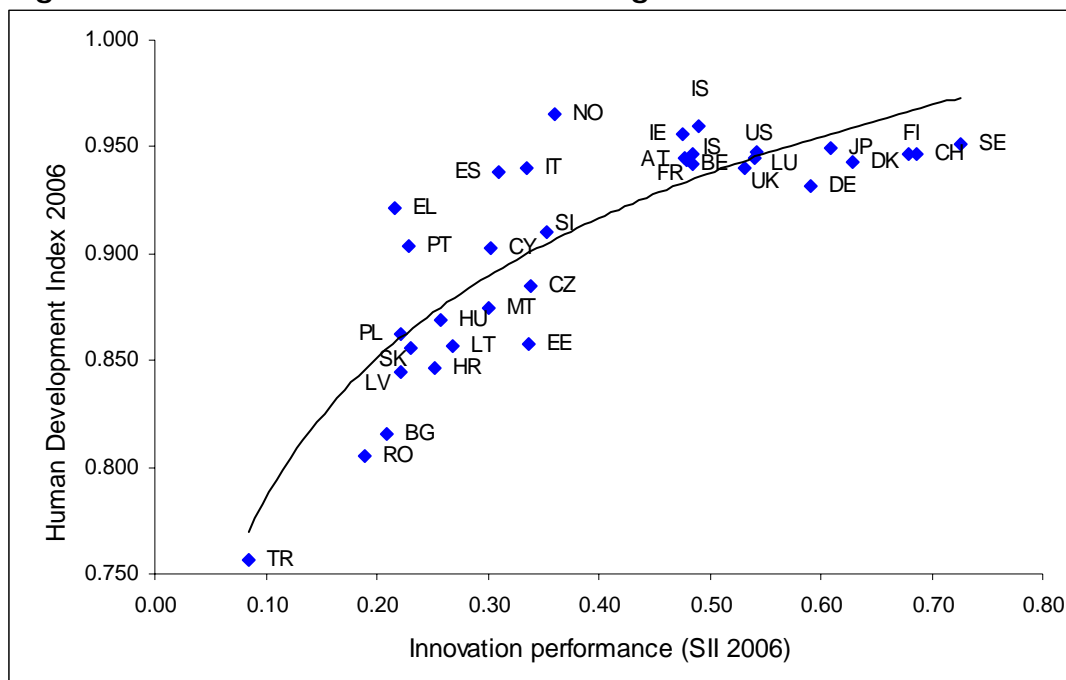
- The result for flexibility of wage bargaining is more curious, in particular as it is most strongly correlated with the innovation drivers dimension of innovation performance. Linked to this, the indicators of social equity also correlate relatively strongly with some dimensions of innovation performance, with the notable exception of social protection expenditure. There are no clear cut causal explanations for this, but it is consistent with earlier work (e.g. NIS paper (Arundel, 2003)) and could warrant further examination.
- There are some correlations between indicators of governance and overall innovation performance. This is particularly the case between government effectiveness and innovation drivers, and to some extent for explaining differences in innovation and entrepreneurship.
- It is noticeable that relatively few of the indicators correlate with the applications dimension of innovation performance (which includes employment in high-tech services, exports of high-tech products, sales of new-to-firm and of new-to-market products, and employment in medium-high and high-tech manufacturing), particularly as this is the dimension which is least correlated with GDP. The most highly correlated indicator with applications is that for income equality, an intriguing result. One possible explanation might be that more equal societies have a higher demand for innovative products and services, i.e. that income equality creates innovation friendly demand conditions. Another explanation is that this dimension of the innovation performance is the most difficult to measure, and hence improvements in the indicators are needed before causal factors can be properly identified.

## 1. Introduction

Economic growth is at the heart of increases in people's well-being. With increasing levels of income societies have the means to ensure adequate per capita food supplies and well-developed high quality health care and educational systems accessible for all. A widely accepted measure of well-being is the Human Development Index (HDI) which is a measure of life expectancy, literacy, education and standard of living for countries worldwide (UNDP, 2006). Innovation including technological progress is one of the main sources of economic growth and well being.

The European Innovation Scoreboard (EIS) measures the innovation performance of EU Member States by means of the Summary Innovation Index (SII). Differences in innovation performance do explain differences in well-being as measured by the HDI 2006 as shown in Figure 1, in particular for the countries with below average levels of innovation performance. Finding robust explanations for these differences in innovation performance will be essential in trying to understand why some countries perform less well and these explanations will also guide us towards better policies aimed at improving the innovation performance of the EU and its Member States.

**Figure 1 Innovation and human well-being**



The SII is a composite index measuring average innovation performance by country by taking the average of 25 different indicators measuring different aspects of the innovation process. These 25 indicators are divided in 5 different innovation dimensions (see Annex 1). Innovation drivers measure the structural conditions required for innovation potential. Knowledge creation measures the investments in R&D activities, considered as one of the key elements for a successful knowledge-based economy. Innovation and entrepreneurship measures the efforts towards innovation at the firm level. Applications measure the performance, expressed in terms of labour and business activities, and their value added in innovative sectors.

Intellectual property measures the achieved results in terms of successful know how. For each of the innovation dimensions a composite index is calculated<sup>2</sup>.

There is a high level of variation in innovation performance in the EIS 2006. Table 1 summarizes the variation in performance on the SII and the different innovation dimensions for the 27 EU Member States, Iceland, Norway and Switzerland using 4 different measures of variation<sup>3</sup>. The first measure of variation is the range or the difference between the best and worst performer. In order to be able to better compare differences in variation over the innovation dimensions, the range is divided by the median score. The range is smallest for Innovation drivers, Innovation & entrepreneurship and Applications and largest for Intellectual property. The second measure of variation is the variance which is equal to the average squared deviation of each number from the mean value. The standard deviation is our third measure of variation and it is the most commonly used measure of spread. The standard deviation is defined as the square root of the variance. A small standard deviation (variance) means the data are close together, a large standard deviation (variance) means the data are wide spread. For the same reason as for the range, both measures are divided by the median score.

Applications and Innovation & entrepreneurship have the smallest standard deviation and variance: innovation performance in these two dimensions is most even within Europe. Intellectual property has the largest standard deviation and variance. A fourth measure of variation or spread is the ratio of best to worst performer. This ratio is smallest for Innovation & entrepreneurship and by far largest for Intellectual property. For the SII all measures of variation are smaller than the five dimensions with the partial exception of Applications.

**Table 1 Variation in innovation performance**

	SII	Innovation drivers	Knowledge creation	Innovation & entrepreneurship	Applications	Intellectual property
Best performer	0.73 (SE)	0.81 (FI)	0.81 (SE)	0.81 (SE)	0.74 (MT)	0.97 (CH)
Worst performer	0.19 (RO)	0.13 (MT)	0.08 (SK)	0.18 (ES)	0.10 (LV)	0.00 (RO)
Median performer	0.35 (SI)	0.45 (AT)	0.39 (SI)	0.42 (LT)	0.43 (HU)	0.23 (ES)
Range/median	1.523	1.526	1.885	1.522	1.499	4.178
Variance/median	0.071	0.082	0.097	0.067	0.058	0.302
Standard deviation/median	0.448	0.430	0.499	0.403	0.403	1.140
Ratio of best to worst performer	3.8	6.4	10.7	4.5	7.8	26490.5

This report will identify policy indicators explaining variations in national innovation performance along the 5 innovation dimensions. The indicators used in this report are partially extracted from the indicators studied in the 2003 EIS Thematic Paper "National Innovation System Indicators" or 2003 NIS report (Arundel, 2003), the 2004 EIS Thematic Paper "EXIS: An Exploratory Approach to Innovation Scoreboards" or 2004 EXIS report (Arundel and Hollanders, 2005) and "The Global Competitiveness Report 2006-2007" (World Economic Forum, 2006).

<sup>2</sup> This methodology is explained in the EIS 2007 report.

<sup>3</sup> Croatia, Turkey, the US and Japan are not included as for each of these countries composite indicator scores are missing for at least 2 innovation dimensions.

## 2. Choice of indicators

Innovation performance is one of the drivers of economic growth and improvements in human well-being. This paper seeks to identify factors that can help explain why countries' innovation performance varies so markedly.

One starting point is the National Innovation Systems (NIS) approach which attempts to understand which factors of each country's NIS have an influence on these differences in innovation performance. The 2003 NIS report distinguished between two major features that explain differences in innovation performance in each NIS: structural (or economic) characteristics and socio-cultural and institutional characteristics where the latter include those characteristics "that encourage individuals, entrepreneurs and employees to actively look for opportunities for innovation, and to acquire the tools to successfully implement them" (Arundel, 2003). The structural indicators are grouped in 3 different categories: demand potential for innovations, industry structure and open economy. The socio-cultural and institutional indicators are grouped in 6 different categories: finance, receptiveness to new ideas, social equity, labour market, entrepreneurial attitudes and social capital. For each of these categories Table 1 summarizes the NIS 2003 correlation results with variations in innovation performance as measured by the 2003 EIS Summary Innovation Index (SII). Social equity and social capital are positively correlated with innovation performance, demand potential and receptiveness to new ideas are weakly correlated with innovation performance, open economy, finance and labour market are not correlated with innovation performance, and industry structure and entrepreneurial attitudes are negatively correlated with innovation performance. For this reason social equity and social capital indicators are included in the analysis presented in this paper.

**Table 1 NIS 2003: categories and indicators**

<b>STRUCTURAL INDICATORS</b>	
<b>Demand potential for innovations</b>	
<ul style="list-style-type: none"> <li>GDP per capita in PPS, relative to the EU15 average of 100</li> <li>Youth share: Ratio of the share of the total population under 30 to the share 65 and over</li> <li>Average time to sales takeoff for consumer products</li> <li>Capital investment: Gross fixed capital formation by the private sector as a percentage of GDP</li> </ul>	Weakly positively correlated with SII
<b>Industry structure</b>	
<ul style="list-style-type: none"> <li>Percent of all private sector value added (primary, manufacturing &amp; services) from private services</li> <li>Percent of all manufacturing value-added from low &amp; medium-low technology manufacturing</li> <li>SME share of total manufacturing employment</li> </ul>	Negatively correlated with SII
<b>Open economy</b>	
<ul style="list-style-type: none"> <li>Transnationality Index: average of FDI inflows as a percent of gross fixed capital formation, FDI inward stock as a percent of GDP, value added of foreign affiliates as a percent of GDP, and employment of foreign affiliates as a percent of total employment</li> <li>Trade openness: Imports + exports of goods and services divided by GDP</li> <li>Foreign-funded R&amp;D as a percentage of total R&amp;D</li> </ul>	Not correlated with SII
<b>SOCIO-CULTURAL AND INSTITUTIONAL INDICATORS</b>	
<b>Finance</b>	
<ul style="list-style-type: none"> <li>Insider/outsider composite index</li> </ul>	Not correlated with SII
<b>Receptiveness to new ideas</b>	
<ul style="list-style-type: none"> <li>Percent of tertiary students from abroad</li> <li>Percent of population that can converse in at least one foreign language</li> <li>Attitude towards science, e.g. esteem for scientific professions</li> <li>Percent of households living in densely populated areas</li> <li>Percent employed (25 to 64 inclusive) with creative occupations (ISCO classes 1–3)</li> </ul>	Weakly positively correlated with SII

<b>Social equity</b>	
<ul style="list-style-type: none"> <li>• Expenditure on social protection as a percentage of GDP</li> <li>• Income equality: 1 – (total income received by the top 20% of the population/ that received by the bottom 20% of the population)</li> <li>• Employment participation rate: Percent of working age population (15-64 inclusive) in employment</li> </ul>	Positively correlated with SII
<b>Labour market</b>	
<ul style="list-style-type: none"> <li>• Job mobility: Percent employees with less than 2 years in their current employment</li> <li>• Percent of employees in a trade union</li> </ul>	Not correlated with SII
<b>Entrepreneurial attitudes</b>	
<ul style="list-style-type: none"> <li>• Positive attitude to self-employment</li> <li>• Positive attitude to starting a financially risky business</li> </ul>	Negatively correlated with SII
<b>Social capital</b>	
<ul style="list-style-type: none"> <li>• Trust: Percent of survey respondents agreeing that 'most people can be trusted' to the question: 'Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?'</li> </ul>	Positively correlated with SII

Source: Arundel (2003)

A second starting point is the 2004 EXIS report which developed an alternative innovation scoreboard with a greater focus on innovation activities at the firm level. The indicators used in the EXIS report were classified in 6 different themes: innovation diversity, innovation-friendly market, knowledge flows, innovation investment, innovation skills and innovation governance. For each of these categories Table 2 summarizes the EXIS 2004 correlation results with variations in innovation performance as measured by the Summary Innovation Index (SII). Innovation skills and innovation governance are positively correlated with innovation performance, innovation diversity and innovation friendly market are weakly correlated with innovation performance, and knowledge flows and innovation investment are not correlated with innovation performance. For the analysis in this paper, we have included indicators relating to the market, knowledge flows and governance. However, in each case a different set of indicators has been used as explained in the next section.

**Table 2 EXIS 2004: categories and indicators**

<b>Theme 1: Innovation Diversity</b>	
<ul style="list-style-type: none"> <li>• Percentage of all firms that are strategic innovators</li> <li>• Percentage of all firms that are intermittent innovators</li> <li>• Value-added as a percent of turnover</li> <li>• Percentage of all firms that are non-technical innovators (introduced an organizational, design or advanced management technique)</li> <li>• Percentage of firms that applied for one or more patents</li> <li>• Number of domestic community trademarks per million population</li> <li>• Number of domestic industrial designs per million population</li> </ul>	Weakly positively correlated with SII
<b>Theme 2: Innovation friendly market</b>	
<ul style="list-style-type: none"> <li>• Percentage of total population under age 25</li> <li>• Average time to sales takeoff for consumer products</li> <li>• Index for the sophistication of local buyers (actively seeking the latest products, technologies, and processes)</li> <li>• Percent of innovative and non-innovative firms (separately) that give a high importance to a lack of customer responsiveness to new goods or services as a barrier to their ability to innovate</li> </ul>	Weakly positively correlated with SII
<b>Theme 3: Knowledge flows</b>	
<ul style="list-style-type: none"> <li>• Percentage of all firms collaborating internationally on innovation</li> <li>• Share of all firms finding higher education knowledge sources to be of medium or high importance to their innovation activities</li> <li>• Share of all firms giving a high importance to at least one external source of knowledge for their innovation activities</li> <li>• Transnationality Index (indicator of inward flows of embodied and tacit knowledge) (average of FDI inflows as a percent of Gross Fixed Capital Formation, FDI inward stock as a percent of GDP, value added of foreign affiliates as a percent of GDP, and employment of foreign affiliates as a percent of total employment)</li> </ul>	Not correlated with SII

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**Theme 4: Innovation investment**

- Composite index for finance availability based on loan access and venture capital availability
- Gross investment in machinery and equipment as a percentage of total value added
- Share of firms that receive public subsidies to innovate
- Policy uptake rate, or average percent of all eligible innovation support programs used by innovative SMES (20-499 employees)
- Percent of innovative and non-innovative firms (separately) that give a high importance to either innovation costs or lack of finance as a barrier to innovate

Not correlated with SII

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**Theme 5: Innovation skills**

- Percent private sector employees whose job requires continual learning. From the Third European WCS of 8081 randomly selected individuals in all EU-15 countries. Private sector employees are divided into four groups depending on their job characteristics: learning, lean production, Taylorism, and traditional/craft
- Percent of all employees with higher education
- Percentage of employees that have participated in Continuing Vocational Training (CVT), defined as training measures or activities financed by the enterprise, partly or wholly, for employees with a working contract
- Average hours of CVT per employee

Positively correlated with SII

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**Theme 6: Innovation governance**

- Composite index for government waste based on responses to 1) do government subsidies to business in your country keep uncompetitive industries alive artificially or do they improve the productivity of industries?, 2) how common is the diversion of public funds to companies, individuals or groups due to corruption?, and 3) how high is the public trust in the financial honesty of politicians? The higher the number of the index, the *less* waste. Therefore, we could call this a government efficiency index
- Composite index for innovation policies based on measures of the 1) effectiveness of IPRs, 2) size and availability of R&D tax credits and subsidies (3.07), 3) costs of tariff restrictions
- Composite index for the cost of starting a business based on four indicators (number of procedures, time in days, cost as a percentage of average income, minimum capital required as a percentage of average income)
- Composite index for domestic product regulation (inward oriented policies), including economic and administrative regulation
- Percent of all firms that give a high importance to environmental benefits from technical innovation

Positively correlated with SII

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Source: Arundel and Hollanders (2005)

A third starting point is the Global Competitiveness Report (GCR). The GCR assesses the competitiveness of nations by building a composite indicator, the Global Competitiveness Index (CGI), using data for almost 130 indicators. Many of these originate from the World Economic Forum's Executive Opinion Survey where representative businesses in each country are asked to evaluate on a scale from 1 to 7 the current condition of their operating environment. For the 2006 GCR more than 11000 responses were used to compile the more than 100 survey based indicators in the GCR (World Economic Forum, 2006). The GCR groups the indicators into three sub-indexes and nine pillars (Table 3): institutions, infrastructure, macro-economy, health and primary education, higher education and training, market efficiency, technological readiness, business sophistication and innovation. Countries are classified in three different groups based on their level of development. In the first stage, the factor-driven stage, "countries compete based on their factor endowments, primarily unskilled labour and natural resources. Companies compete on the basis of prices and sell basic products or commodities". None of the countries covered in the EIS belong to the factor-driven stage. In the second stage, the efficiency-driven stage, countries need "to develop more efficient production processes and increase product quality". Bulgaria, Croatia, Latvia, Lithuania, Poland, Romania, Slovak Republic and Turkey belong to the efficiency-driven stage. The categories and indicators listed under Efficiency enhancers are most critical for the countries in the efficiency-driven stage. In the third-stage, the innovation-driven stage, countries "are only able to sustain higher wages and the associated standard of living if their businesses are able to compete with new and

unique products". Czech Republic, Estonia, Hungary and Malta are in between the efficiency-driven and innovation-driven stage. All EU15 countries, Cyprus, Iceland, Japan, Norway, Slovenia, Switzerland and the US belong to the innovation-driven stage. The categories and indicators listed under Innovation and sophistication factors are most critical for the countries in the innovation-driven stage. Therefore, various indicators from the market efficiency, technological readiness, and innovation categories have been selected for the analysis in this paper. Business sophistication indicators have not been used because as most of these indicators measure the competitive environment of a country and not its innovation environment.

