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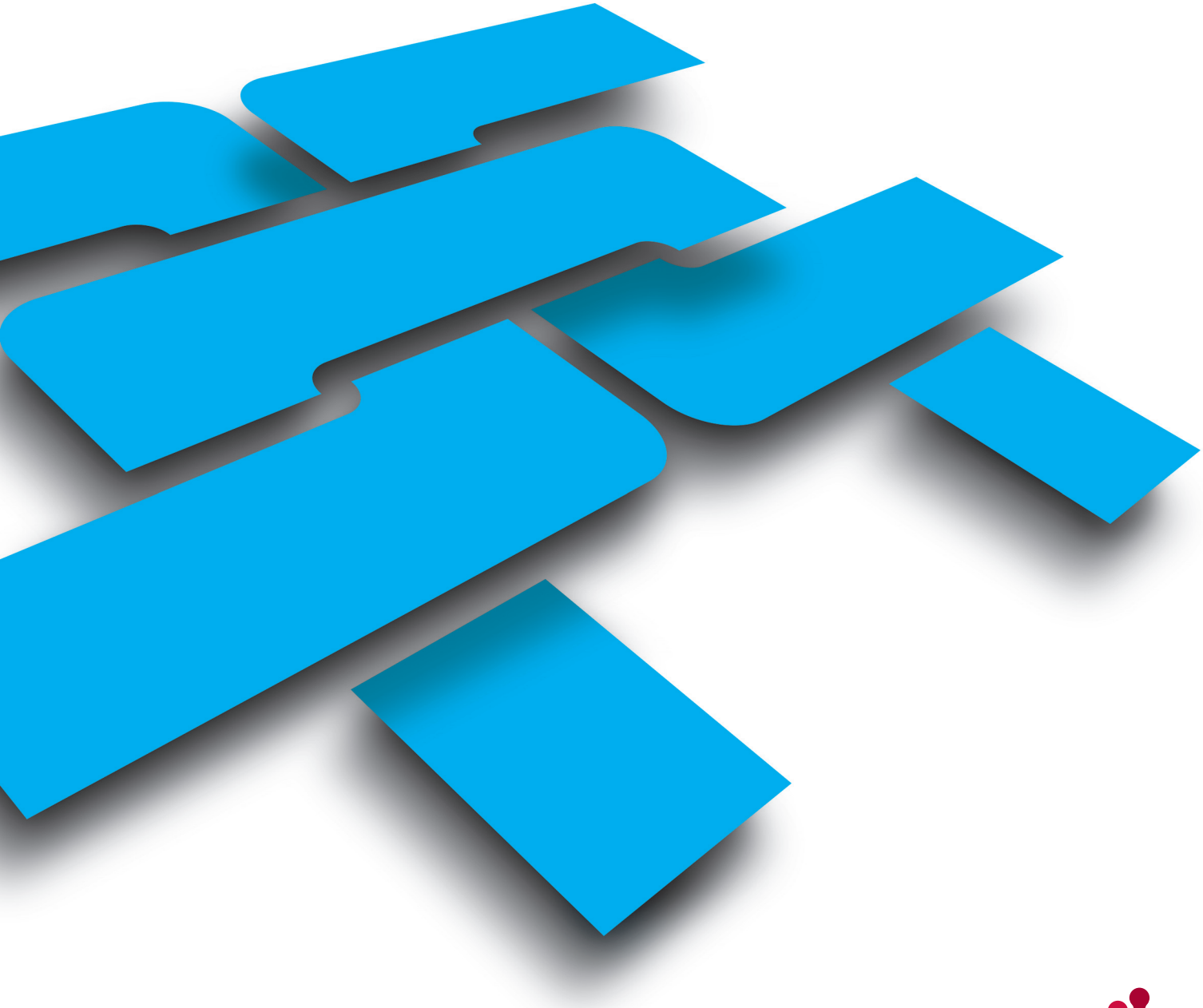

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SUMMARY

Structural funds and the new challenge to convergence

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Europe is about to face a crucial turning point in its development trajectories. One of the key\determinants of success along such trajectories is bound to be its ability to raise the average innovation performance not only of best performers but, most importantly, of worst performers.

