

Comments on „Recommendations for further Improvements of the EIS“

prepared by MERIT for the Commission workshop on June 16th, 2008

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Mannheim, June 17th, 2008

1. Detailed Comments on Proposed Indicators

In the following I give some comments on each of the indicators listed in Table 1 on p. 24 of the MERIT input paper, including some tentative thoughts on additional or alternative indicators

1. HUMAN RESOURCES

1.1 S&E graduates

o.k.

1.2 Population with tertiary education

o.k.

1.3 Broadband penetration

Rather drop, the indicator is too specific, has little to do with human resources, focuses on the access only one communication technology, strongly depends on a country's ICT environment (role of incumbent telecommunication provider, role of cable television), link to innovation rather unclear

1.4 Participation in life-long learning

o.k.

1.5 Youth education attainment level

o.k.

1.NEW Share of foreign students in S&E in total students in S&E

Source: Eurostat, indicates how attractive a country is for foreign students to study innovation relevant fields - and may show a country's ability to combat shortages in supply of highly qualified labour by immigration. The indicator has some weaknesses, however, such as border effects (small, centrally located countries may have a higher share than large, remotely located ones), language effects (English speaking countries are generally more attractive) and history effects (e.g. students from former dependent territories)

2. ENTREPRENEURSHIP AND FINANCE

2.1. ICT Expenditure

Rather drop, too specific, optimal level difficult to determine, indicator value depend on ICT prices (e.g. low competition in ICT product markets may result in high prices and high expenditure, indicating a weakness)

2.2 Early-stage VC

One may think of using investment in early & expansion stages (instead of funds raised for early stage) since this change may decrease volatility and give a broader picture on the availability of a domestic VC industry

2.2a Private Credit

Is this indicator really informative? Within the group of industrialised countries, there is no specific shortage in financial sources as such, and there are not really national financial markets but there is rather an integrated international financial market. Differences in the level of private credit availability will most likely reflect differences in the demand for loans to finance investment that bear bankable risks. The indicator may thus relate to macroeconomic indicators such as change in aggregated demand, gross investment or expenses of consumer for durables. What is more, within Euro-zone countries, inflation rate differentials become important, since in high-inflation Euro countries, real interest rates are low (since the interest rate for loans is basically the same in each Euro country) and demand for loans is higher (e.g. in Spain, Ireland). Changes in this indicator within Euro zone countries may reflect changes in inflation rate differentials. I do not think that we want to measure such things by EIS.

Therefore: check carefully the validity of any financial market indicator you may want to use.

2.3 Business Entry and Exit Rates

One should focus this indicator on manufacturing and business services (e.g. NACE 10-41, 51, 60-74) in order to avoid measuring firm turbulence in retail trade, restaurants, construction services and other sectors that are predominantly based on non-innovation competition.

One could use two indicators alternatively: (a) entry rate (no. of newly established enterprises during year t per no. of enterprises at the beginning of year t) and (b) “turnover of enterprises” (no. of newly established plus no. of closed-down enterprises during year t per no. of enterprises at the beginning of year t)

2. NEW Enterprises lacking external funding for innovation

Source: CIS. Share of enterprises that stated that a lack of external funding is a highly important obstacle to innovation. This indicator would provide a more complete picture on whether financial markets support innovation in enterprises across all sectors and all types of external finance (loans, VC, business angels), including non-innovative enterprises.

3. TECHNOLOGICAL INNOVATION

3.1 Public R&D expenditures

keep it - public knowledge stocks are an important source of various types of spillovers to the business sector, though the spillovers as such may be difficult to observe since they range from human capital, reading academic publications, technology advice, joint R&D to informal exchange of knowledge.

3.2 Business R&D expenditures

o.k.

3.3 Share of medium-high-tech and high-tech R&D

drop it - any business R&D expenditure is investment in new technology and new knowledge and therefore relevant to business innovation

3.4 Share of enterprises receiving public funding for innovation

drop it - no optimum level to be determined, strongly depending on national ways to fund R&D in enterprises (e.g. tax schemes will target a large share of enterprises but provide small funding shares per enterprise, while direct subsidies address a smaller share of enterprises but offer higher public contribution for each funded enterprise)

3.5 Flows of technological knowledge

In general, I do not see the need to measure certain types of how enterprises may organise their innovation activities (and thus implicitly devaluating other types). Organising innovation through a network approach is certainly one option for a firm, but there are other options that may work as well. The only issue for the EIS would be to look whether a country fails in offering appropriate framework conditions for firms to follow every possible type of organising innovation activities (e.g. lack of co-operation partners, lack of qualified personnel, unwillingness of public research to co-operate, ineffective knowledge and technology markets, ineffective IP protection system etc.). The flow of technological knowledge as such is an ambiguous indicator since it may also reflect a lack of appropriation methods for firms to protect their knowledge from flowing out.

- *Share of firms involved in R&D co-operation*: strongly correlates with 4.2, no need for a separate indicator here
- *Share of firms involved in networks*: no clear relation to technological innovation, difficult to measure (what is a network?), optimum level unclear
- *Scientific co-publications (or co-patenting of firms and public research institutions)*: strongly biased to a few fields of technology where close direct co-operation between businesses and academia is widespread, e.g. biotechnology, chemicals, some areas of ICT

I would therefore recommend to refrain from adding an indicator on flows of technological knowledge.

3.6 Indicator capturing knowledge inflows

Acquiring knowledge from abroad is certainly an important element of upgrading technologies and utilising the global stock of knowledge. But is it really true that larger knowledge inflows indicate a better innovation performance? I strongly doubt. Policy implications of this indicator are also unclear: Should policy encourage firms to acquire knowledge from abroad (e.g. deter them from purchasing technology from domestic suppliers)?