**Table 3 Global Competitiveness Report 2006-2007: categories and indicators**

<b>Basic requirements</b>	
1. Institutions	29 indicators
2. Infrastructure	8 indicators
3. Macro-economy	8 indicators
4. Health and primary education	9 indicators
<b>Efficiency enhancers</b>	
5. Higher education and training	8 indicators
6. Market efficiency	32 indicators
7. Technological readiness	15 indicators
<b>Innovation and sophistication factors</b>	
8. Business sophistication	12 indicators
9. Innovation	8 indicators

Finally, a set of indicators on governance have been drawn from the World Bank's Worldwide Governance Indicators project following the analysis between country level indicators on governance and innovation in Celikel Esser (2007)<sup>4</sup>:

- Voice and accountability, the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media.
- Political stability and absence of violence.
- Government effectiveness, the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
- Regulatory quality, the ability of the government to formulate and implement sound policies and regulations that permits and promotes private sector development.
- Rule of law, the extent to which agents have confidence in and abide by the rules of society.
- Control of corruption, the extent to which public power is exercised for private gain as well as "capture" of the state by elites and private interests.

Of the various categories and indicators in the NIS 2003, EXIS 2004, the GCR 2006-2007 and World Bank reports we have selected the categories and indicators shown in Table 4. Only those categories of the NIS 2003 and EXIS 2004 reports have been selected which were significantly correlated with innovation performance as measured by the SII. For these categories we have used some of the indicators used in the NIS 2003 and EXIS 2004 reports and indicators from the GCR 2006-2007 report and the governance indicators from the World Bank's Worldwide Governance Indicators project. From the GCR 2006-2007 report, we have selected

<sup>4</sup> The indicators are based on several hundred individual variables measuring perceptions of governance, drawn from 31 separate data sources constructed by 25 different organizations. The individual measures of governance are assigned to different categories capturing key dimensions of governance (Kaufmann et al., 2006).

relevant categories and indicators out of the group of efficiency enhancers and innovation and sophistication factors as all EU countries belong to the efficiency-driven and innovation-driven stage or are in a transition phase between these stages. Higher education and training was not selected as the EIS itself already includes several education indicators. Technological readiness and Innovation were not selected as both seem to be too much intertwined with the concept of (technological) innovation. These indicators have been categorised under seven categories as shown in Table 4 and for the reasons set out in the following section.

**Table 4 Selected categories and indicators**

<b>Demand conditions</b>	<b>* NIS 2003</b>
<ul style="list-style-type: none"> <li>Youth share</li> <li>Buyer sophistication</li> </ul>	Included in EXIS * "Innovation friendly market" GCR "Business sophistication" indicator
<ul style="list-style-type: none"> <li>Government procurement of advanced technology products</li> </ul>	GCR "Innovation" indicator
<ul style="list-style-type: none"> <li>Demanding regulatory standards</li> </ul>	GCR "Market efficiency" indicator
<b>Social capital</b>	<b>*** NIS 2003</b>
<ul style="list-style-type: none"> <li>Trust</li> <li>Perception of corruption</li> </ul>	
<b>Institutional framework</b>	
<ul style="list-style-type: none"> <li>Burden of administration</li> <li>Quality of education system</li> </ul>	GCR "Institutions" indicator *** EXIS 2004 "Innovation skills" GCR "Higher education and training" indicator
<ul style="list-style-type: none"> <li>Strength of domestic property protection</li> <li>Price stability</li> </ul>	GCR "Innovation" indicator
<b>Market efficiency</b>	
<ul style="list-style-type: none"> <li>Intensity of local competition</li> <li>Foreign ownership restrictions</li> <li>Flexibility of wage determination</li> <li>Financial market sophistication</li> </ul>	GCR "Market efficiency" indicator GCR "Market efficiency" indicator GCR "Market efficiency" indicator GCR "Market efficiency" indicator
<b>Technology/knowledge flows</b>	<b>– EXIS 2004</b>
<ul style="list-style-type: none"> <li>Brain drain</li> <li>Firm's aggressiveness in absorbing new technologies</li> <li>Importance of university-industry research collaboration</li> </ul>	GCR "Market efficiency" indicator GCR "Technological readiness" indicator GCR "Innovation" indicator
<b>Social equity</b>	<b>*** NIS 2003</b>
<ul style="list-style-type: none"> <li>Expenditure on social protection</li> <li>Income equality</li> <li>Employment rate</li> </ul>	
<b>Governance</b>	<b>*** EXIS 2004</b>
<ul style="list-style-type: none"> <li>Voice and accountability</li> <li>Political stability</li> <li>Government effectiveness</li> <li>Regulatory quality</li> <li>Rule of law</li> <li>Control of corruption</li> </ul>	World Bank Governance Indicator World Bank Governance Indicator World Bank Governance Indicator World Bank Governance Indicator World Bank Governance Indicator World Bank Governance Indicator

\*\*\* Strong correlation with SII; \* Weak correlation with SII; – Not correlated with SII.

### 3. Seven categories of the wider innovation environment

The categories and indicators identified in Table 4 will now be discussed in more detail. Annex 3 provides for each of the indicators a graph showing countries' performance and some discussion.

#### 3.1 DEMAND CONDITIONS

Firms need markets where they can sell their new innovative products. Demand for innovative products can either come from business investments in new capital equipment, from consumer demand for final products or from government demand. Sophisticated domestic demand is included in Porter's (1990) "diamond" of competitive advantages as an important component of innovative capability. The reason for this is that informed consumers can play an important role in demanding technically advanced, innovative products. There are no direct indicators for 'sophisticated consumer demand', but the adoption rates for innovative consumer products are inversely related with age and positively related with income. We therefore use the following proxy indicator:

- **Youth share**, which is defined as the ratio of total population under 30 to population 65 and over (source: Eurostat)

For business investments or business sophistication we use the following proxy indicator:

- **Buyer sophistication** (source: WEF 2006, indicator 8.09)

The indicator gives the average score on a scale from 1 to 7 to the question: 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).

Governments can play an active role in promoting innovation by asking their suppliers for innovative products or solutions. We use the following proxy indicator to measure this role of governments:

- **Government procurement of advanced technology products** (source: WEF 2006, indicator 9.04)

The indicator gives the average score on a scale from 1 to 7 to the question: Government purchase decisions for the procurement of advanced technology products are (1 = based solely on price, 7 = based on technical performance and innovativeness).

Standards specify a technical reference standard, a minimum admissible attribute or technical design interface. Standards facilitate communication within an industry, reduce the cost of information acquisition for economic agents by reducing variety and they can yield uniformity which permit scale economies (Iversen, 2000). Standards thus promote the diffusion of new more efficient production techniques. We use the following indicator for measuring demanding regulatory standards:

- **Demanding regulatory standards** (source: WEF 2006, indicator 6.26)

The indicator gives the average score on a scale from 1 to 7 to question: Standards on products/service quality, energy and other regulations (outside environmental regulations) in your country are (1 = lax or nonexistent, 7 = among the world's most stringent).

#### 3.2 SOCIAL CAPITAL

Social capital is assumed to contribute to innovation by reducing transaction costs between firms, as well as information and enforcement costs (Barney and Hansen, 1994). Although social capital can take different forms (trust, norms and networks), most studies that include a measure of social capital use trust in people (Knack and Keefer, 1997; Whiteley, 1997). According to Knack and Keefer (1997, p. 1252): "Low trust can also discourage innovation. If entrepreneurs must devote more time

to monitoring possible malfeasance by partners, employees and suppliers, they have less time to devote to innovation in new products or processes." We have two indicators which measure social capital:

- **Trust** (source: Special Eurobarometer 223: Social Capital (p.41).  
Trust is measured by the percentage responses for 3 possible answers (Most people can be trusted; You can't be too careful; It depends) to the question: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?". The indicator used here takes the percentage of people who replied "Most people can be trusted".
- **Perception of corruption** (source: the 2006 Transparency International Corruption Perceptions Index<sup>5</sup>)  
"The index defines corruption as the abuse of public office for private gain and measures the degree to which corruption is perceived to exist among a country's public officials and politicians. It is a composite index, drawing on 12 polls and surveys from 9 independent institutions, which gathered the opinions of businesspeople and country analysts. The scores range from ten (squeaky clean) to zero (highly corrupt). A score of 5.0 is the number Transparency International considers the borderline figure distinguishing countries that do and do not have a serious corruption problem."

### 3.3 INSTITUTIONAL FRAMEWORK

The institutional framework is important for the competitiveness and innovativeness of a country by as it has a direct impact on the investment decisions of firms (WEF, 2006). Government regulation can hinder innovation activities<sup>6</sup> and better regulation is needed to spur innovation and economic growth. The EU's Better Regulation policy<sup>7</sup> aims at simplifying and improving existing regulations and the 2006 strategic review has shown that considerable progress has been made<sup>8</sup>. We use the following proxy indicator:

- **Burden of administration** (source: WEF 2006, indicator 1.07, burden of government regulation)  
The indicator gives the average score on a scale from 1 to 7 to the question: Complying with administrative requirements (permits, regulations, reporting) issued by the government in your country is (1 = burdensome, 7 = not burdensome).

Education and in particular higher education is crucial for the supply of highly skilled workers, professionals and researchers. The EIS has two indicators measuring the education system, Science and engineering (S&E) graduates per 1000 population and Population with a degree in tertiary education per 100 population. Here we use a proxy indicator for measuring differences in the quality of the educational system:

- **Quality of the educational system** (source: WEF 2006, indicator 5.03)  
The indicator gives the average score on a scale from 1 to 7 to the question: 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 basic policy rationale for intellectual property laws is that they facilitate and encourage the pursuit of innovation and the disclosure of knowledge into the public domain for the common good, by granting authors and inventors exclusive rights to exploit their works and invention for a limited period. The EIS includes 5

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<sup>5</sup> <http://www.transparency.org/>

<sup>6</sup> Cf. Epstein (2006) for how government regulation stifles innovation in the pharmaceutical industry.

<sup>7</sup> [http://ec.europa.eu/governance/better\\_regulation/index\\_en.htm](http://ec.europa.eu/governance/better_regulation/index_en.htm)

<sup>8</sup> European Commission, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: A strategic review of Better Regulation in the European Union, Brussels, 14 November 2006, COM(2006) 689 final.

performance indicators for intellectual property: the relative number of EPO patent applications, USPTO patents, Triad patents, Community trademarks and Community designs. Here we look at the strength of the domestic intellectual property system:

- **Intellectual property protection** (source: WEF 2006, indicator 9.07)

The indicator gives the average score on a scale from 1 to 7 to question: Intellectual property protection in your country (1 = is weak or nonexistent, 7 = is equal to the world's most stringent).

Price instability or high inflation rates are considered to have adverse effects on economic growth (Temple, 2000). Inflation has two countervailing effects on the incentive to innovate (Funk and Kromen, 2005). Past price rigidity is encouraging the use of inefficient cheap old intermediate goods, thereby reducing demand for new ones and thus the incentive to innovate. Future price rigidity lowers the relative price for a new good, thus increasing demand and the incentive to innovate. Funk and Kromen show that the first effect dominates the second effect; inflation thus lowers the incentive to innovate. Another argument why price stability increases investment is that it reduces the cost of capital and discount rates. We use the following proxy indicator for price stability:

- **The inverse of the inflation rate** (source: Eurostat)

The inflation rate is defined as the annual average rate of change in Harmonized Indices of Consumer Prices (HICPs).

### 3.4 MARKET EFFICIENCY

Markets are seen by many as the most efficient mechanism for allocating resources. Market distortions have an adverse effect on the efficient allocation of an economy's production factors (labour, capital), market efficiency is crucial to ensure an optimal allocation of these production factors. We use four proxy indicators for measuring market efficiency which were taken from the market efficiency group of indicators from the Global Competitiveness Report.

Competition encourages the adoption of innovation as companies evolve and offer new ideas in order to flourish in the marketplace. Intense local competition is thus expected to drive innovation:

- **Intensity of local competition** (source: WEF 2006, indicator 6.06)

The indicator gives the average score on a scale from 1 to 7 to the question: 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).

Foreign direct investment is seen as a source of new technology embodied in equipment and of innovative organizational and management methods. The 2003 NIS report however has shown that there is no correlation between the Transnationality Index capturing FDI inflows and the SII. Innovative organizational and management methods can also be 'imported' by foreign companies buying domestic companies with foreign management structures replacing domestic ones. We use the following indicator as a proxy:

- **Foreign ownership restrictions** (source: WEF 2006, indicator 6.10)

The indicator gives the average score on a scale from 1 to 7 to the question: Foreign ownership of companies in your country is (1 = rare, limited to minority stakes, and often prohibited in key sectors, 7 = prevalent and encouraged).

Attracting highly skilled workers is essential for firms to be able to expand their (innovative) activities. Firms will use high(er) wages to attract both domestic and foreign workers. Markets where wages can be determined by firms themselves are thus expected to be more conducive for innovation activities. We use the following indicator as a proxy:

- **Flexibility of wage determination** (source: WEF 2006, indicator 6.13)

The indicator gives the average score on a scale from 1 to 7 to question: Wages in your country are (1 = set by a centralized bargaining process, 7 = up to each individual company).

The sophistication of the domestic financial market will determine the efficient allocation of available resources, including those for innovation activities.

- **Financial market sophistication** (source: WEF 2006, indicator 6.19)

The indicator gives the average score on a scale from 1 to 7 to question: The level of sophistication of financial markets in your country is (1 = lower than international norms, 7 = higher than international norms).

### 3.5 TECHNOLOGY/KNOWLEDGE FLOWS

Skilled workers entering or leaving a country contribute to an increase or decrease in the knowledge stock of that country. Skilled workers will usually leave a country due to a lack of local opportunities. When there is a net outflow of skilled workers we speak of a brain drain and it is usually that this has an adverse impact on the knowledge stock and economic development of that country. We use the following indicators as a proxy for the perception of this brain drain effect:

- **Brain drain** (source: WEF 2006, indicator 6.17)

The indicator gives the average score on a scale from 1 to 7 to the question: Your country's talented people (1 = normally leave to pursue opportunities in other countries, 7 = almost always remain in the country).

Diffusion of technologies is an important driver for product development. But not all firms or countries have the required skills to absorb new technologies developed elsewhere. We include the following indicator which measures the extent to which firms are capable of absorbing existing technologies:

- **Firm-level technology absorption** (source: WEF 2006, indicator 7.02)

The indicator gives the average score on a scale from 1 to 7 to question: Companies in your country are (1 = not able to absorb new technology, 7 = aggressive in absorbing new technology).

Research collaboration between the private and public sector is essential for an efficient flow of the results from universities' efforts in basic research. The EIS indicator on the share of enterprises receiving public funding for their innovation activities is a proxy indicator for public-private research collaboration. Here we use the following proxy indicator:

- **University-industry research collaboration** (source: WEF 2006, indicator 9.03)

The indicator gives the average score on a scale from 1 to 7 to question: In its R&D activity, business collaboration with local universities is (1= minimal or nonexistent, 7 = intensive and ongoing).

### 3.6 SOCIAL EQUITY

A socially inclusive society, with high rates of after-tax income equality and high educational levels, could support innovation through three channels. First, by increasing the disposable income of a large share of the population sophisticated demand will be increased. Second, the pool of individuals with both the capital and education to invest in risk taking innovative projects will be increased; and third, the pool of highly-trained scientists and engineers will be increased. But inequality could also increase innovation. High financial rewards for successful innovation and entrepreneurship could encourage individuals to invest in those skills and abilities that lead to high financial rewards. A more equal income distribution will imply smaller rewards for investing and saving as well as smaller incentives to do so.

Inequality can also be harmful for innovation, as low-income individuals may not have the resources to make the necessary investments to be able to access high-wage jobs reducing both the human capital stock of the economy and the purchasing power of much of the population. For the same reasons, social protection spending may either be good or bad for innovation, as its objective is to achieve income equality.

In the NIS 2003 report, the composite indicator for social equity correlates positively with innovation performance as measured by the SII. Here we adopt the same proxy indicators used in the 2003 NIS report:

- **The percentage of GDP spent on social protection** (source: Eurostat)  
Social protection expenditures include social benefits, administration costs and other expenditure linked to social protection schemes.
- **Income equality** (source: Eurostat)  
Income equality is defined as the ratio of total income received by the 20% of the population with the lowest income (lowest quintile) to that received by the 20% of the population with the highest income (top quintile).
- **The employment rate** (source: Eurostat)  
The employment rate is defined as the share of employed persons aged 15-64 out of total population of the same age group.

### 3.7 GOVERNANCE

Innovation governance is one of the categories in the 2004 EXIS report that correlated with innovation performance as measured by the SII. "Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them."<sup>9</sup> Research has shown that good governance is important for promoting the economic performance of a country. But research on linking governance to innovation performance is scarce. Celikel Esser (2007) explores in detail the link between innovation and governance by exploring the relationship between six governance indicators from the World Bank and the innovation performance measures from the EIS and the Global Innovation Scoreboard (Hollanders and Arundel, 2006). For three governance indicators – control of corruption, rule of law and government effectiveness, there is a strong link with innovation performance. For voice and accountability, political stability and regulatory quality Celikel Esser finds a moderate relation with innovation performance. We will use the same governance indicators from the World Bank to explore differences in innovation performance in each of the 5 innovation dimensions:

- **Voice and accountability** measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media (source: WGI 2007, scores range from -2.5 to +2.5).
- **Political stability and absence of violence** measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism (source: WGI 2007, scores range from -2.5 to +2.5).
- **Government effectiveness** measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the

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<sup>9</sup> Worldwide Governance Indicators (WGI) project: <http://info.worldbank.org/governance/wgi2007/>

government's commitment to such policies (source: WGI 2007, scores range from -2.5 to +2.5).

- **Regulatory quality** measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (source: WGI 2007, scores range from -2.5 to +2.5).

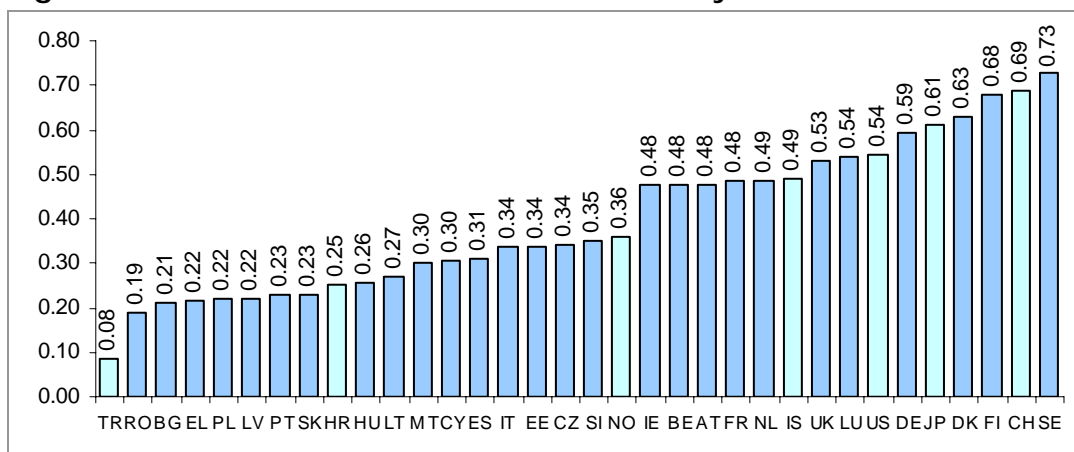
Rule of law is a concept close to that of trust. The same countries performing well on trust also perform well on rule of law. But there are also significant differences, as trust measures personal trust among people whereas rule of law measures trust in a society's law enforcement:

- **Rule of law** measures the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence (source: WGI 2007, scores range from -2.5 to +2.5).
- **Control of corruption** measures the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (source: WGI 2007, scores range from -2.5 to +2.5).