Southern European countries are characterized by the highest variance in the innovation performances of their regions. In the 2006 European Innovation Scoreboard, not only southern countries ranked quite low, but it is interesting to observe that 20 out of 23 bottom positions of the regional ranking are occupied by Spanish, Italian, Portuguese and Greek regions.

Europe is now clearly experiencing a true innovation divide, due not only, and not primarily, to the enlargement of its boundaries but also to the fact that certain regions of the former EU15, in particular in southern Europe, have fallen short of the objective to catch up with most innovative economies.

Such dichotomous innovation potential is just one of several reasons why we are in strong need of a new generation of structural policies. Structural funds have steadily gained relevance in the EU budget, due both to the increase of the budget itself and to the relative decrease of allocations to agriculture, which, nevertheless, is still having the lion's share. Indeed, the 2007-2013 structural funds programme has strongly taken into consideration the need for supporting the convergence objective, which will endow catching-up regions with a fairly large amount of resources. Most importantly, in agreeing a financial perspective for 2007-2013 structural policies, the Member States decided that a relevant proportion of the resources for the next generation of programmes should be reserved for investment in areas directly linked to the Lisbon Strategy, and, in particular, research and innovation.

Such vision, together with the allocation of 4,7% of the EU budget to the programme on research, technological development and demonstration and the allocation of 0,3% of the EU budget to the competitiveness and innovation framework programme will put, quite conveniently, research and innovation among the top priorities of the future European policy agenda.

We are fast approaching the due date in which Europe would be expected to achieve the goals that were set by the Lisbon Strategy. Though, well in advance, the European Commission itself has acknowledged not only the difficulty to achieve those results but, most importantly, it has recognised that the policy agenda that was behind those objectives had to be reconsidered. The Aho report, in particular, has highlighted the necessity to redesign some

of the policies that will shape the future of innovation in Europe, pointing out the specific need for a shift of balance from supply side innovation policies to demand side innovation policies and for a deeper understanding of the
process of innovation in small and medium enterprises.

COTEC Europe endorses such perspective and recommends that future policy actions would take into full consideration the relevance of traditional industries based on SMEs without scale and abilities such to have access to ambitious innovative projects. In the same direction, we stress the importance to design differentiated incentives to innovation, according to company size and maturity, competition pressures, and technological paradigms. Moreover, such policies should be designed so to reinforce non-linear, open, demand driven, and suitably organized innovation processes. Only the full consideration of the emerging model of open innovation will allow policy makers to effectively support the growth of companies in catching up regions of Europe.

In supporting any effort to develop suitable demand side policies, COTEC Europe also encourages the recent initiative of the European Commission to define a consistent legal and administrative framework in which single member countries could develop policies based on public procurement of new technologies, and in particular pre-commercial procurement in strategic areas such as health, sustainability, security and transports.

Furthermore, COTEC Europe recommends that any policy action to be undertaken is suitably matched by adequate education and training policies, making human resources the fundamental intangible infrastructure upon which structural change will be based. In doing so, it is recommended that the whole integrated process, from primary education to academic education and life long learning is considered.

In terms of innovation policy governance, it is recommended that an appropriate effort is produced to diffuse better innovation governance practices in the regions, in terms of strategy definition, assessment, accountability, and improved coordination with central government and other regions. This would also entail the partial commissioning of the definition of appropriate innovation governance models, as well as the convenient implementation of innovation activities, to private companies.

As a final recommendation, it is important to underline that the success a new generation of policies will be largely dependent on implementation issues. COTEC Europe recommends that a considerable effort is placed on imposing strict evaluation criteria, standard and practices in the selection of policies and projects. This will be possible only if regions will be impelled to build up adequate project evaluation, monitoring and follow up capabilities.