- *High-tech imports/GDP*: this indicator strongly and negatively correlates with country size since small countries simply cannot produce all the technology they need domestically and will have to purchase a large fraction of their technology from abroad (this is even true for countries specialised on high-tech such as Switzerland or Sweden) while large countries are more likely to have a diversified domestic high-tech industry which will diminish the propensity to import high-tech goods (e.g. USA, Japan).
- *Share of GERD financed by foreign sources*: it is hard to see why a high share of GERD financed by foreign sources is better than a small one. Changes in this indicator can be quite arbitrary as a result of M&A activities (without any change in the innovation behaviour of firms)
- *Share of BERD conducted by foreign affiliates*: see above.

I would therefore recommend to refrain from adding an indicator on knowledge inflows.

4. NON-TECHNOLOGICAL INNOVATION

4.1 SMEs innovating in-house

o.k.

4.2 Non-R&D Innovation expenditures

Drop it - this indicator is likely to be little reliable and comparable. While some countries survey (and report) total innovation expenditure, others only survey innovation-related expenditure in machinery/equipment/software and other external knowledge. The accuracy of innovation-related expenditure in machinery/equipment/software reported in the CIS is quite doubtful. You may think of using an alternative indicator capturing investment in new machinery/equipment (see 4.NEW)

4.3 SMEs using organisation innovation

o.k.

4.4 SMEs using marketing innovation

o.k.

4.NEW Ratio of gross fixed capital formation

Source: Eurostat, National Accounts. Numerator: Gross fixed capital formation in metal products, machinery, transport equipment at current prices; Denominator: Gross fixed assets in metal products, machinery, transport equipment at current prices (all NACE branches). This indicator captures the speed of renewal of fixed assets relevant to the business sector (e.g. excluding construction). High investment ratios indicate a rapid change in fixed assets. Since new investment is almost always based on new technology, the indicator can reflect an important part of non-R&D based investment.

5. THROUGHPUTS

5.1 EPO patents per million population

add PCT patents into one indicator

- 5.2 **ISPTO patents per million population**
drop
- 5.3 **Triad patents per million population**
drop
- 5.4 **New community trademarks per million population**
use WIPO trademarks instead
- 5.5 **New community designs per million population**
use WIPO designs instead

6. APPLICATIONS

- 6.1 **Employment in high-tech services**
Extend to all knowledge intensive services and include Indicator 6.5 (employment in medium-high and high-tech manufacturing)
- 6.2 **Exports of high technology products as a share of total products**
This indicator does not measure performance but rather industry structure (since a country with a very small high-tech sector will not be able to obtain a high share of high-tech products in total exports, even if the country's high-tech sector is extremely successful in transferring R&D into global sales of new products.
I would suggest to change this indicator by the following:
 - *Trade balance in medium-high and high-tech products (% of GDP)*: This indicator would capture the ability of a country to sell more technology products abroad than it purchases from other countries (i.e. the country is a net exporter of technology). Focusing on technology products is useful since for these products, innovation is a key competitive factor (while for other products, labour and other input costs are more relevant).
- 6.2 **Sales with new-to-market products**
o.k.
- 6.3 **Sales with new-to-firm products**
o.k.
- 6.4 **Employment in medium-high and high-tech manufacturing**
merge with Indicator 6.1
- 6.5 **Labour productivity**
o.k.
- 6.6 **Share of innovators for whom innovation has significantly reduced labour costs per unit of output**
include innovators for whom innovation has significantly reduced material or energy costs per unit of output

6.NEW Technology balance of payment

Source: OECD, Eurostat; Numerator: Receipts minus payments for technical knowledge and services; Denominator: GDP. The technology balance of payments is the difference between exports and imports of technical knowledge and services (including licence fees, patent purchases and royalties paid, know-how, research and technical assistance). It is strongly related to trade in knowledge-intensive services (excluding software) and is thus a measure for a country's competitiveness on the international market for knowledge.

2. Further Remarks

In the workshop, the Portuguese delegate mentioned a likely overlap between **marketing innovation and non-R&D innovation expenditure**. Analyses of the German CIS2006 data have shown, however, that there is no strong link. Only a few percent of total non-R&D innovation expenditure refer to expenditure for marketing innovation. There is a report to Eurostat documenting the results.

In the workshop, someone suggested to use indicators from the **Global Entrepreneurship Monitor (GEM)**. I would be rather careful when using this source as an indicator on market entry that stimulates innovation (or at least competition, with competition maybe stimulating innovation) because entrepreneurial attitudes often depend on opportunity costs, e.g. the probability to earn high income from dependent employment. Low income countries tend to have higher entrepreneurial attitudes as a result of low income levels (see for more details on likely sources for international differences in self-employment Blanchflower, D.G. (2004), "Self-Employment: More may not be better", *NBER Working Paper No. 10286*; Parker, S.C., M.T. Robson (2004), "Explaining International Variations in Self-Employment: Evidence from a Panel of OECD Countries", *Southern Economic Journal* 71(2): 287-301; Torrini, R. (2005). "Cross-country differences in self-employment rates: the role of institutions", *Labour Economics* 12(5): 661-683.)

On the **comparability of national data on entry and exit rates**, see my small paper (2006): "Technology-based Start-ups", in U. Schmoch, C. Rammer, H. Legler (eds.), *National Systems of Innovation in Comparison. Structure and Performance Indicators for Knowledge Societies*, Dordrecht: Springer, 153-167. I will send a pdf of this article.

Concerning **framework conditions for entrepreneurship**, the World Bank's Doing Business indicators are worthwhile to be considered. There are four indicators on start-ups: time to set up a new business, costs of establishing a new business, volume of capital for starting a business, and number of administrative procedures needed to start-up a business. It may be difficult to combine these four indicators into a single one.