#### 4. Explaining variations in innovation performance

We have seen in section 1 that there is a high level of variation in innovation performance as measured by the 2006 Summary Innovation Index (SII). Figure 2 shows the ranking of the countries based on the 2006 SII. Sweden is the most innovative country and Turkey is the least innovative country. Variation is high, but it also appears that there are several groups of countries where variation within these groups is small. Within-group variation will not be addressed in this report.

**Figure 2 Variation in innovation: 2006 Summary Innovation Index**



We use ordinary least squares (OLS) linear regression models to analyse the relation between each of the 'policy' indicators and innovation performance as measured by the SII and the composite indexes for each of the innovation dimensions.

Per capita GDP will be used as a control variable as previous studies have shown that innovation and many of the individual indicators are correlated with per capita GDP (cf. Annex 2). By controlling for per capita GDP the regression results will be more robust and reliable. The correlation between GDP and the SII as well as between GDP and knowledge creation and Intellectual Property is relatively high. This means that there is less space for other factors to explain differences. In

contrast, GDP is more weakly correlated with applications, innovation and entrepreneurship, and to some extent innovation drivers, so it is in these dimensions that other factors may be relatively more important in explaining differences in performance. The results for the OLS regressions between the different indicators and the SII are shown in Table 5.

The NIS 2003 and EXIS 2004 reports showed strong correlation results between social capital, social equity and innovation governance and weak correlation results for demand. But in both the NIS 2003 and EXIS 2004 report the correlation analyses did not control for differences in per capita GDP. The regression results in Table 5 do use per capita GDP as a control variable and we may thus expect different results.

Variations in social capital as measured by trust and the perception of corruption have a high explanatory power in explaining differences in innovation performance. Societies where levels of trust and people's perception of corruption are higher show higher levels of innovation performance. Also technology flows as measured by firm's aggressiveness in absorbing new technologies and the importance of university-industry research collaborations have high explanatory power. But surprisingly differences in the net flow of skilled people leaving the country - the brain drain - do not explain differences in innovation performance. Of the demand conditions government procurement of advanced technology products and stringent standards on products and service quality, energy and other regulations seem to be important. The youth share as a proxy for sophisticated consumer demand and buyer sophistication as a proxy for business demand do not explain differences in innovation performance. Social equity and the SII were highly correlated in the NIS 2003 report, but results here show that only one of the 3 social equity indicators can explain differences in innovation performance. Countries with higher levels of income equality are more innovative. The EXIS 2004 report showed a high correlation coefficient between innovation governance and the SII. The results shown in Table 5 are different: we only find support for a weak explanatory power for the governance indicators. Good governance is important as a driver of innovation performance, but is not as important as suggested in previous studies. Differences in the institutional framework indicators explain variations in innovation performance. Countries where firms are less burdened with administrative requirements, where the educational system is of perceived higher quality, where domestic intellectual property protection is stringent and in particular where prices are stable will be more innovative. Differences in market efficiency also matter. Intense competition in the local market and wage flexibility where wages are not set by a centralized bargaining process both lead to higher innovation performance. Also the relative absence of restrictions on foreign ownership of domestic companies drives innovation performance.

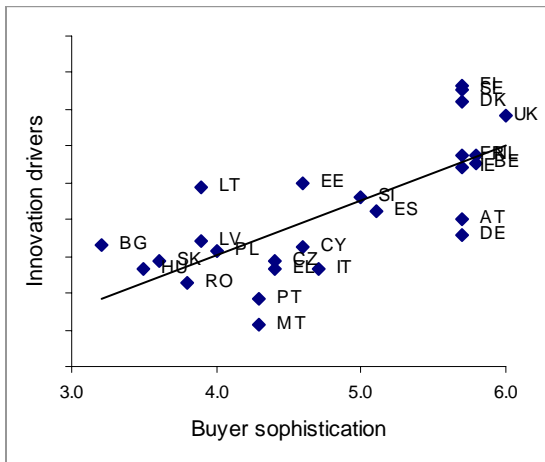
**Table 5 Regression results explaining variations in SII performance**

	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.789	0.176	6.971	0.014	9.730***	
<b>DEMAND CONDITIONS</b>						
Youth share	0.781	0.198	2.606	-0.008	-0.297	
Buyer sophistication	0.795	-0.029	-0.180	0.056	1.295	
Government procurement	0.815	-0.116	-0.811	0.084	2.072**	++
Demanding regulatory standards	0.830	-0.098	-0.903	0.063	2.579**	++
<b>SOCIAL CAPITAL</b>						
Trust	0.840	0.140	5.565	0.003	2.944***	+++
Perception of corruption	0.852	-0.003	-0.045	0.045	3.333***	+++
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.805	0.053	0.702	0.043	1.728*	+
Quality of educational system	0.807	0.011	0.114	0.045	1.772*	+
Intellectual property protection	0.810	-0.005	-0.049	0.055	1.910*	+
Price stability	0.827	0.108	3.151	1.577	2.750**	++
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.830	-0.248	-1.502	0.089	2.593**	++
Foreign ownership restrictions	0.809	-0.040	-0.340	0.043	1.873*	+
Flexibility of wage determination	0.818	-0.041	-0.402	0.037	2.200**	++
Financial market sophistication	0.792	0.078	0.860	0.026	1.117	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.792	0.082	0.943	0.033	1.148	
Firm-level technology absorption	0.872	-0.250	-2.346	0.094	4.069***	+++
University-industry research collaboration	0.878	-0.078	-1.246	0.086	4.292***	+++
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.751	0.189	2.554	-0.001	-0.193	
Income equality	0.813	0.065	1.064	0.597	1.996**	++
Employment rate	0.804	-0.119	-0.661	0.005	1.658	
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.789	0.114	1.657	0.078	0.982	
Political stability	0.806	0.137	4.172	0.067	1.763*	+
Government effectiveness	0.811	0.140	4.580	0.089	1.921*	+
Regulatory quality	0.806	0.103	2.107	0.093	1.751*	+
Rule of law	0.798	0.157	5.594	0.073	1.438	
Control of corruption	0.814	0.172	7.190	0.083	2.042*	+

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

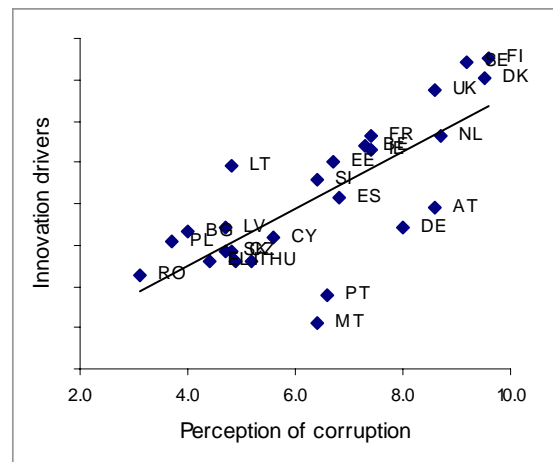
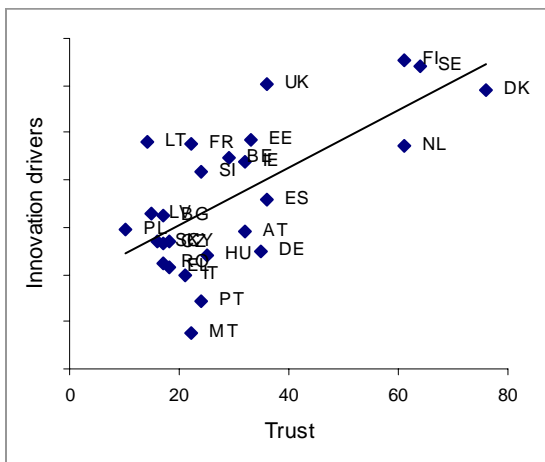
#### 4.1 Innovation drivers

Innovation drivers measure the structural conditions required for innovation. This dimension is captured by the following EIS indicators: the share of S&E graduates per 1000 population, the share of working age population with a tertiary education, the broadband penetration rate, the share of working age population active in life-long learning and the youth education attainment level. Most of these indicators are proxies for human skills; for population with tertiary education and youth education attainment level the direct impact of new policies or changes in existing policies to improve the performance on these indicators on the innovation performance of a country is limited as these indicators can only change slowly over time. The regression results are summarised in Table 6. The indicators with a significant regression coefficient will be discussed in more detail using scatter plots showing differences in indicator performance and per capita adjusted performance in Innovation drivers by country.



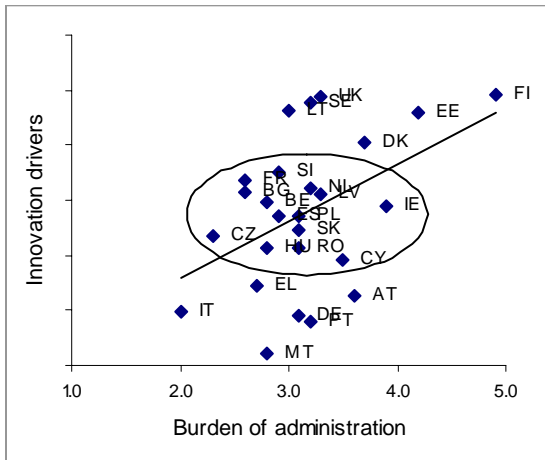
Variations in demand conditions have low explanatory power explaining differences in Innovation drivers. Only for business demand measured by buyer sophistication there is weak evidence that countries with more sophisticated buyers will perform better. But differences in buyer sophistication become less important when buyers are highly sophisticated. For Austria, Germany, Ireland, France, Denmark, Finland and Sweden buyer sophistication is similar but differences in Innovation drivers are large, with Denmark, Finland and Sweden

performing twice as good as Austria and Germany. In particular for countries experiencing low to medium levels of buyer sophistication differences seem to be important.



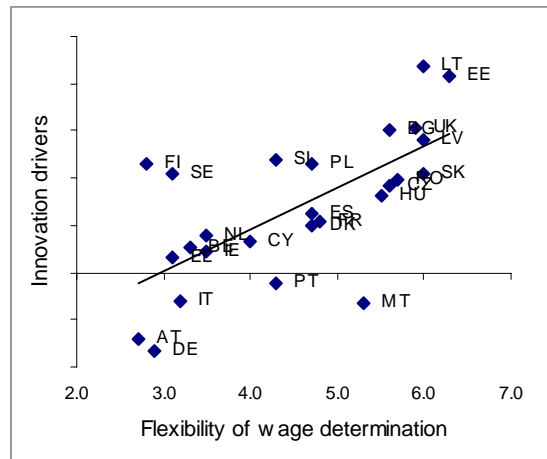
Social capital is a strong driver of Innovation drivers. The regression results show significant results for both trust and the perception of corruption. For trust the countries could even be divided in two different groups, given the gap in trust between Finland, Sweden, Denmark and Netherlands versus the other 'low trust' countries. For the 'low trust' countries the relation between trust and Innovation drivers seems to be even stronger. For the 'high trust' countries, there is a negative relationship between trust and Innovation drivers for the Northern countries. Here higher levels of trust clearly no longer matter in achieving higher performance in Innovation drivers. Differences in people's perception of corruption are strongly

related to differences in Innovation drivers with countries with low levels of corruption achieving high levels of performance. But this relation does not hold for all countries. Malta and Portugal, but also Germany and Austria, have far below expected Innovation drivers scores given their levels of perceived corruption, and for Lithuania the score is above the expected level.

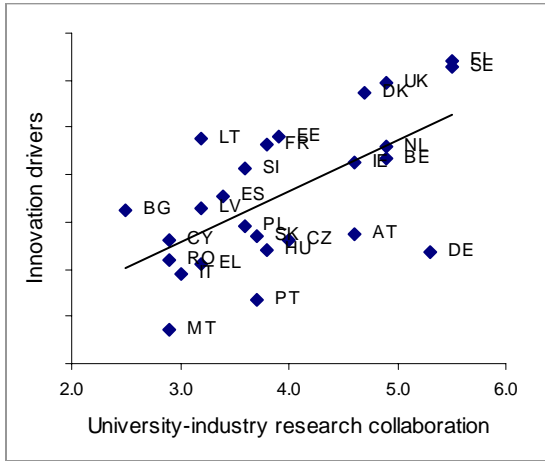


Of the institutional framework indicators only differences in the burden of administration seem to be important. Countries where firms do not feel hampered by administrative requirements have higher performance in Innovation drivers, but the graph on the left also shows that one has to be careful in interpreting the regression results for this indicator. There is a whole group of countries within the highlighted circle where lower levels of burden of administration are of less importance as the regression results would suggest.

Most of the market efficiency indicators do not explain differences in innovation performance with the notable exception of flexibility of wage determination. Countries where wages are set by a centralized bargaining process (low score on the indicator) have lower innovation performance and countries where wages are determined by the individual company have higher performance. As shown in the graph on the right, this relation holds true for most countries except Finland, Sweden and Malta. The bottom position of Austria and Germany on the vertical axis is explained by the fact that for all countries the scores for Innovation drivers shown on the vertical axis are not the real scores but hypothetical scores after controlling for differences in levels of per capita GDP. Given the fact that countries with a centralized bargaining process – Finland, Sweden, Austria and Germany – share high and low innovation scores, one may say that the positive relation between flexibility of wage determination and Innovation drivers performance only holds true for countries where there are no centralized wage bargaining processes.

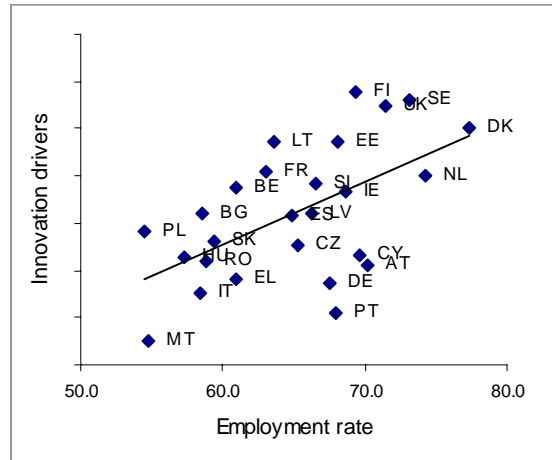


As shown in the graph on the right, this relation holds true for most countries except Finland, Sweden and Malta. The bottom position of Austria and Germany on the vertical axis is explained by the fact that for all countries the scores for Innovation drivers shown on the vertical axis are not the real scores but hypothetical scores after controlling for differences in levels of per capita GDP. Given the fact that countries with a centralized bargaining process – Finland, Sweden, Austria and Germany – share high and low innovation scores, one may say that the positive relation between flexibility of wage determination and Innovation drivers performance only holds true for countries where there are no centralized wage bargaining processes.

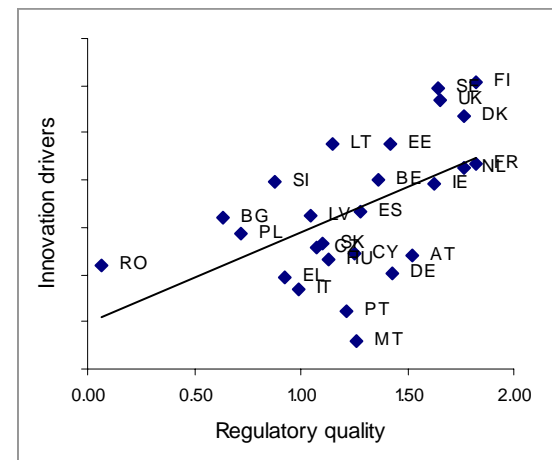
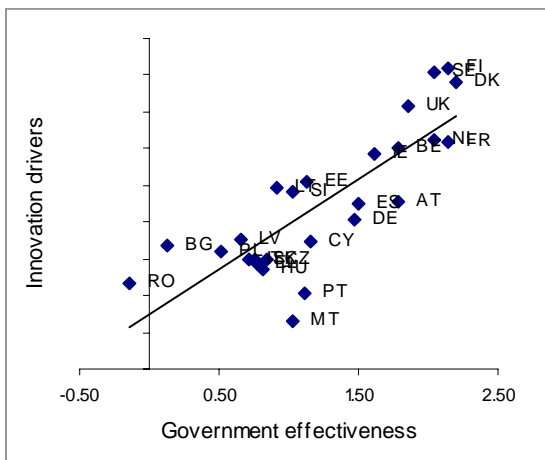


Technology or knowledge flows only matter when there are differences in the perceived intensity of university-industry research collaboration. Collaboration between universities and business enterprises matters. The EIS 2005 included an indicator measuring the share of university R&D expenditures financed by industry but the indicator was no longer included in the EIS 2006 as it was not correlated with the SII. Here we could have an example of an indicator where quantity (funding share) and perceived quality (intensity) are not linearly related.

Social equity as measured by differences in social protection expenditures and income equality cannot explain differences in Innovation drivers but differences in the employment rate do drive innovation performance. Although there are some exceptions, the graph on the right clearly shows that countries with higher shares of the adult population being employed have higher innovation performance.



Good governance is important in driving Innovation drivers, but only differences in government effectiveness and regulatory quality matter. Government effectiveness measures the quality of public services, the degree of its independence from political pressures and government's commitments to formulate and implement high quality policies. Countries where governments excel in good governance score high on Innovation drivers. In particular Sweden, Finland and Denmark show that good governance and innovation performance are strongly related. But also governments' abilities to formulate and implement sound policies and regulations that promote private sector development explain differences in Innovation drivers. Here is the relationship is less strong and we can see that there are more pronounced exceptions (Malta and Portugal).



Summarizing, social capital, good governance, market efficiency measured by flexibility of wage determination, lower burden of administration, high employment rates and intense university-industry research collaboration all drive good performance in Innovation drivers. Governments can actively contribute by, obviously, improving the quality and service of their public services ('good governance'), by reducing the number of permits and regulations so firms have to face less administrative requirement, by actively motivating firms and universities to collaborate and by improving labour market conditions so that less people will be unemployed.