Improving Innovation Scoreboards: finding a way forward

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This paper reports the results of a joint project on Innovation Scoreboards, carried out by COTEC Italy, COTEC Portugal and COTEC Spain. It reflects therefore the work of a group of people committed to a common objective. I would therefore like to thank all the colleagues that participated in this international project. I assume, however, the full responsibility for any remaining mistakes or inaccuracies.

Introduction

Several initiatives aimed at developing sets of indicators to assess country performances in various fields came along during the last decade. In the European Union, the need to monitor the progress in areas connected with the 'Lisboa Agenda' led to the development of three main sets of indicators: (1) Structural indicators; (2) Research indicators; and (3) Innovation indicators. The latter are expressed in the various vintages of the European Innovation Scoreboard (EIS). This move is not specific of the European Union. The OECD has also developed indicator sets. In parallel, there is an older tradition of developing multi-criteria exercises to assess and compare the so-called "competitiveness of countries", the two most relevant exemples being the Global Competitiveness Report, undertaken by the World Economic Forum, and the IMD World Competitiveness Yearbook. The need for combining different indicators has also became established at company level, as shown by the success of various Balanced Scorecard approaches.

The relevance of innovation for achieving competitiveness in an increasingly globalised and knowledge-based economy has led to the development of Innovation Scoreboards (IS). These are aimed at collecting information on the varibles deemed as most important to asess innovation behaviour and performance. The EIS is most probably the best-known IS instrument. It is not, however, without criticisms, and the European Commission is now in the process of revising it.

Concerned with innovation, and especially with innovation conditions and performance in South European countries, COTEC Europa found that existing IS do not fully translate the

specific characteristics of innovation drivers and behaviour in those countries. It has been therefore decided to launch a project on the topic, with the aim of contributing towards the improvement of such Scoreboards, and namely of the EIS.

This document provides the headlines of such project, pointing out in particular the main findings and presenting a proposal for an improved Innovation Scoreboard. It draws to a large extent on the contribution of colleagues from COTEC Italy, COTEC Spain and COTEC Portugal. The document is organised in six sections. The first provides information on the main purposes and theoretical background behind the design of IS. The second is addressed to the revision of the EIS experience. Then, a discussion of the common characteristics of the National Systems of Innovation of the three countries concerned is undertaken. The key aspects of the COTEC project are reviewed more in detail in the fourth section. The IS proposal stemming from the project is presented next. The paper closes with a concluding section.

Innovation Scoreboards: Purpose and Theoretical Foundations

Generally speaking, international Innovation Scoreboards (IS) may serve three main purposes:

1. Supporting policy-making, as they enable the identification of weaknesses or under-performing areas which may demand new policy initiatives;
2. Assessing policy outcomes, particularly the monitoring of the progress in achieving specific policy targets; and
3. International assessments and rankings, by comparing country performances.

Very often, there is a conflict among these three purposes. There is an almost automatic bias to focus on inter-country comparisons and rankings. These are important to put one country's performance into perspective. Unfortunately, however, rankings tend to obfuscate the other purposes. They attract most attention, leaving little ground for the consideration of the other two purposes. Furthermore, as Schibani & Streicher (2008) pointed out, they may lead to "name and shame". It is important, therefore, to underline the other IS purposes, since they are essential for policy design and fine-tuning. As it has been pointed out by COTEC Spain, and endorsed by COTEC Italy and Portugal, IS should be mainly aimed at identifying "those indicators which are useful to measure specific aspects of our National Innovation Systems in order to recommend specific policies, to improve them" and to assess the progress.

This comment leads to another relevant issue: the appropriateness of the battery of indicators selected to fully reflect the key policy and performance variables. Extant research on the topic converges in pointing out the need for new indicators, better suited to capture the systemic nature of innovation. The main problems appear to concern linkage and process indicators (Smith, 2004; Veugelers, 2006; Arundel & Hollanders, 2006). There is a widespread recognition that improving the relevance of IS for policy making and assessment demands specific indicators for recording actors' activities, inter-actions and clustering, as well as for expressing the outcomes of technology diffusion processes. A further question is

the appropriate time frame to assess indicators, since some have a structural nature, thereby exhibiting little changes on an yearly basis.

The issues raised above make clear that, besides the definition of purpose, the existence of a sound theoretical basis for the definition of the IS indicator set becomes essential.

The transition from a linear to a systemic model of innovation is the cornerstone of a new theoretical perspective on the innovation process. If in the academic community the new perspective is now clearly dominant, namely among the innovation research community, in the policy-making field progress has been much slower.

The systemic approach to innovation has been espoused in the European Commission discourse. The differences between the 1996 Green Book on Innovation and recent E.C. Communications on innovation policy (see, for instance, the Communications 'Innovation policy: updating the Union's approach in the context of the Lisbon strategy' [COM(2003)112] and 'Putting knowledge into practice: A broad-based innovation strategy for the EU' [COM(2006) 502]) is striking. As the Aho report (2006) has pointed out, there is a need to close the gap between the political rhetoric and the reality of European policies.

A central theoretical foundation for designing IS is the concept of National System of Innovation (NSI). It may be defined as a "set of elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge" in a given country (Lundvall, 1993). It is important to recognise, however, that some of the above relationships are not geographically confined to the boundaries of the country concerned. The main players in a NSI are business firms, but other elements such as education and training organisations, research organisations, support and technical assistance centres, and the financial sector are also important elements.

NSIs involve learning, inter-actions and dynamics. They combine stability and change. Some features may change at a relatively fast pace, while others are structural, experiencing slow evolutionary processes. National differences may therefore take a long time to be effaced. Furthermore, countries' have different underlying 'heritages' and characteristics, thereby leading to a diversity of approaches and paths to respond broadly similar challenges. In this context, B. Lundvall and E. Lorenz developed a framework for identifying skills for innovation (Lundvall, Lorenz & Drejer, 2004; Jensen *et allii*, 2004; Lorenz, 2005), which may be relevant for our objectives. They suggest the existence of two different, though complementary, modes of skills development and learning: the STI-mode (Science, Technology and Innovation), and the DUI-mode (Doing, Using and Interacting). The STI-mode corresponds to the common view of technological development processes. It largely draws on explicit know-why, based on scientific and technological research, and on the R&D activities of big firms. The DUI-mode, in contrast, relies chiefly on employee know-how, of a tacit and localised nature. On-going problem-solving processes are central, encompassing learning-by-doing and learning by using. The results of their empirical analysis show that country performance seems to be higher when the two modes are combined. However, most NSIs lean towards one or another of the modes identified.

This research has interesting implications for the design of IS. It indicates that there is not 'one-best-way'. Different approaches and mixes being followed in different countries with similar degrees of success. Therefore, an IS vision just focussed on the dominant perspective, that is, the STI-mode may be misguided. Account should be taken of different 'models' for skill development and learning as well as of different industrial patterns. The diversity of approaches has to be taken onboard in designing an IS instrument.

To conclude, extant evidence suggests that such an instrument should be based on a systemic view of innovation, and draw upon a NSI perspective. Due account should, however, be taken of the different characteristics of NSIs. These conclusions provide the foundations of a critical analysis of the present EIS, which will be undertaken below.

The EIS experience: achievements and room for improvement

The initiative to launch the EIS comes in the wake of the 'Lisboa Agenda', where a new approach to innovation has been clearly espoused. The theoretical logic behind the building up of the EIS is the systemic approach, and more particularly the concept of NSI. In parallel, there is a growing recognition that, though technological innovation is important, innovation is not just about technology. There are other facets of innovation that need to be taken into consideration. The documents recently produced by the European Commission acknowledge this fact. Therefore, the systemic nature of innovation, the diversity of innovation types and the multifaceted nature of the NSIs require a wide set of indicators to express such a diversity and complexity.