**Table 6 Regression results explaining variations in Innovation drivers**

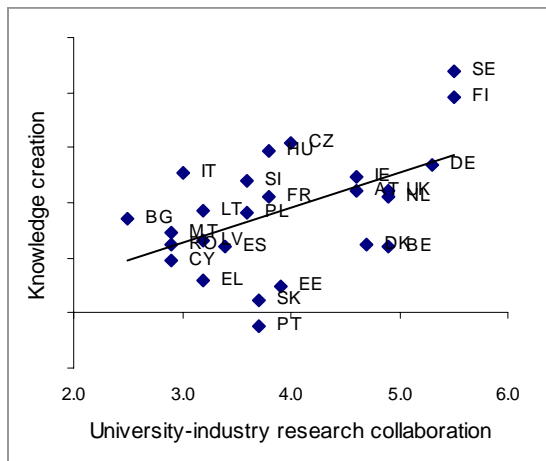
	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.492	0.249	5.225	0.014	5.023***	
<b>DEMAND CONDITIONS</b>						
Youth share	0.470	0.245	1.714	0.001	0.028	
Buyer sophistication	0.541	-0.295	-1.013	0.150	1.891*	+
Government procurement	0.482	0.040	0.136	0.060	0.731	
Demanding regulatory standards	0.523	-0.096	-0.433	0.079	1.595	
<b>SOCIAL CAPITAL</b>						
Trust	0.611	0.182	3.813	0.006	2.887***	+++
Perception of corruption	0.587	-0.028	-0.242	0.069	2.549**	++
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.569	-0.048	-0.351	0.103	2.302**	++
Quality of educational system	0.518	-0.021	-0.115	0.073	1.511	
Intellectual property protection	0.489	0.075	0.386	0.052	0.920	
Price stability	0.503	0.203	2.841	0.596	0.498	
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.490	-0.076	-0.219	0.068	0.945	
Foreign ownership restrictions	0.479	0.106	0.448	0.029	0.617	
Flexibility of wage determination	0.612	-0.258	-1.436	0.087	2.899***	+++
Financial market sophistication	0.511	0.024	0.139	0.061	1.384	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.492	0.091	0.558	0.054	1.006	
Firm-level technology absorption	0.518	-0.123	-0.489	0.082	1.506	
University-industry research collaboration	0.574	-0.069	-0.487	0.108	2.370**	++
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.457	0.362	2.665	-0.008	-0.943	
Income equality	0.475	0.195	1.577	0.290	0.478	
Employment rate	0.584	-0.537	-1.696	0.013	2.504**	++
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.478	0.179	1.367	0.087	0.573	
Political stability	0.494	0.204	3.163	0.077	1.031	
Government effectiveness	0.627	0.148	2.857	0.246	3.117***	+++
Regulatory quality	0.546	0.095	1.053	0.195	1.968*	+
Rule of law	0.474	0.238	4.325	0.041	0.415	
Control of corruption	0.524	0.242	5.221	0.128	1.621	

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

## 4.2 Knowledge creation

Knowledge creation measures the investments in R&D activities. This dimension is captured by 4 indicators: public R&D as a percentage of GDP, business R&D as a percentage of GDP, the share of medium-high and high-tech R&D and the share of firms receiving public funding for their innovative activities. The regression results are summarised in Table 7. The indicators with a significant regression coefficient will be discussed in more detail using scatter plots showing differences in indicator performance and per capita adjusted Knowledge creation performance by country.

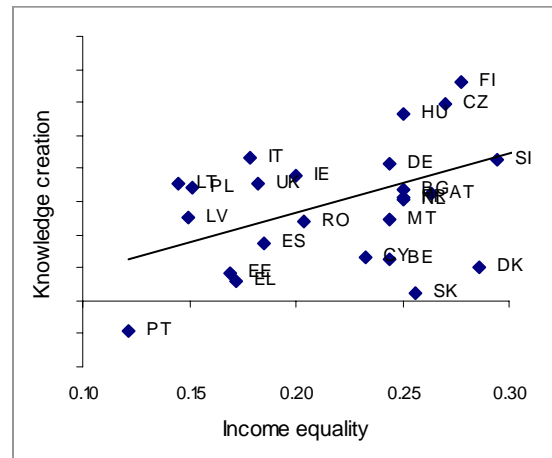
Variations in Knowledge creation are very strongly related to differences in per capita GDP. Once we control for per capita GDP, demand conditions, social capital, market efficiency and governance do not explain differences in Knowledge creation. There is only weak to moderate statistical evidence that technology flows and social equity are important.



Technology or knowledge flows only matter when there are differences in the perceived intensity of university-industry research collaboration. Collaboration between universities and business enterprises matters, but the relationship is not that strong as shown by the many countries lying relatively far below or above the regression line as shown in the graph on the left.

Social equity measured by higher levels of income equality has the highest explanatory power in explaining

differences in Knowledge creation. Income equality is defined as the ratio between the income share of the 20% of the population with the lowest income and that of the 20% of population with the highest income. As opposed to some popular beliefs that income inequality drives innovation with wealthy consumers driving innovation by asking the newest products for which they are willing to pay a premium price, these results suggest the opposite. Governments should thus pursue an income policy which guarantees a more equal income distribution. Progressive tax policies but also social welfare programs will distribute income from the wealthiest to less wealthy citizens.



**Table 7 Regression results explaining variations in Knowledge creation**

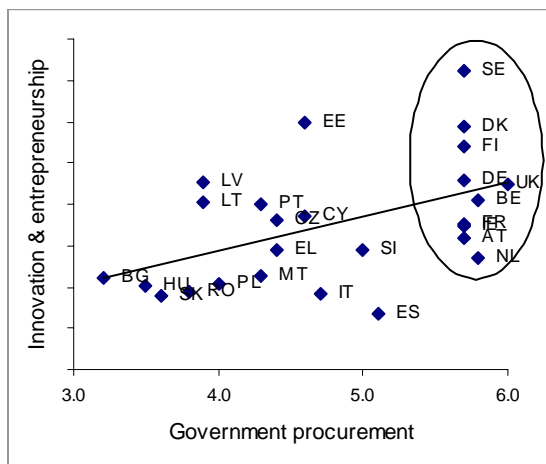
	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.757	0.122	3.479	0.018	8.871***	
<b>DEMAND CONDITIONS</b>						
Youth share	0.749	0.175	1.673	-0.019	-0.539	
Buyer sophistication	0.746	0.110	0.480	0.003	0.051	
Government procurement	0.749	0.008	0.039	0.033	0.537	
Demanding regulatory standards	0.760	-0.063	-0.381	0.042	1.138	
<b>SOCIAL CAPITAL</b>						
Trust	0.751	0.109	2.685	0.001	0.655	
Perception of corruption	0.747	0.098	1.008	0.006	0.264	
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.748	0.162	1.470	-0.014	-0.390	
Quality of educational system	0.748	0.064	0.451	0.016	0.422	
Intellectual property protection	0.746	0.18	1.017	-0.008	-0.186	
Price stability	0.752	.062	1.179	1.349	1.529	
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.751	-0.043	-0.166	0.034	0.645	
Foreign ownership restrictions	0.746	0.101	0.578	0.004	0.119	
Flexibility of wage determination	0.748	0.193	1.255	-0.012	-0.475	
Financial market sophistication	0.748	0.180	1.398	-0.016	-0.471	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.750	0.051	0.416	0.025	0.610	
Firm-level technology absorption	0.761	-0.099	-0.530	0.049	1.200	
University-industry research collaboration	0.778	-0.066	-0.610	0.064	1.829*	+
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.722	0.084	0.822	0.002	0.354	
Income equality	0.789	-0.043	-0.517	0.879	2.154**	++
Employment rate	0.748	0.236	0.904	-0.002	-0.442	
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.746	0.124	1.282	-0.003	-0.027	
Political stability	0.755	0.091	1.922	0.052	0.946	
Government effectiveness	0.747	0.128	2.820	-0.016	-0.232	
Regulatory quality	0.746	0.126	1.766	-0.006	-0.077	
Rule of law	0.746	0.121	2.975	0.004	0.053	
Control of corruption	0.746	0.122	3.388	0.002	0.030	

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

### 4.3 Innovation & entrepreneurship

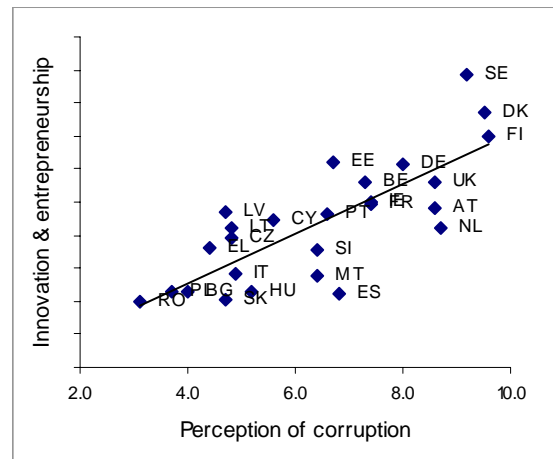
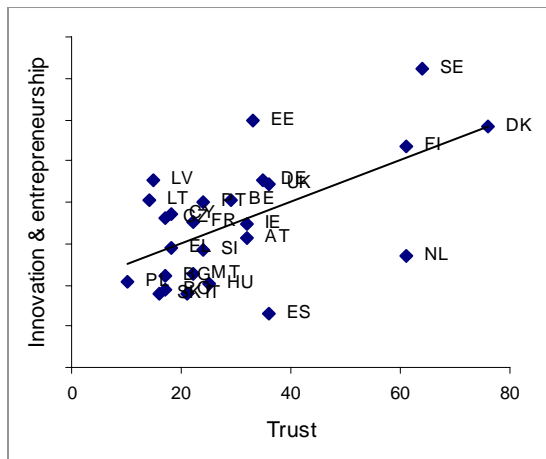
Innovation & entrepreneurship measures the innovation efforts made at the firm level. This dimension is captured by the following EIS indicators: the share of SMEs innovating in-house, the share of SMEs with co-operative innovation arrangements, innovation expenditures as a percentage of turnover, early-stage venture capital as a percentage of GDP, ICT expenditures as a percentage of GDP and the share SMEs implementing organisational innovations. The regression results are summarised in Table 8. The indicators with a significant regression coefficient will be discussed in more detail using scatter plots showing differences in indicator performance and per capita adjusted Innovation & entrepreneurship performance by country.

Variations in Innovation & entrepreneurship are very strongly related to differences in per capita GDP. But despite this, once we control for per capita GDP, all categories explain variations in Innovation & entrepreneurship, in particular social capital, technology flows and equity.

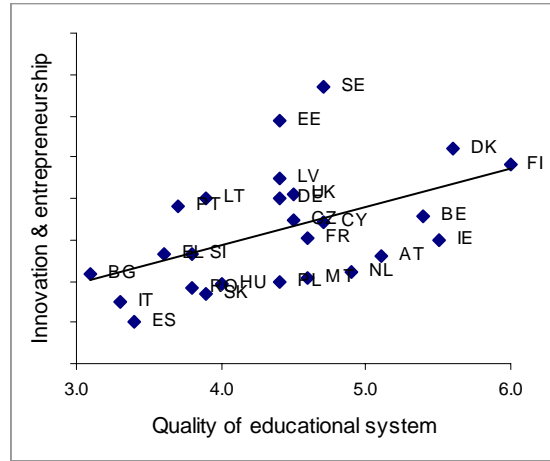
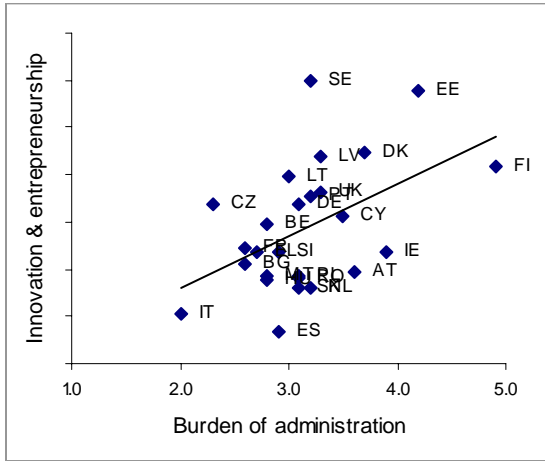


Consumer and business demand do not explain differences in Innovation & entrepreneurship, but government demand for advanced technology products does. Governments which base their purchase decision for the procurement of advanced technology products on technical performance and innovativeness rather than on cost price, clearly drive innovation in their country. However, for high levels of government procurement differences no longer seem to matter as indicated by the encircled countries in the graph on the left. Government procurement is

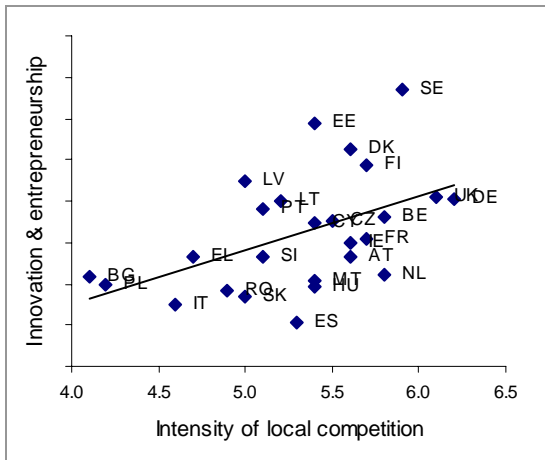
more a policy option for those countries with low to moderate levels on this indicator.



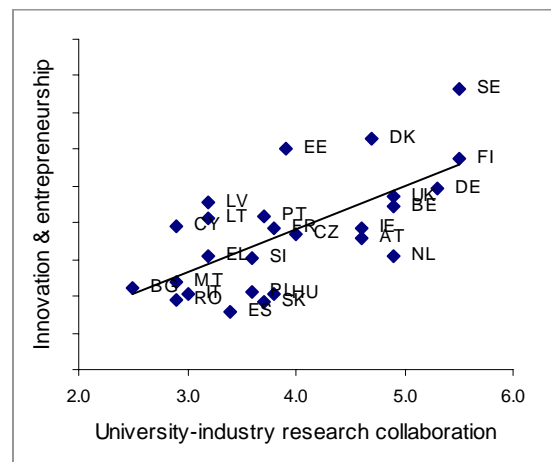
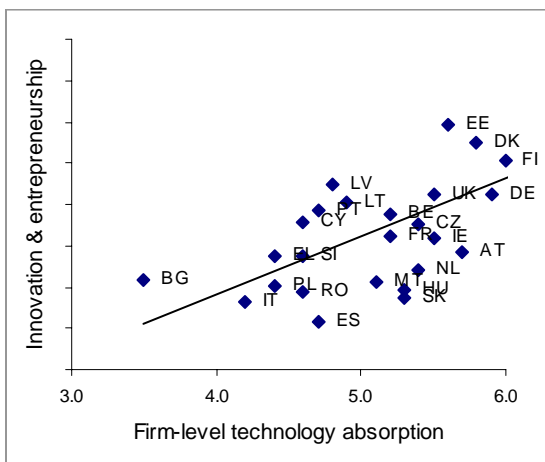
Social capital is a strong driver of Innovation & entrepreneurship. The regression results show significant results for both trust and the perception of corruption. For the 'low' trust countries the relation between trust and Innovation & entrepreneurship seems less strong and for the 'high trust' countries differences in trust do not matter. Differences in people's perception of corruption are more strongly related to differences in Innovation & entrepreneurship with countries with low levels of corruption achieving high levels of Innovation & entrepreneurship. But this relation does not hold for all countries.



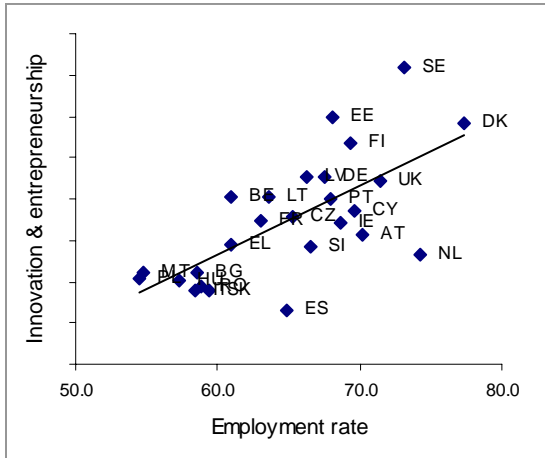
Of the institutional framework indicators both differences in the burden of administration and quality of the educational system seem to be important. Countries where firms do not feel hampered by administrative requirements have higher Innovation & entrepreneurship performance, but the graph above also shows that one has to be careful in interpreting the regression results for this indicator. There are many countries which combine levels of burden of administration and Innovation & entrepreneurship which are not as expected. Examples of such countries include Spain and Sweden. The quality of the educational system is weakly important. But countries clearly can improve their innovation performance by improving the quality of their educational system so that it better meets the needs of a competitive economy.



Differences in market efficiency explain variations in Innovation & entrepreneurship. Intense competition in the local market drives innovation as shown in the graph on the left. Competition in the international market is important for large companies competing with foreign firms for the preference of international customers, but also competition in the local market is important as it forces domestic firms to be more competitive and to be more innovative. Bulgaria, Poland, Italy and Greece clearly need to improve conditions in their countries aimed at intensifying local competition.

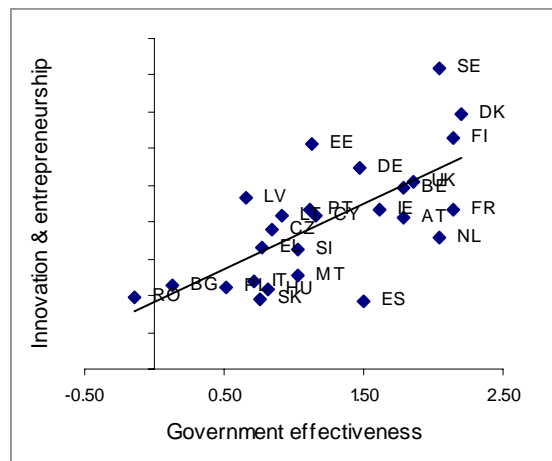
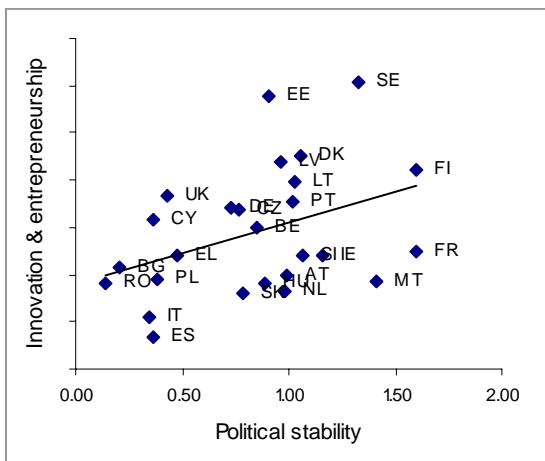


Technology flows explain differences in Innovation & entrepreneurship: both firm-level technology absorption and university-industry research collaboration show a strong relation with Innovation & entrepreneurship. Countries where firms are more aggressive in absorbing new technologies also score higher on Innovation & entrepreneurship. The aggressiveness with which firms absorb new technologies is perhaps not within the direct reach of government policies, but governments can improve the investment climate improving the conditions in which it is worthwhile for firms to become more competitive by actively seeking for and absorbing new technologies. Collaboration between universities and business enterprises also matters as countries with intense university-industry research collaboration show higher innovation performance.



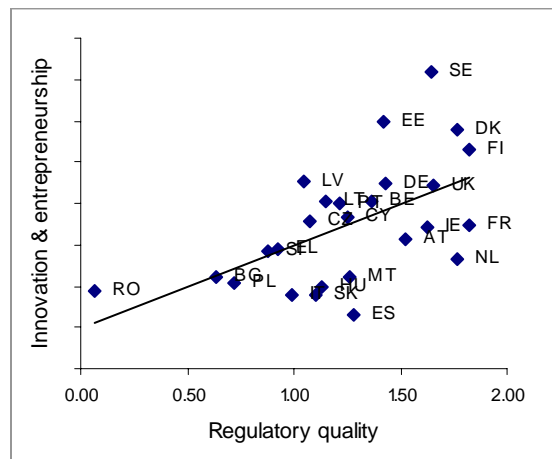
Social equity as measured by differences in the employment rate drives Innovation & entrepreneurship. Although there are some exceptions (Spain and Netherlands), the graph on the right clearly shows that countries with higher shares of the adult population being employed have higher innovation performance.

Good governance is important in driving Innovation & entrepreneurship, but differences in political stability, government effectiveness and regulatory



quality are only weakly related to variations in Innovation & entrepreneurship.

Political stability and absence of violence measures the perception how likely it is that governments will be destabilized or overthrown by unconstitutional or violent means. It is surprising that there are large differences between the indicator scores within Europe; one would assume that it is unlikely that governments could be overthrown in most EU Member States. Perhaps the indicator says more about people's perception of the risk of terrorism, as both the UK and Spain have low scores. Nevertheless, the indicator is weakly related to innovation



performance, but it seems unclear which policies governments can devise to improve performance on political stability. Government effectiveness measures the quality of public services, the degree of its independence from political pressures and government's commitments to formulate and implement high quality policies. Countries where governments excel in good governance score high on the scale of Innovation & entrepreneurship. In particular Sweden, Finland and Denmark show that good governance and innovation performance are strongly related. But also governments' abilities to formulate and implement sound policies and regulations that promote private sector development explain differences in Innovation & entrepreneurship.

**Table 8 Regression results explaining variations in Innovation & entrepreneurship**

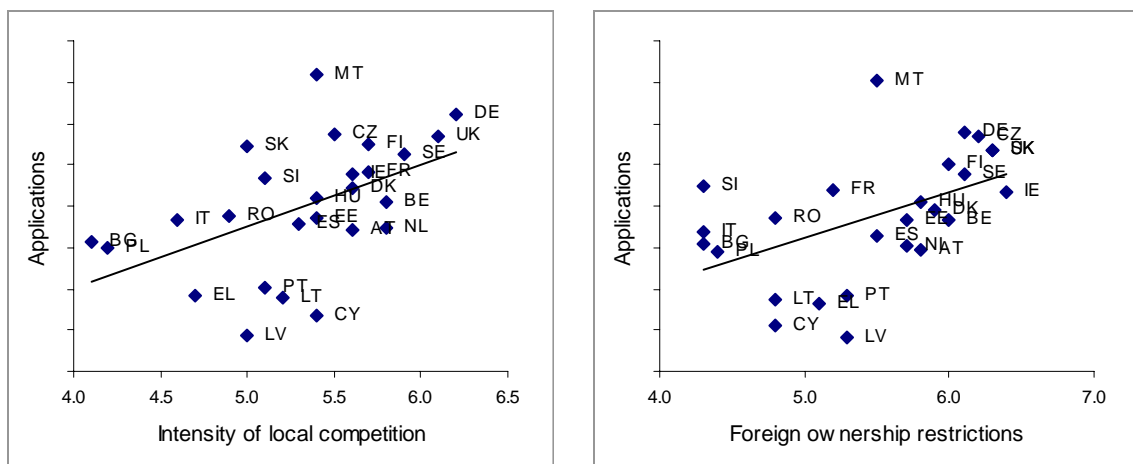
	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.328	0.255	5.227	0.010	3.566***	
<b>DEMAND CONDITIONS</b>						
Youth share	0.316	0.367	2.410	-0.041	-0.778	
Buyer sophistication	0.327	-0.048	-0.155	0.083	0.985	
Government procurement	0.398	-0.289	-1.005	0.155	1.917*	+
Demanding regulatory standards	0.371	-0.103	-0.451	0.081	1.598	
<b>SOCIAL CAPITAL</b>						
Trust	0.433	0.195	3.753	0.005	2.292**	++
Perception of corruption	0.489	-0.056	-0.482	0.077	2.870***	+++
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.452	-0.066	-0.484	0.112	2.495**	++
Quality of educational system	0.399	-0.086	-0.468	0.093	1.925*	+
Intellectual property protection	0.366	-0.034	-0.175	0.087	1.541	
Price stability	0.368	0.172	2.406	1.923	1.621	
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.395	-0.368	-1.101	0.130	1.882*	+
Foreign ownership restrictions	0.356	-0.075	-0.313	0.066	1.410	
Flexibility of wage determination	0.366	-0.056	-0.270	0.053	1.546	
Financial market sophistication	0.358	0.015	0.086	0.064	1.435	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.327	0.098	0.587	0.054	0.984	
Firm-level technology absorption	0.500	-0.421	-1.824	0.148	2.980***	+++
University-industry research collaboration	0.495	-0.154	-1.057	0.137	2.935***	+++
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.228	0.338	2.324	-0.004	-0.490	
Income equality	0.299	0.280	2.223	-0.133	-0.215	
Employment rate	0.546	-0.771	-2.586	0.017	3.472***	+++
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.325	0.136	1.006	0.147	0.943	
Political stability	0.399	0.168	2.617	0.142	1.928*	+
Government effectiveness	0.404	0.184	3.152	0.175	1.985*	+
Regulatory quality	0.406	0.097	1.067	0.200	2.000*	+
Rule of law	0.350	0.220	4.005	0.131	1.335	
Control of corruption	0.359	0.247	5.149	0.119	1.452	

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

#### 4.4 Applications

Applications measure the performance in employment and value added in innovative sectors. The following EIS indicators capture this dimension: the employment share in high-tech services, the employment share in medium-high and high-tech manufacturing, the export share of high-tech products, the sales share of new-to-firm products and the sales share of new-to-market products. The regression results are summarised in Table 9. The indicators with a significant regression coefficient will be discussed in more detail using scatter plots showing differences in indicator performance and per capita adjusted Applications performance by country.

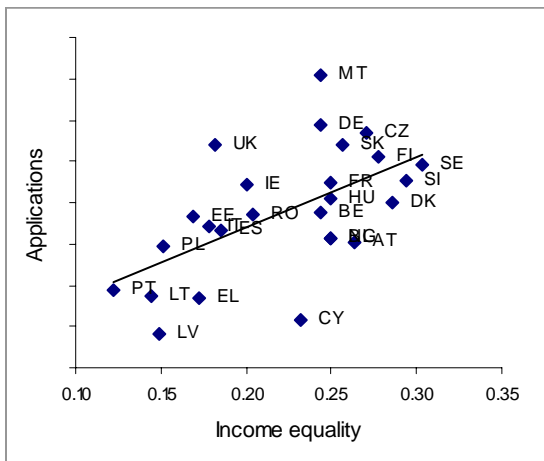
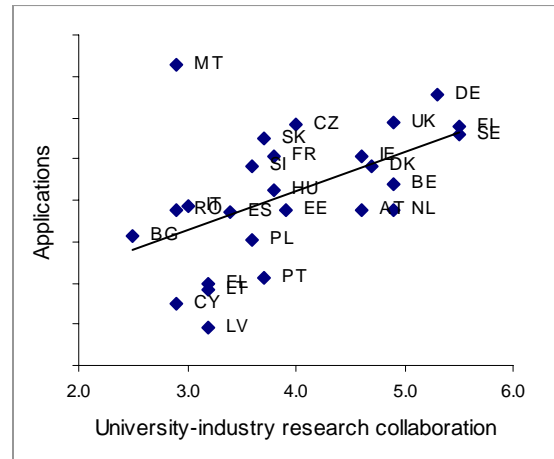
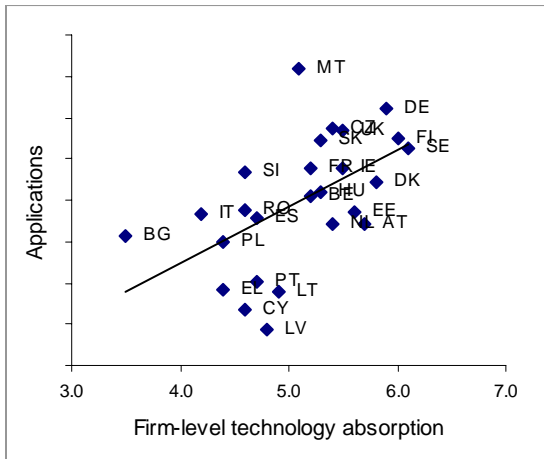
Variations in Applications are only moderately related to differences in per capita GDP. Once we control for per capita GDP, demand conditions, social capital and institutional framework do not explain differences in Applications. There is only weak to moderate statistical evidence that market efficiency, technology flows and governance are important and strong statistical evidence that social equity is important.



Differences in market efficiency explain variations in Applications. Intense competition in the local market drives innovation as shown in the graph above. With the exception of Malta and Latvia, Cyprus, Lithuania and Portugal, most countries follow the suggested relation. Competition in the international market is important for large companies competing with foreign firms for the preference of international customers, but also competition in the local market is important as it forces domestic firms to be more competitive and to be more innovative. Less restrictions of foreign ownership also drive Applications performance. Countries where foreign ownership is less rare and where governments encourage foreign firms to acquire ownership of domestic firms show higher innovation performance. The innovative capacity of an open economy will not only depend on its domestic stock of knowledge but also on that of other economies. Foreign ownership of domestic firms could be a proxy for the inflow of new ideas and government should encourage foreign ownership.

Technology flows explain differences in Applications performance: both firm-level technology absorption and university-industry research collaboration show a weak to moderate relation with Applications. Countries where firms are more aggressive in absorbing new technologies also score higher on Applications performance. The aggressiveness with which firms absorb new technologies is perhaps not within the direct reach of government policies, but governments can improve the investment climate improving the conditions in which it is worthwhile for firms to become more competitive by actively seeking for and absorbing new technologies. Collaboration between universities and business enterprises also matters as countries with intense university-industry research collaboration show higher Applications performance, but the relationship is not that strong as shown by the many

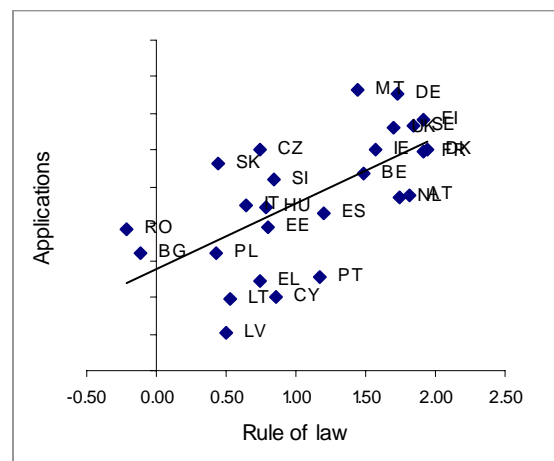
countries lying relatively far below or above the regression line as shown in the graph below.



Social equity measured by higher levels of income equality has the highest explanatory power in explaining differences in Applications. Income equality is defined as the ratio between the income share of the 20% of the population with the lowest income and that of the 20% of population with the highest income. Governments should thus pursue an income policy which guarantees a more equal income distribution. Progressive tax policies but also social welfare programs will distribute income from the wealthiest to less wealthy citizens. Higher income

equality could in particular benefit Cyprus and Latvia.

Governance is only of weak importance for explaining variations in Applications. Most of the indicators show no significant result, with the exception of rule of law. Rule of law measures the extent to which firms and consumers have confidence in and abide by the rules of society, in particular the quality of contract enforcement. In countries where agents have more confidence in the rules of society, it is more likely that firms will invest in risky innovative activities resulting in higher employment shares of high-tech activities and higher sales share of new-to-firm and new-to-market products.



Summarizing, market efficiency, technology flows, social equity and good governance all drive good performance in Applications. Governments can actively contribute by removing domestic obstacles which limit local competition, by relaxing restrictions on foreign ownership of domestic firms, by reducing income inequality, by intensifying research collaboration between universities and business firms and by enforcing the rules of societies.

**Table 9 Regression results explaining variations in Applications**

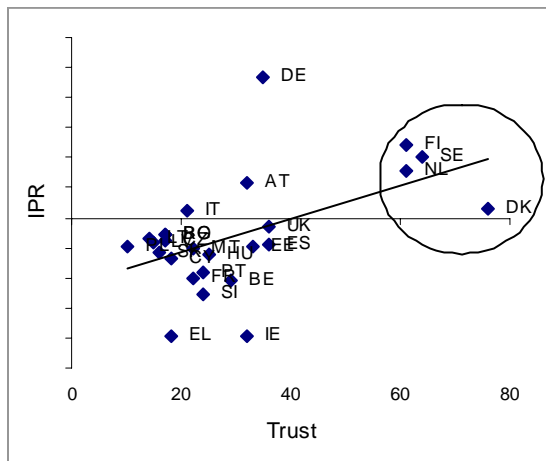
	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.184	0.322	6.106	0.008	2.579**	
<b>DEMAND CONDITIONS</b>						
Youth share	0.165	0.224	1.426	0.035	0.667	
Buyer sophistication	0.173	0.045	0.131	0.076	0.822	
Government procurement	0.207	-0.078	-0.249	0.115	1.293	
Demanding regulatory standards	0.220	-0.028	-0.116	0.080	1.453	
<b>SOCIAL CAPITAL</b>						
Trust	0.159	0.306	4.994	0.001	0.537	
Perception of corruption	0.210	0.146	1.037	0.044	1.337	
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.157	0.395	2.372	-0.025	-0.461	
Quality of educational system	0.162	0.200	0.942	0.033	0.590	
Intellectual property protection	0.229	0.009	0.044	0.094	1.544	
Price stability	0.207	0.249	3.240	2.187	1.696	
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.272	-0.387	-1.068	0.148	1.976*	+
Foreign ownership restrictions	0.320	-0.234	-0.990	0.111	2.404**	++
Flexibility of wage determination	0.232	-0.016	-0.074	0.58	1.574	
Financial market sophistication	0.160	0.218	1.124	0.028	0.559	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.179	0.162	0.892	0.055	0.919	
Firm-level technology absorption	0.324	-0.302	-1.163	0.137	2.445**	++
University-industry research collaboration	0.252	0.046	0.280	0.094	1.782*	+
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.133	0.251	1.635	0.004	0.479	
Income equality	0.380	0.006	0.054	1.685	2.928***	+++
Employment rate	0.223	0.878	2.321	-0.009	-1.483	
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.202	0.159	1.125	0.203	1.240	
Political stability	0.203	0.262	3.710	0.102	1.254	
Government effectiveness	0.154	0.305	4.465	0.041	0.391	
Regulatory quality	0.158	0.276	2.568	0.058	0.497	
Rule of law	0.248	0.274	4.776	0.181	1.742*	+
Control of corruption	0.230	0.314	6.108	0.136	1.557	

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

## 4.5 Intellectual property

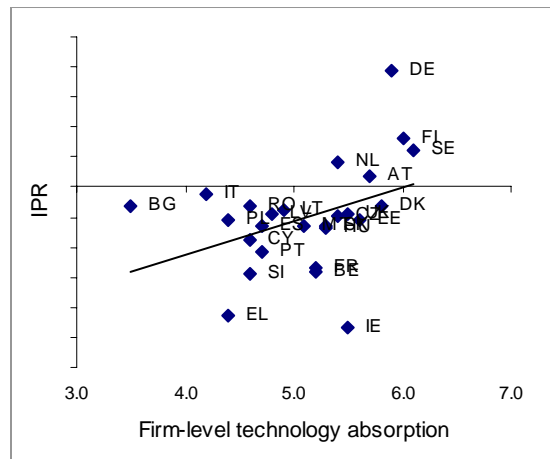
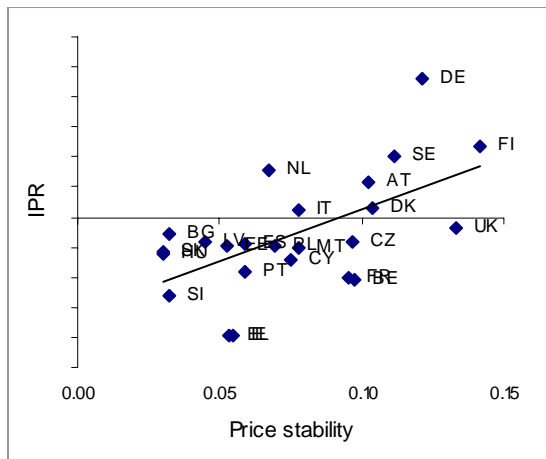
Intellectual property measures the achieved results in terms of successful know how measured by the relative amount of EPO patent applications, USPTO granted patents, Triad patents, Community trademarks and Community designs. The regression results are summarised in Table 10. The indicators with a significant regression coefficient will be discussed in more detail using scatter plots showing differences in indicator performance and per capita adjusted IP performance by country.

Variations in Intellectual property are very strongly related to differences in per capita GDP. Once we control for per capita GDP, demand conditions, market efficiency, social equity and governance do not explain differences in Intellectual property performance. There is only weak to moderate statistical evidence that social capital, institutional framework and technology flows are important.



Social capital is a moderate driver of Intellectual property performance. The regression results show significant results for trust. For trust the countries could even be divided in two different groups, given the gap in trust between Finland, Sweden, Denmark and Netherlands versus the other 'low trust' countries. For the 'high trust' countries, there is a negative relationship between trust and Intellectual property. Here higher levels of trust clearly no longer matter in achieving higher Intellectual property performance. For the 'low trust' countries results are more difficult

to interpret. If we exclude Germany as a clear outlier, the statistical relation between trust and Intellectual property seems to break down. Trust is most likely of lesser importance than the regression results seem to suggest.



Price stability – the inverse of the inflation rate of the consumer price index – drives Intellectual property performance. Germany, Finland and Sweden are all countries with stable prices and a high Intellectual property performance. Price stability in the UK is not matched by a good Intellectual property performance and Intellectual property performance in the Netherlands is higher as expected given its moderate level of price stability. Governments should pursue policies aimed at stable prices making it more attractive for enterprises to invest in risky innovative activities.