The creation of the EIS was a welcome move from a situation where most indicators just concerned R&D expenditures. Similarly, the earlier launching of the Communitity Innovation Survey (CIS) has been a step in the right direction. Broadly speaking, the EIS has significant merits on three grounds:

(i) a more encompassing approach to measuring innovation;
(ii) the creation of a tool for comparative inter-country analysis of innovation capabilities and performance along different policy relevant dimensions; and
(iii) a wide country coverage.

These merits notwithstanding, the capability of the EIS to respond the three-fold purpose identified above of supporting policy-making, policy assessment and international comparisons remains limited. Most analyses of EIS focus on comparisons, and not on the policy-making and assessment purposes. As mentioned above, ranking tends to prevail over the other purposes. In spite of the relevance of many indicators, it has been difficult to 'translate' the EIS into a coherent frame for supporting policy design and evaluation at country level. The absence of a clear inter-action chain between indicators, namely input and output indicators, and the variability in CIS indicators appear to be key reasons for those 'translation' difficulties.

This general comment leads to the presentation of the main shortcomings of the EIS as it stands now. In our opinion, these may be clustered in five groups: insufficient consideration of different NSI patterns; bias towards technological, and manufacturing, innovation; insufficient attention assigned to dynamics; weaknesses of the indicator set; and aggregation issues in the design of the Summary Innovation Index (SII).

As mentioned above, the development of NSIs is largely evolutionary and shaped by history. So, countries exhibit different interaction patterns among the key players and different industrial fabrics. As Keith Pavitt has shown two decades ago, technological innovation trajectories differ according to the industries concerned. A similar problem concerns the financial dimension of NSIs . In credit-based financial systems, where the strength of capital markets is traditionally limited, venture capital indicators may not be the most appropriate to fully express entrepreneurship dynamics. In the same vein, there are NSIs more axed on knowledge creation, while others mainly rely on knowledge diffusion and use. To sum up, a sound inter-country comparative analysis needs to take structural NSI differences into account, in order to avoid the biases of assuming 'one best way'.

The second criticism concerns the focus on technological, and manufacturing, innovation. The 2005 version of the OECD Oslo Manual fully recognises the relevant role played by both commercial and organisational innovation. However, the more 'intangible', 'soft' and 'social' forms of innovation are not easily captured by statistical instruments. The translation into 'Euro amounts' entails even more difficulties than the traditional R&D investments. A related issue is the strong emphasis on manufacturing industry. The EIS 2007 Report acknowledges the need for overcoming these problems. The carrying out of the CIS has been a positive step to respond both concerns, although it still suffers from reliability and comparability problems. Finding a solution is not easy, and requires increased effort and cooperation. However, the need to tackle the issue, to better address the 'softer' forms of innovation, and to translate them into reliable figures, is undeniable.

The insufficient attention paid to dynamics is a third issue. Although the analyses of EIS address the identification of trends, the tool itself does not provide appropriate information on the changes occurred in innovation behaviour and performance. Those countries which have a lower starting point do not have, therefore, the outcome of their efforts fully translated into the basic EIS tool. There is a need to better take change into account. This would enable to express the efforts undertaken by the countries to improve innovation climate and performance.

The issues pointed out above become translated into the set of indicators selected. Both the structure and the set of indicators included in the EIS, have changed since its launch in 2000. This is an expression of the concern to improve its quality and reliability. As Arundel and Hollanders (2006: 3) have remarked, "[d]ue to a lack of good diffusion indicators, the EIS provides considerably better coverage of innovation as a creative activity than innovation as a process of diffusing new technologies and knowledge". This criticism is particularly relevant for NSIs more orientated towards DUI, as is the case of South European countries. More specifically, the analysis of the EIS 2007 indicator set suggests that it suffers from: an excessive focus on patents; an excessive assimilation of 'knowledge creation' to R&D

activities; an insufficient relevance assigned to inter-organisational cooperation on innovation; weakness of the entrepreneurship indicator; and lack of consideration of international trade on knowledge intensive business services (KIBS) and on disembodied technology.