Technology flows as measured by firm-level technology absorption explain differences in Intellectual property performance, but the statistical relation is only

of moderate strength. Countries where firms are more aggressive in absorbing new technologies also score higher on Intellectual property performance. The aggressiveness with which firms absorb new technologies is perhaps not within the direct reach of government policies, but governments can improve the investment climate improving the conditions in which it is worthwhile for firms to become more competitive by actively seeking for and absorbing new technologies.

**Table 10 Regression results explaining variations in Intellectual property**

	Adjusted R <sup>2</sup>	Constant		Independent variable		Strength of relation
		Coef-ficient	T value	Coef-ficient	T value	
<b>Control variable: per capita GDP</b>	0.866	-0.082	-2.689	0.022	12.726***	
<b>DEMAND CONDITIONS</b>						
Youth share	0.874	0.050	0.575	-0.047	-1.616	
Buyer sophistication	0.862	0.043	0.218	-0.034	-0.639	
Government procurement	0.872	-0.348	-1.940	0.076	1.504	
Demanding regulatory standards	0.869	-0.263	-1.830	0.041	1.289	
<b>SOCIAL CAPITAL</b>						
Trust	0.879	-0.112	-3.390	0.003	1.888*	+
Perception of corruption	0.869	-0.179	-2.183	0.024	1.271	
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	0.862	-0.134	-1.395	0.018	0.572	
Quality of educational system	0.860	-0.055	-0.448	-0.007	-0.222	
Intellectual property protection	0.866	-0.211	-1.705	0.039	1.076	
Price stability	0.882	-0.162	-3.795	1.719	2.411**	++
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	0.865	-0.290	-1.306	0.043	0.946	
Foreign ownership restrictions	0.860	-0.131	-0.863	0.010	0.332	
Flexibility of wage determination	0.860	-0.088	-0.652	0.001	0.043	
Financial market sophistication	0.860	-0.045	-0.399	-0.010	-0.343	
<b>TECHNOLOGY FLOWS</b>						
Brain drain	0.864	0.000	0.000	-0.028	-0.812	
Firm-level technology absorption	0.879	-0.253	-2.712	0.058	1.928*	+
University-industry research collaboration	0.874	-0.338	-2.119	0.056	1.633	
<b>SOCIAL EQUITY</b>						
Social protection expenditure	0.852	-0.135	-1.539	0.003	0.494	
Income equality	0.865	-0.149	-1.913	0.358	0.936	
Employment rate	0.863	-0.236	-1.041	0.003	0.686	
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability	0.861	-0.051	-0.606	-0.039	-0.396	
Political stability	0.861	-0.071	-1.687	-0.019	-0.386	
Government effectiveness	0.861	-0.071	-1.807	-0.026	-0.431	
Regulatory quality	0.860	-0.077	-1.232	-0.006	-0.094	
Rule of law	0.860	-0.081	-2.297	-0.003	-0.046	
Control of corruption	0.862	-0.084	-2.693	0.030	0.572	

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level. \* Significant at 0.10 level

## 5. Conclusions

Economic growth is at the heart of increases in people's well-being. Innovation including technological progress is one of the main sources of economic growth. Variations in economic growth and well-being can be partially explained by variations in innovation performance. Previous EIS Thematic Papers – the NIS 2003 and EXIS 2004 report – have identified innovation categories and indicators which explained variations in innovation performance as measured by the Summary Innovation Index (SII). This report builds upon the findings of the NIS 2003 and EXIS 2004 report and extends the analysis to the 5 innovation dimensions as identified in the EIS: Innovation drivers, Knowledge creation, Innovation & entrepreneurship, Applications and Intellectual property. Innovation drivers measure the structural conditions required for innovation potential. Knowledge creation measures the investments in R&D activities, considered as one of the key elements for a successful knowledge-based economy. Innovation & entrepreneurship measures the efforts towards innovation at the firm level. Applications measure the performance, expressed in terms of labour and business activities, and their value added in innovative sectors. Intellectual property measures the achieved results in terms of successful know how. Based on the findings of the before-mentioned Thematic Papers and World Economic Forum's 'Global Competitiveness Report 2006-2007' and the World Bank 'Worldwide Governance Indicators' project we have identified 7 categories of 'policy indicators' covering 26 indicators. We have then explored the explanatory power of each of these on the five different innovation dimensions using linear regressions controlling for differences in per capita GDP. Table 11 summarizes for each of the innovation dimensions the explanatory power of the indicators explaining variations in performance.

Differences in social capital and technology flows explain best the variations in innovation performance between the EU Member States. High levels of social capital may contribute to innovation by reducing transaction costs as well as information and enforcement costs. Both trust and people's perception of corruption are measures of social capital which explain variations in innovation performance. The diffusion of technology as measured by the indicators used as proxies for technology flows also drive innovation. This suggests that innovation is both driven by firms aggressively absorbing new technologies but also by intensive university-industry research collaboration. Differences in institutional framework conditions and market efficiency also explain variations in innovation performance but the statistical evidence is less strong. In particular price stability, the intensity of local competition, flexibility of wage determination and demanding regulatory standards drive innovation. Demand conditions, social equity and governance are all of lesser importance in explaining variations in innovation performance. Business demand, measured by buyer sophistication, drives innovation performance by enterprises investing in new capital equipment. Government procurement of advanced technology products and higher income equality also are statistically significant in explaining innovation performance. Good governance is important for promoting the innovation performance of a country. We have found evidence that good governance measured by high levels of government effectiveness and regulatory quality explains variations in innovation performance.

### ***Innovation drivers***

Variation in performance in Innovation drivers (which includes indicators measuring S&E graduates, population with tertiary education, broadband penetration rate, life-long learning and youth education) is explained best by differences in social capital. The statistical relations between Innovation drivers and demand conditions, institutional framework, market efficiency, social equity and governance are less strong. The following indicators are related best with differences in Innovation

drivers: buyer sophistication, trust, perception of corruption, burden of administration, flexibility of wage determination, university-industry research collaboration, employment rate, government effectiveness and regulatory quality.

**Table 11 Summary of regression results**

	SII	Innovation drivers	Knowledge creation	Innovation & entrepreneurship	Applications	Intellectual property
<b>PER CAPITA GDP</b>						
Adjusted R <sup>2</sup>	0.789	0.492	0.757	0.328	0.184	0.866
Coefficient (t value)	0.014 (9.730)	0.014 (5.023)	0.018 (8.871)	0.010 (3.566)	0.008 (2.579)	0.022 (12.726)
<b>DEMAND CONDITIONS</b>						
Youth share						
Buyer sophistication		+				
Government procurement	++			+		
Demanding regulatory standards	++					
<b>SOCIAL CAPITAL</b>						
Trust	+++	+++		++		+
Perception of corruption	+++	++		+++		
<b>INSTITUTIONAL FRAMEWORK</b>						
Burden of administration	+	++		++		
Quality of educational system	+			+		
Intellectual property protection	+					
Price stability	++					++
<b>MARKET EFFICIENCY</b>						
Intensity of local competition	++			+	+	
Foreign ownership restrictions	+				++	
Flexibility of wage determination	++	+++				
Financial market sophistication						
<b>TECHNOLOGY FLOWS</b>						
Brain drain						
Firm-level technology absorption	+++			+++	++	+
University-industry research collaboration	+++	++	+	+++	+	
<b>SOCIAL EQUITY</b>						
Social protection expenditure						
Income equality	++		++		+++	
Employment rate		++		+++		
<b>(INNOVATION) GOVERNANCE</b>						
Voice and accountability						
Political stability	+			+		
Government effectiveness	+	+++		+		
Regulatory quality	+	+		+		
Rule of law					+	
Control of corruption	+					

+++ : Strong correlation between variation in indicator and innovation performance; ++ : Moderate correlation; + : Weak correlation.

### **Knowledge creation**

Variation in performance in Knowledge creation (which includes indicators measuring both public and private investments in R&D, high-tech R&D activities and public funding of private R&D activities) is explained to a large extent by GDP per capita. Of the wider factors studied in this report, the variation in performance

is explained best by differences in technology flows and social equity. None of the other categories show significant regression results, a result which follows from the strong explanatory power of per capita GDP. The following two indicators are correlated best with differences in Knowledge creation: university-industry research collaboration and income equality.

### ***Innovation & entrepreneurship***

Variation in performance in Innovation & entrepreneurship (which includes indicators measuring SMEs innovating in-house or in co-operation with others, innovation expenditures, early-stage venture capital, ICT expenditures and organisational innovation by SMEs) is explained best by differences in social capital and technology flows. Demand conditions, institutional framework, market efficiency, social equity and governance all relate weak to moderate with differences in Innovation & entrepreneurship. The following indicators explain the variations in Innovation & entrepreneurship best: government procurement of advanced technology products, trust, perception of corruption, burden of administration, quality of educational system, intensity of local competition, firm-level technology absorption, university-industry research collaboration, income equality, political stability, government effectiveness and regulatory quality.

### ***Applications***

Variation in performance in Applications (which includes indicators measuring high-tech employment in manufacturing and services, sales shares of new-to-firm and new-to-market products and high-tech exports) are not strongly correlated with GDP per capita, and hence other factors are important in explaining variations in country performance. In this study, such variations were found to be explained best by differences in technology flows and social equity. Market efficiency and governance are weakly correlated with differences in Applications. Demand conditions, social capital and institutional framework are not correlated with differences in Applications. The following indicators correlate best with differences in Applications: intensity of local competition, foreign ownership restrictions, firm-level technology absorption, university-industry research collaboration, income equality and rule of law.

### ***Intellectual property***

Variation in performance in Intellectual property (which includes indicators measuring relative numbers of EPO patents, USPTO patents, Triad patents, Community trademarks and Community industrial designs) is only explained by differences in social capital, institutional framework and technology flows. Variations in per capita GDP provide by far the strongest explanation for differences in Intellectual property performance. The following three indicators are correlated best with differences in Intellectual property: trust, price stability and firm-level technology absorption.

### ***Policy conclusions***

Not all of the indicators measuring economic and socio-economic conditions are 'policy indicators' which can be directly influenced by countries' governments, but governments can take action in some areas. The results here are based on statistical correlations which do not necessarily imply causality. They do, however, highlight a range of policy areas where governments may be able to influence innovation performance, including a number of areas outside the usual scope of innovation policy.

The statistical correlations revealed in this report suggest that policies that raise social capital and technology flows may have a high and positive impact on innovation performance. Examples of such policies could be those that support clustering, networking, and collaboration between firms and universities.

The results also highlight the role of governments in stimulating demand for innovations, in particular through public procurements that are based more on technical performance and innovativeness, and not solely on price. In particular the performance in Innovation & entrepreneurship may benefit from governments demanding more innovative products. Countries with demanding regulatory standards tend to show higher innovation performance. This suggests that governments that adopt more stringent standards (e.g. the quality of products and services and environmental regulations) may also benefit from increased levels of innovation performance. An example could be a stricter implementation of the emission limitations for the reduction of greenhouse gas emissions as specified in the Kyoto Protocol.

Reducing the administrative burden for firms may have some effect on some aspects of innovation. There is some evidence that loosening the burden of administration will increase performance in Innovation drivers and Innovation & entrepreneurship, but there is no statistical evidence that this will also drive overall innovation performance as measured by the SII. The quality of the educational system also appears to have some impact on innovation performance in Innovation & entrepreneurship. Governments can have a direct influence here by increasing the quality levels of their domestic systems of (higher) education, but the effect may only be noticeable in the long(er) run.

The strength of domestic intellectual property protection seems to have some relationship with innovation performance in general, but this is not as strong as might be expected. This may be because many firms, in particular SMES, still file their patent applications at their national patent office instead of filing at an international patent office (e.g. the European Patent Office) and only international filings are included in the measure of innovation performance. Stable prices are statistically the most important factor in explaining innovation performance in Intellectual property examined in this study. Moreover the statistical evidence suggests a moderate correlation between price stability and innovation performance, which may be because stable prices directly benefit all investment decisions made by enterprises.

Intense local competition appears to have an impact on innovation performance, in particular in Applications and in Innovation and entrepreneurship. This suggests that policies to increase competition and lower barriers to trade and foreign ownership may also be beneficial in increasing innovation performance in the country. Centralized wage bargaining processes seem to have an adverse effect on innovation where the statistical evidence is strong for Innovation drivers. It is not clear why this should be and there is no clear conclusion for policies.

The results highlight the governments' role in stimulating university-industry research collaboration as this is associated with high innovation performance, in particular in Innovation drivers and Innovation & entrepreneurship. Strengthening existing and the creation of new university- industry collaborations (and exchanges such as technology platforms), both domestically and within the EU, is one example where governments can directly stimulate the extent and intensity of university-industry research collaborations.

Good governance seems to be important for innovation, in particular in the innovation dimensions of Innovation drivers and Innovation & entrepreneurship. Of the different indicators measuring governance, government effectiveness is correlated with innovation performance and political stability, regulatory quality and rule of law are weakly statistically correlated with innovation performance. This suggests that improvements in the general quality of public services and the quality of policy formulation and its implementation may have a positive effect in raising innovation performance.

A more equal income distribution and higher employment rates are also linked with high innovation performance. Government policies and labour market conditions

which enable high employment levels and more equal income distributions may therefore be beneficial for raising innovation performance.

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## Annex 1 EIS 2006 Indicators

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<b>INNOVATION DRIVERS</b>	
1.1	S&E graduates per 1000 population aged 20-29
1.2	Population with tertiary education per 100 population aged 25-64
1.3	Broadband penetration rate (number of broadband lines per 100 population)
1.4	Participation in life-long learning per 100 population aged 25-64
1.5	Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)

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<b>KNOWLEDGE CREATION</b>	
2.1	Public R&D expenditures (% of GDP)
2.2	Business R&D expenditures (% of GDP)
2.3	Medium-high-tech and high-tech manufacturing R&D (% of manufacturing R&D expenditures)
2.4	Share of enterprises receiving public funding for innovation

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<b>INNOVATION &amp; ENTREPRENEURSHIP</b>	
3.1	SMEs innovating in-house (% of all SMEs)
3.2	Innovative SMEs co-operating with others (% of all SMEs)
3.3	Innovation expenditures (% of total turnover)
3.4	Early-stage venture capital (% of GDP)
3.5	ICT expenditures (% of GDP)
3.6	SMEs using organisational innovation (% of all SMEs)

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<b>APPLICATIONS</b>	
4.1	Employment in high-tech services (% of total workforce)
4.2	Exports of high technology products (% of total exports)
4.3	Sales of new-to-market products (% of total turnover)
4.4	Sales of new-to-firm products (% of total turnover)
4.5	Employment in medium-high and high-tech manufacturing (% of total workforce)

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<b>INTELLECTUAL PROPERTY</b>	
5.1	EPO patents per million population
5.2	USPTO patents per million population
5.3	Triadic patent families per million population
5.4	Community trademarks per million population
5.5	Community designs per million population

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## Annex 2 Correlations results between per capita GDP and indicators

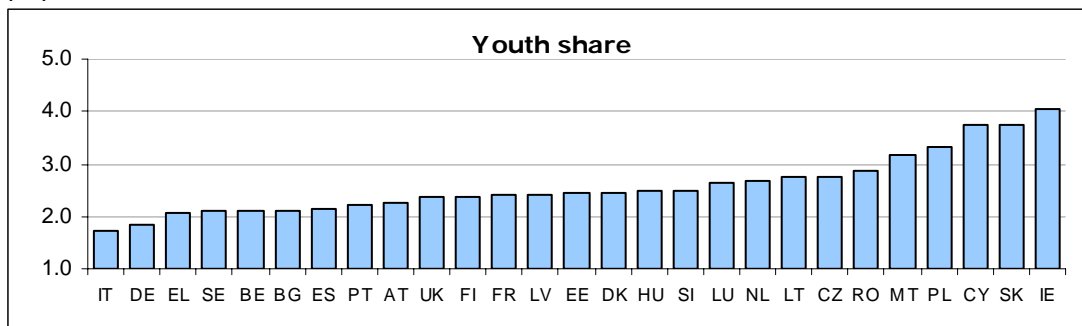
	Correlation coefficient	Significance (2-tailed)
Summary Innovation Index (SII)	0.893	0.000***
Innovation drivers	0.716	0.000***
Knowledge creation	0.875	0.000***
Innovation & entrepreneurship	0.597	0.002***
Applications	0.466	0.016**
Intellectual property	0.933	0.000***
<b>DEMAND CONDITIONS</b>		
Youth share	-0.238	0.241
Buyer sophistication	0.927	0.000***
Government procurement	0.717	0.000***
<b>SOCIAL CAPITAL</b>		
Trust	0.757	0.000***
Perception of corruption	0.880	0.000***
<b>INSTITUTIONAL FRAMEWORK</b>		
Burden of administration	0.318	0.113
Quality of educational system	0.669	0.000***
Intellectual property protection	0.906	0.000***
Price stability	0.685	0.000***
<b>MARKET EFFICIENCY</b>		
Intensity of local competition	0.685	0.000***
Foreign ownership restrictions	0.474	0.015**
Flexibility of wage determination	-0.748	0.000***
Financial market sophistication	0.814	0.000***
Demanding regulatory standards	0.762	0.000***
<b>TECHNOLOGY FLOWS</b>		
Brain drain	0.819	0.000***
Firm-level technology absorption	0.617	0.001***
University-industry research collaboration	0.783	0.000***
<b>SOCIAL EQUITY</b>		
Social protection expenditure	0.803	0.000***
Income equality	0.457	0.019**
Employment rate	0.635	0.000***
<b>(INNOVATION) GOVERNANCE</b>		
Voice and accountability	0.856	0.000***
Political stability	0.433	0.027**
Government effectiveness	0.888	0.000***
Regulatory quality	0.776	0.000***
Rule of law	0.900	0.000***
Control of corruption	0.915	0.000***

\*\*\*Significant at 0.01 level. \*\* Significant at 0.05 level.

## Annex 3 Indicators of the wider innovation environment

### DEMAND CONDITIONS

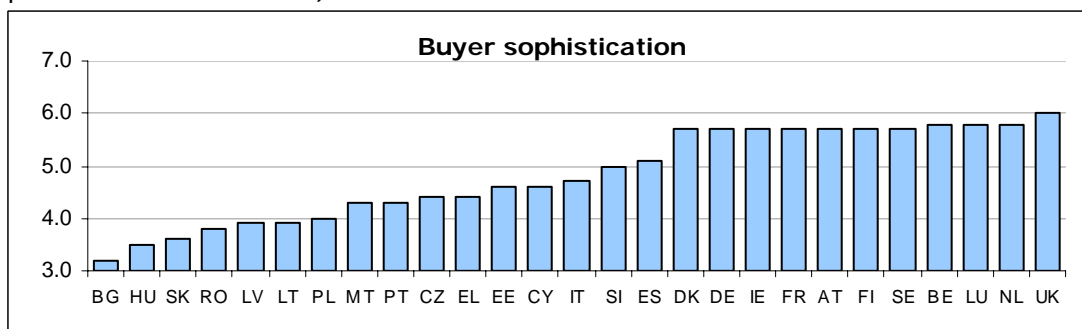
- **Youth share**, which is defined as the ratio of total population under 30 to population 65 and over (source: Eurostat)



The youth share is highest in Ireland, Slovakia and Cyprus; and lowest in Germany and Italy. Differences between most countries are relatively small.

- **Buyer sophistication** (source: WEF 2006, indicator 8.09)

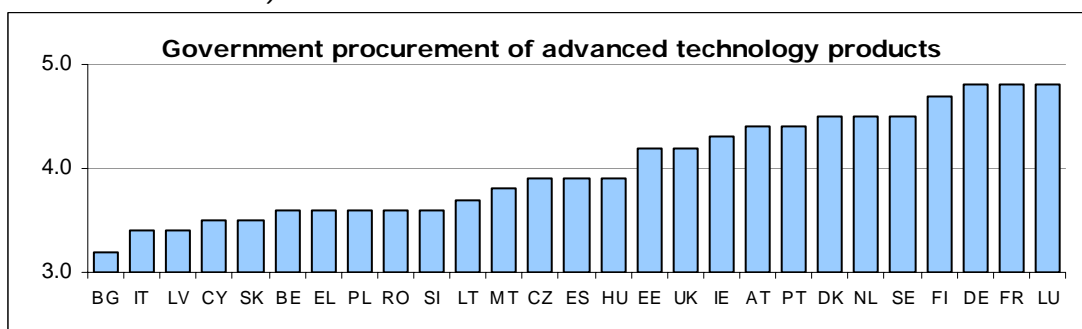
The indicator gives the average score on a scale from 1 to 7 to the question: Buyers in your country are (1 = unsophisticated and make choices based on the lowest price, 7 = knowledgeable and demanding and buy based on superior performance attributes).



Buyers in Western and Northern Europe are all knowledgeable and demanding, with buyers in the UK considered to be most demanding. There is a clear difference between buyers in the Southern EU15 countries and New Member States. Buyers are least knowledgeable and demanding in Bulgaria, Hungary, Slovakia and Romania. Variation in buyer sophistication is low.

- **Government procurement of advanced technology products** (source: WEF 2006, indicator 9.04)

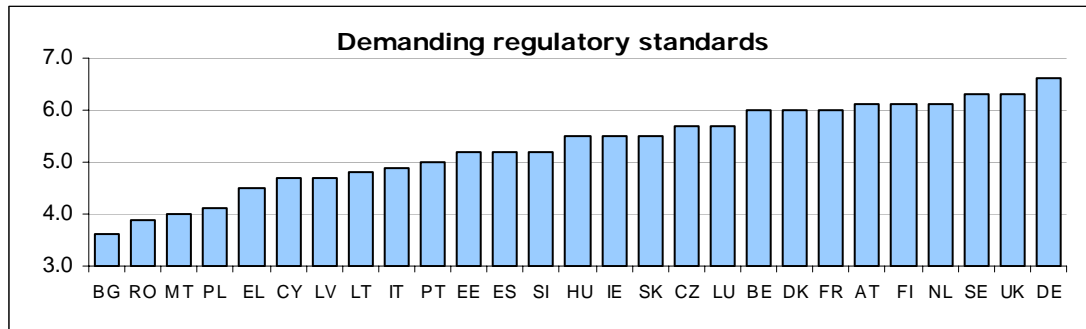
The indicator gives the average score on a scale from 1 to 7 to the question: Government purchase decisions for the procurement of advanced technology products are (1 = based solely on price, 7 = based on technical performance and innovativeness).



Governments in Luxembourg, France and Germany are most pro-active in demanding innovative products. We also observe that even for the best performing countries there is still room for further improvements as the maximum score for the indicator (5) is well below the maximum of the scale (7). Variation in government procurement is lowest of all demand indicators.

- **Demanding regulatory standards** (source: WEF 2006, indicator 6.26)

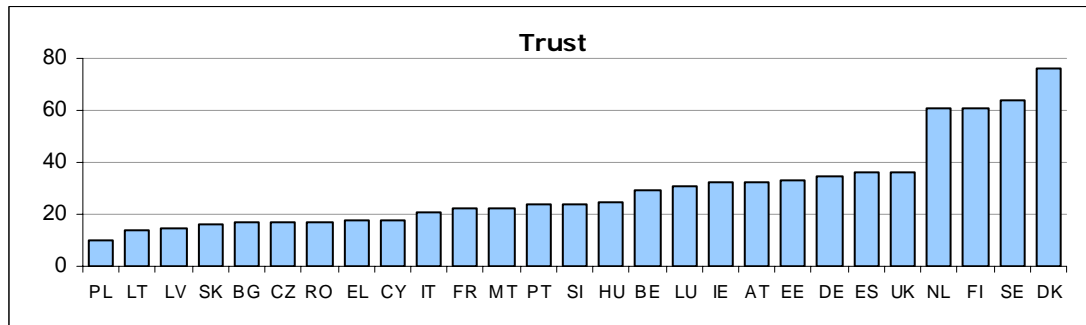
The indicator gives the average score on a scale from 1 to 7 to question: Standards on products/service quality, energy and other regulations (outside environmental regulations) in your country are (1 = lax or nonexistent, 7 = among the world's most stringent).



#### SOCIAL CAPITAL

- **Trust** (source: Special Eurobarometer 223: Social Capital (p.41)).

Trust is measured by the percentage responses for 3 possible answers (Most people can be trusted; You can't be too careful; It depends) to the question: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?". The indicator used here takes the percentage of people who replied "Most people can be trusted".

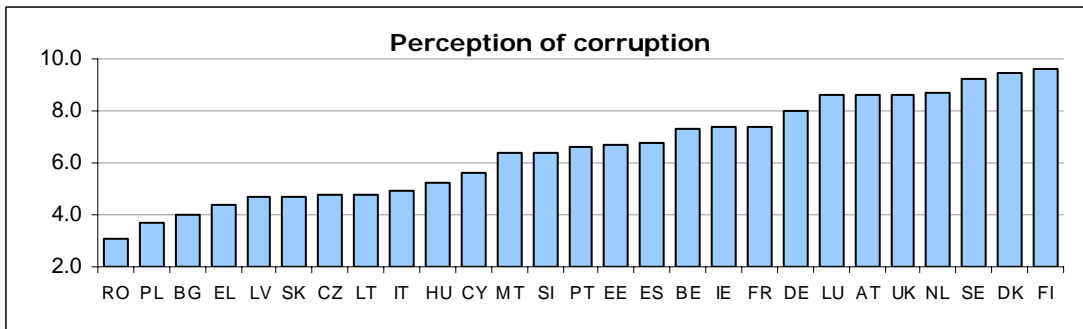


Variation in trust is quite high, mostly due to the very high levels of trust in the Scandinavian countries and the Netherlands. There is a huge gap with all other countries, with trust being lowest in Poland.

- **Perception of corruption** (source: the 2006 Transparency International Corruption Perceptions Index<sup>10</sup>)

"The index defines corruption as the abuse of public office for private gain and measures the degree to which corruption is perceived to exist among a country's public officials and politicians. It is a composite index, drawing on 12 polls and surveys from 9 independent institutions, which gathered the opinions of businesspeople and country analysts. The scores range from ten (squeaky clean) to zero (highly corrupt). A score of 5.0 is the number Transparency International considers the borderline figure distinguishing countries that do and do not have a serious corruption problem."

<sup>10</sup> <http://www.transparency.org/>

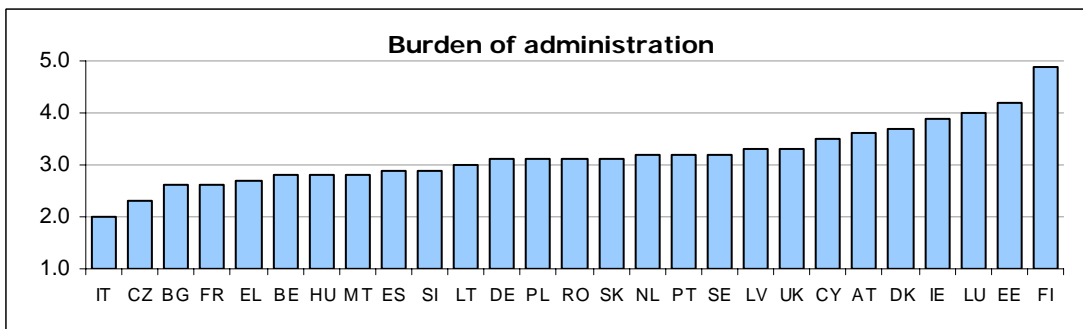


All countries up to Italy have, following the Transparency International threshold value of 5.0, a serious problem with corruption, in particular Romania, Poland and Bulgaria. Denmark and Finland have the least problems with corruption.

### INSTITUTIONAL FRAMEWORK

- **Burden of administration** (source: WEF 2006, indicator 1.07, burden of government regulation)

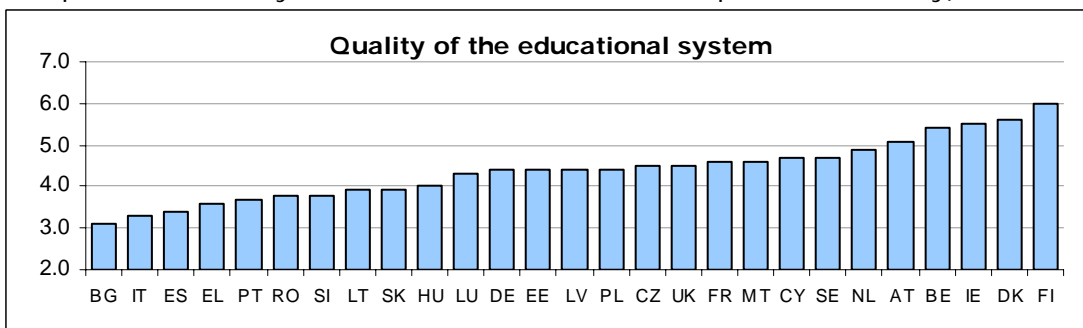
The indicator gives the average score on a scale from 1 to 7 to the question: Complying with administrative requirements (permits, regulations, reporting) issued by the government in your country is (1 = burdensome, 7 = not burdensome).



Finland and Estonia are among the countries where the burden of administration is lowest. In Italy and Czech Republic firms are most hindered by a burdensome administration.

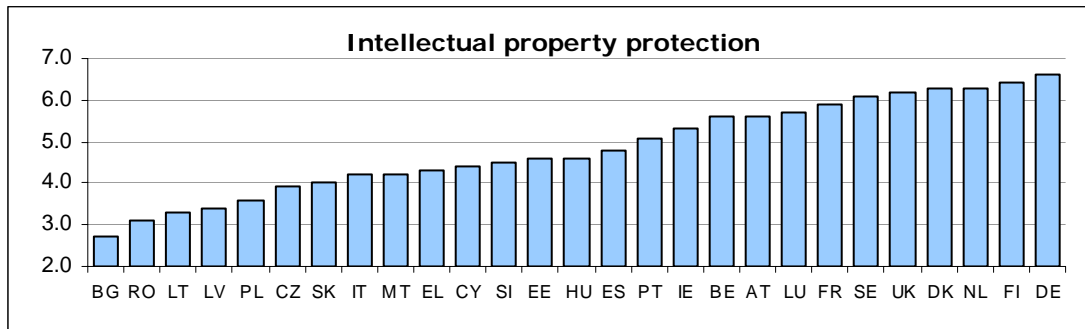
- **Quality of the educational system** (source: WEF 2006, indicator 5.03)

The indicator gives the average score on a scale from 1 to 7 to the question: The educational system in your country (1 = does not meet the needs of a competitive economy, 7 = meets the needs of a competitive economy).



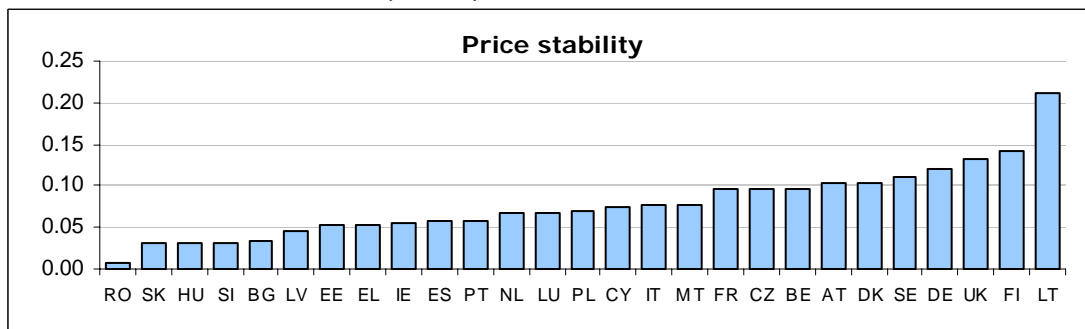
The educational system in Finland, Denmark, Ireland and Belgium is best equipped to meet the needs of a competitive economy. Educational systems in the Southern Member States are of lower quality, in particular in Bulgaria, Italy, Spain and Greece.

- Intellectual property protection** (source: WEF 2006, indicator 9.07)  
 The indicator gives the average score on a scale from 1 to 7 to question: Intellectual property protection in your country (1 = is weak or nonexistent, 7 = is equal to the world's most stringent).



Domestic intellectual property protection is stringent in Germany, Finland, Netherlands, Denmark, UK and Sweden, either among or close to the innovation leaders. Intellectual property protection is weak in Bulgaria and Romania.

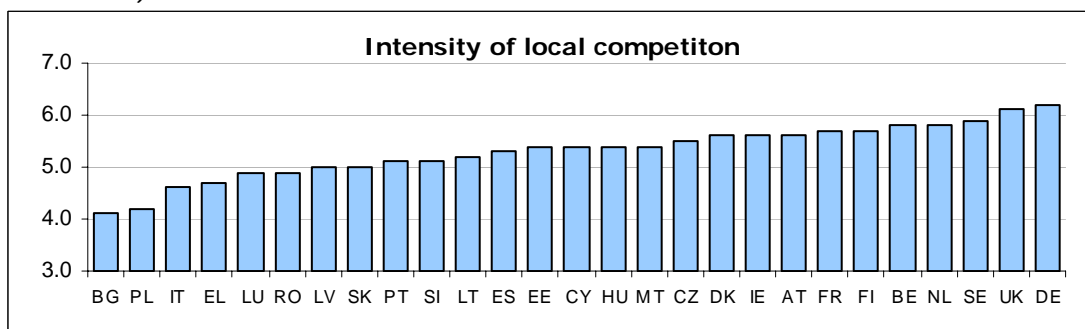
- The inverse of the inflation rate** (source: Eurostat)  
 The inflation rate is defined as the annual average rate of change in Harmonized Indices of Consumer Prices (HICPs).



Prices are most stable in Lithuania, Finland and the UK. Prices are least stable in Romania. Price stability on average is higher in Scandinavian and more advanced Member States and lower in Southern and New Member States.

#### MARKET EFFICIENCY

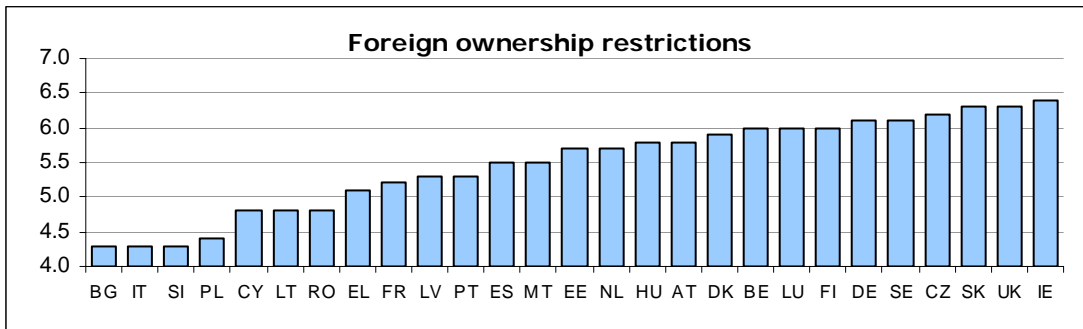
- Intensity of local competition** (source: WEF 2006, indicator 6.06)  
 The indicator gives the average score on a scale from 1 to 7 to the question: Competition in the local market is (1 = limited in most industries and price-cutting is rare, 7 = intense in most industries as market leadership changes over time).



Competition is most intense in Germany, UK and Sweden, all belonging to the group of innovation leaders. Competition is less intense in Bulgaria and Poland.

- **Foreign ownership restrictions** (source: WEF 2006, indicator 6.10)

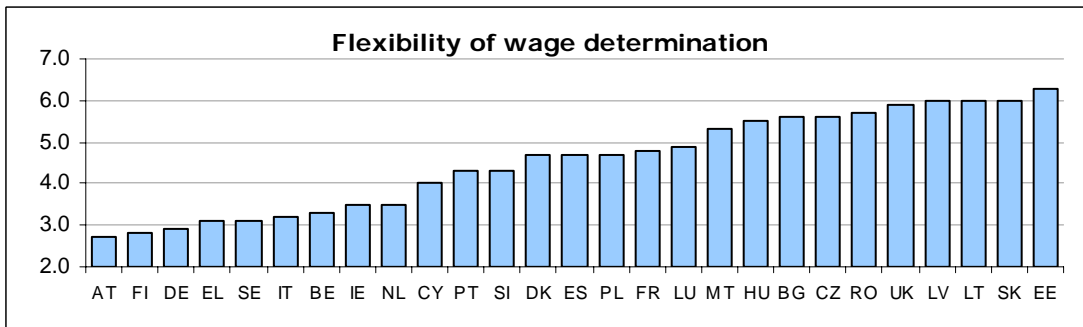
The indicator gives the average score on a scale from 1 to 7 to the question: Foreign ownership of companies in your country is (1 = rare, limited to minority stakes, and often prohibited in key sectors, 7 = prevalent and encouraged).



Ireland and the UK encourage foreign ownership of countries. The openness of Ireland to foreign ownership is also demonstrated by its high score on the Transnationality index. Foreign ownership is far less encouraged in Bulgaria, Italy, Slovenia and Poland.

- **Flexibility of wage determination** (source: WEF 2006, indicator 6.13)

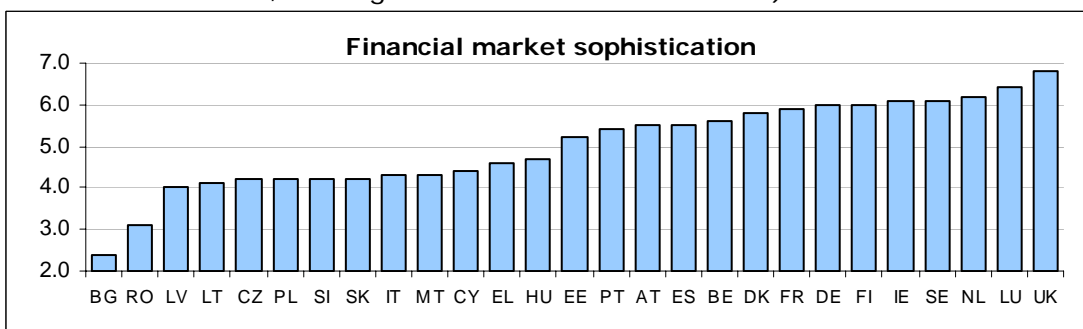
The indicator gives the average score on a scale from 1 to 7 to question: Wages in your country are (1 = set by a centralized bargaining process, 7 = up to each individual company).



Countries shown on the left (from Austria to the Netherlands) have more centralized wage bargaining processes. Countries shown on the right (from Malta to Estonia) wage bargaining processes are more up to individual companies.

- **Financial market sophistication** (source: WEF 2006, indicator 6.19)

The indicator gives the average score on a scale from 1 to 7 to question: The level of sophistication of financial markets in your country is (1 = lower than international norms, 7 = higher than international norms).

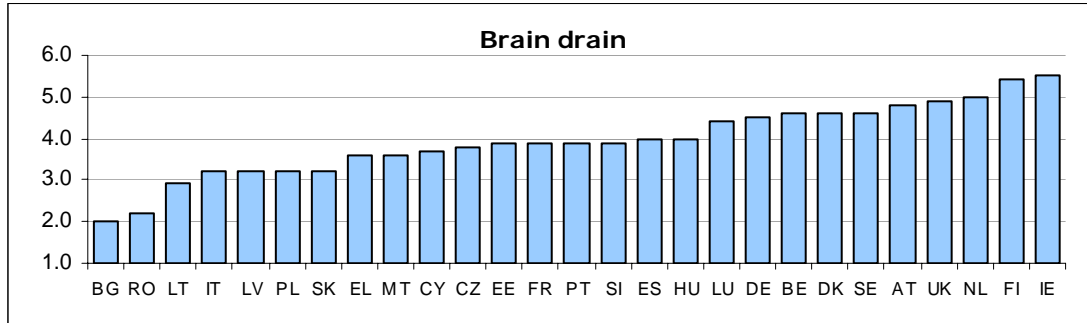


Sophisticated financial markets are found in half of the Member States, from Estonia to the UK, where the financial market in the UK has the highest level of sophistication. Financial markets in Bulgaria and Romania are not highly sophisticated.

**TECHNOLOGY/KNOWLEDGE FLOWS**

- **Brain drain** (source: WEF 2006, indicator 6.17)

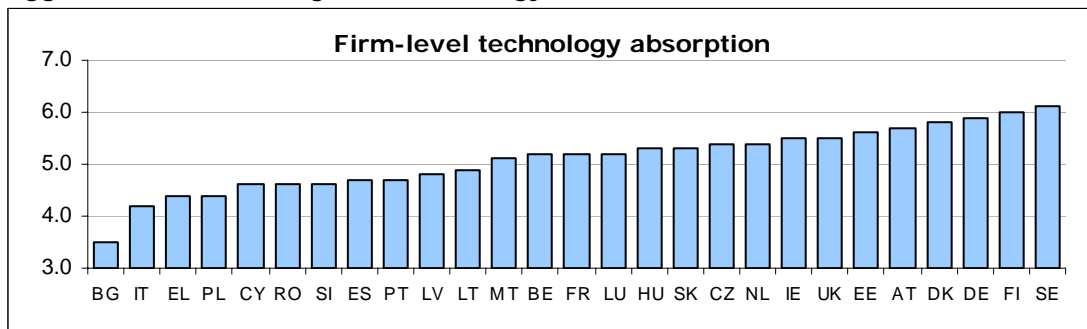
The indicator gives the average score on a scale from 1 to 7 to the question: Your country's talented people (1 = normally leave to pursue opportunities in other countries, 7 = almost always remain in the country).



Bulgaria and Romania face a brain drain where talented people leave their country for better opportunities in other Member States. Ireland and Finland are best able to retain their talented people.

- **Firm-level technology absorption** (source: WEF 2006, indicator 7.02)

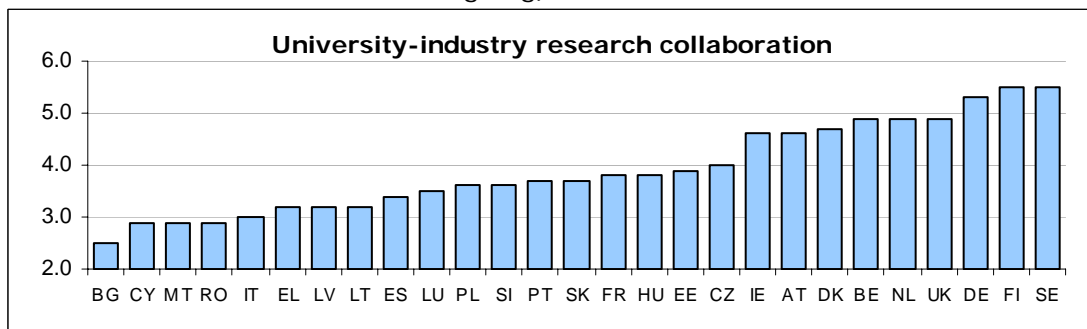
The indicator gives the average score on a scale from 1 to 7 to question: Companies in your country are (1 = not able to absorb new technology, 7 = aggressive in absorbing new technology).



Differences in firm-level technology absorption are small and are highest in the innovation leaders Sweden, Finland, Germany and Denmark.

- **University-industry research collaboration** (source: WEF 2006, indicator 9.03)

The indicator gives the average score on a scale from 1 to 7 to question: In its R&D activity, business collaboration with local universities is (1= minimal or nonexistent, 7 = intensive and ongoing).

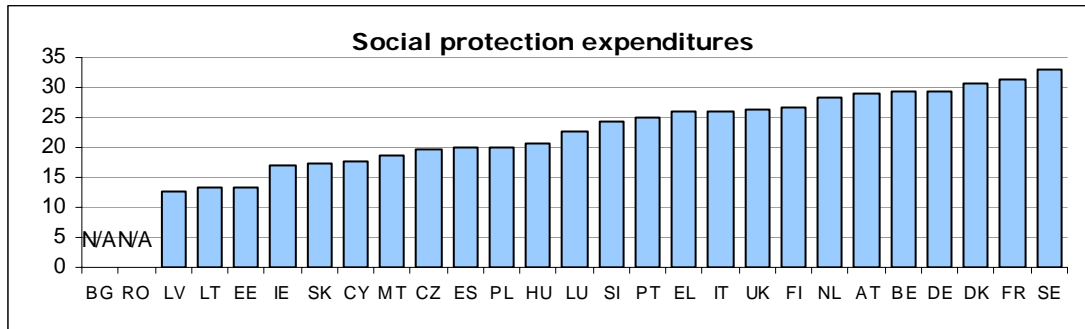


Research collaboration is intensive in the more innovative countries, in particular in Finland and Sweden.

## SOCIAL EQUITY

- **The percentage of GDP spent on social protection** (source: Eurostat)

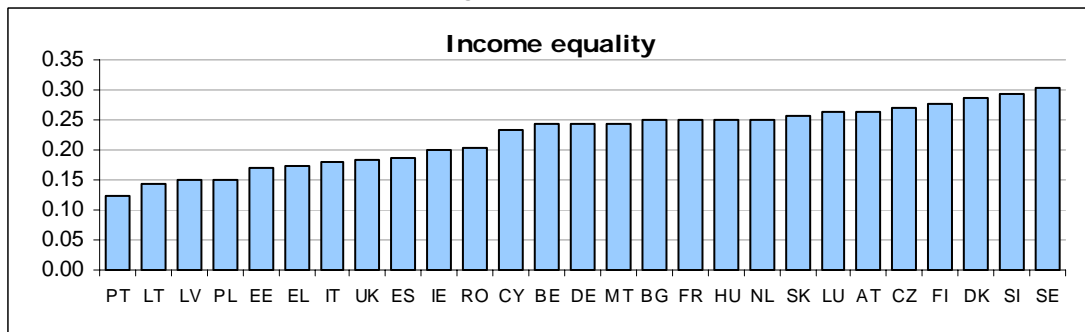
Social protection expenditures include social benefits, administration costs and other expenditure linked to social protection schemes.



Data for Bulgaria and Romania are not available. Social protection expenditures are highest in the Northern and Western EU Member States.

- **Income equality** (source: Eurostat)

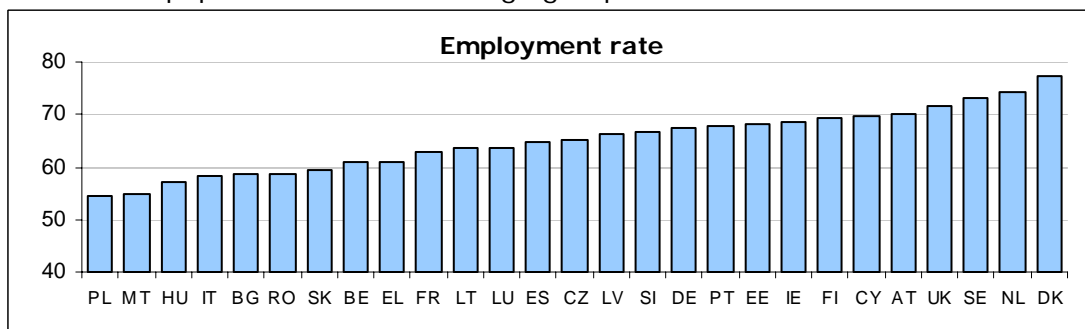
Income equality is defined as the ratio of total income received by the 20% of the population with the lowest income (lowest quintile) to that received by the 20% of the population with the highest income (top quintile).



Income equality is highest in the Northern European countries and lowest in Portugal and Lithuania.

- **The employment rate** (source: Eurostat)

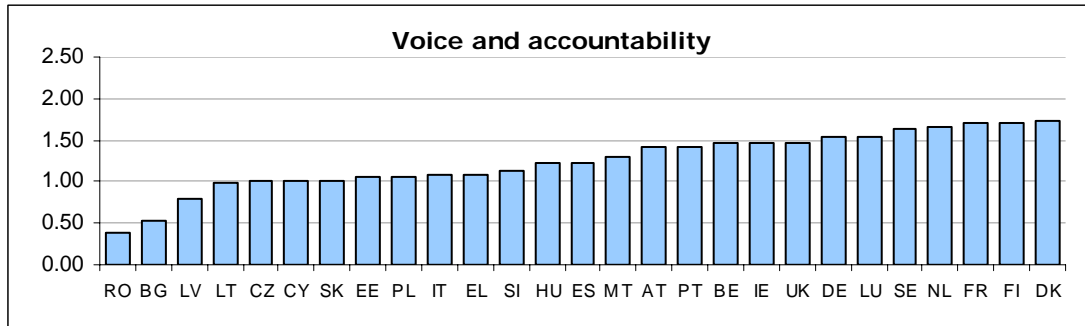
The employment rate is defined as the share of employed persons aged 15-64 out of total population of the same age group.



The employment rate is highest in Denmark, the Netherlands and Sweden.

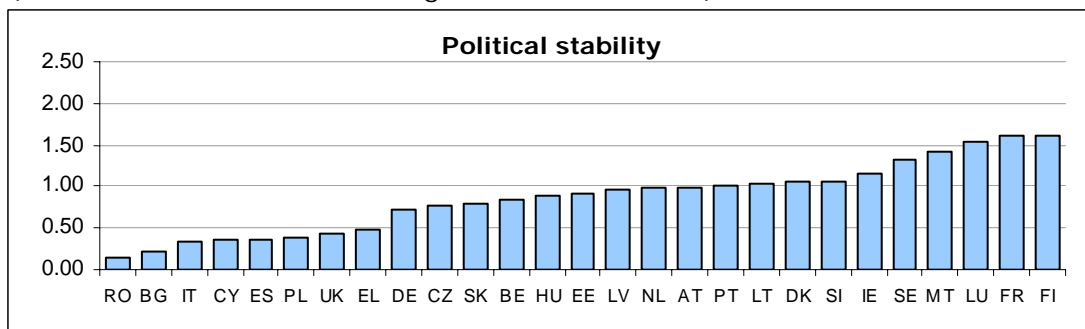
## GOVERNANCE

- **Voice and accountability** measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media (source: WGI 2007, scores range from -2.5 to +2.5).



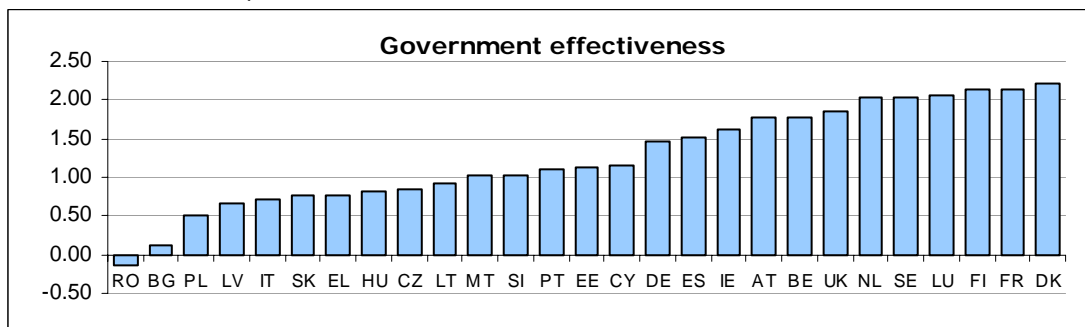
In the Scandinavian and Western European countries citizens enjoy high degree of freedom. In the Eastern European countries the degree of freedom is less but still high. Countries where citizens face problems in their freedom of expression, association, free media and selecting their governments include Latvia and in particular Romania and Bulgaria.

- **Political stability and absence of violence** measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism (source: WGI 2007, scores range from -2.5 to +2.5).



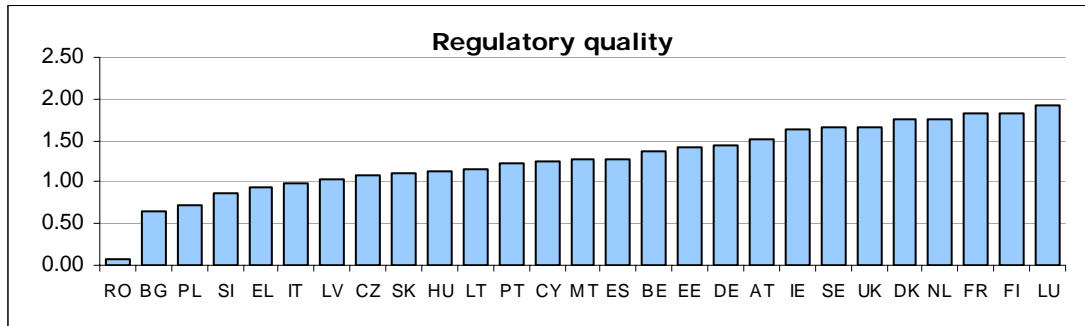
Finland, France and Luxembourg political stability and absence of violence is highest, followed by Malta, Sweden and Ireland. Perceptions about political stability and absence of violence are below average in Greece, Poland, Spain, Cyprus, Italy, Bulgaria, Romania and the UK.

- **Government effectiveness** measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (source: WGI 2007, scores range from -2.5 to +2.5).



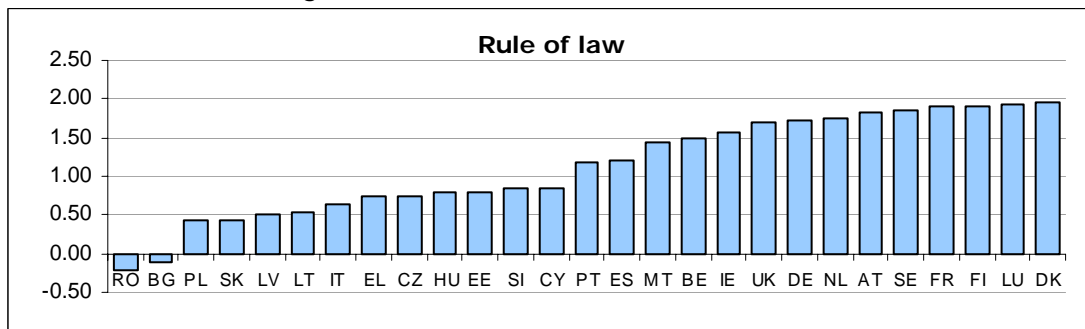
Governments are most effective in the Scandinavian countries, France, Luxembourg and the Netherlands. In Romania and Bulgaria government effectiveness is at a too low level.

- **Regulatory quality** measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (source: WGI 2007, scores range from -2.5 to +2.5).



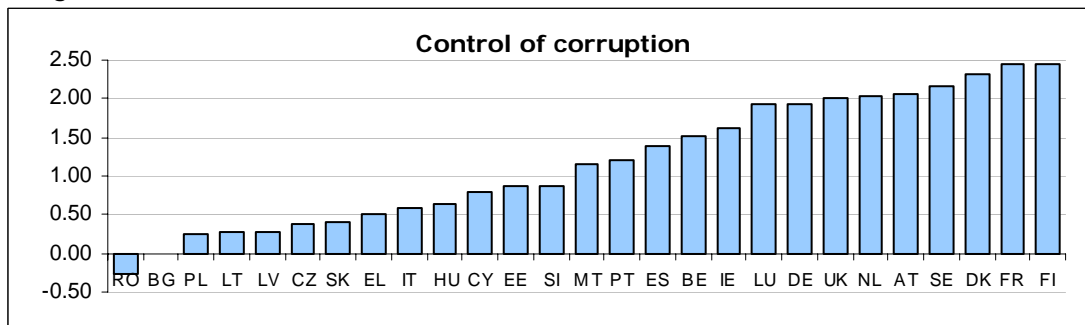
Regulatory quality is highest in Luxembourg and by far lowest in Romania.

- **Rule of law** measures the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence (source: WGI 2007, scores range from -2.5 to +2.5).



Rule of law is a concept close to that of trust. The same countries performing well on trust also perform well on rule of law. But there are also significant differences, as trust measures personal trust among people whereas rule of law measures trust in a society's law enforcement. In Romania and Bulgaria rule of law is far below the average value for an EU Member State.

- **Control of corruption** measures the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (source: WGI 2007, scores range from -2.5 to +2.5).



Control of corruption is highest in Finland and France and lowest in Romania and Bulgaria. Finland also performs best on the before-mentioned Transparency International Corruption Perceptions Index.