Finally, a reference should be made to aggregation issues. These may be considered from two main perspectives. The first concerns the dimensions included in the EIS. The present five dimensions (Innovation drivers, Knowledge creation, Innovation & entrepreneurship, Applications, and Intellectual property) have been criticised, namely for the shortcomings of the contrast between inputs and outputs. Furthermore, if one does not explicitly discriminate the weight of the different dimensions, one would not fully recognise the importance of efficiency in 'transforming' conditions and inputs into outputs. The second perspective regards the building up of the Summary Innovation Index (SII). The SII is the EIS indicator that most people will immediately look at. In fact, the SII provides the basic tool for inter-country comparisons. For this very reason, greater care should be put on designing the SII. At present, it over-emphasises the weight of those dimensions with more indicators. For instance, the weight of Intellectual property, with 5 indicators, is clearly unjustified, when compared with indicators on innovation expenditures or on inter-organisational cooperation. Besides the flaws with regard to the definition of country scores on individual indicators (COTEC Spain, 2008), the option of assigning equal weight to all indicators is highly questionable (Simões, 2008; Schibany & Streicher, 2008; Tarantola, 2008a and 2008b). A cautionary note is needed in this regard: although the SII is inescapable, the EIS is much more than the SII, and all indicators should be taken into account since they illuminate different aspects of NSIs performance.

The initiatives taken by the European Commission to revise the EIS are, therefore, most welcome. There is awareness about the main limitations of the present configuration of EIS as well as about the need to improve the collection of relevant information on 'softer' innovation factors and performance. This has been clearly shown in the workshop on "Improving the European Innovation Scoreboard methodology", held on 16 June 2008. Stakeholders from different countries, including the three COTECs, were invited to express their views on the configuration and contents of the 'new' EIS. The input paper for the workshop (Hollanders & van Cruysen, 2008) reviews many of the criticisms, and presents some fresh ideas on how to improve the EIS. Although some may still be subject to criticism, namely the definition of dimensions and the sharp distinction between technological and non-technological innovation, the revision seems to go in the right direction. At the end of the day, there is a need for pragmatism. First, it is difficult, if not impossible, to avoid the 'disturbing' effect of SII in overshadowing the relevance of single indicators (or groups of closely related indicators). Second, by its very nature, the EIS is not able to fully reflect the specificities of different NSIs.

It is recognised that the particular characteristics of South European NSIs can not be accurately translated into the 'general', broad scope, nature of the EIS. Nevertheless, it is of the utmost importance to better address different paths and enabling factors for innovation. The development of a commom endeavour to design indicators more suited to express the

specificities of those NSIs does not go against the efforts towards improving the EIS. On the contrary, the initiatives are mutually reinforcing.

Improving Innovation measurement: a South European perspective

Drawing on the discussion on the theoretical basis for designing IS and on the above comments, it is possible to identify key features that should, in our opinion, be taken into consideration in designing IS instruments that might better understand how innovation takes place in South European countries.

A starting point should be the analysis of the NSIs. Extant research suggests the existence of some stylised common facts about our countries that might lay the ground for a more in-depth analysis. Such facts may be summarised as follows:

i) Late industrialisation processes (with the exception of some parts of Northern Italy, and the Basque Country and Catalonia in Spain);
ii) Follower approach, the accumulation of knowledge and technology being more based on diffusion than on the more structured, research-based, STI-mode;
iii) Relevance of traditional industries, where technology change is more supplier-driven than based on in-house research;
iv) Relatively high share of SMEs;
v) Foreign investments had a significant role in modernising the industrial structure, particularly in Portugal and Spain;
vi) The development of some nodes in the NSI is relatively recent, and (in the case of Portugal, Spain and Southern Italy) supported by the EU in the context of Community Support Frameworks;
vii) Relatively low quality of the education system;
viii) Conservative University system and weak tradition of University-Industry cooperation;
ix) A burdensome and 'heavy' regulatory system, in spite of the improvements undertaken in recent years; and
x) Dominance of a credit-based financial system.

These significant commonalities do not preclude the existence of several differences. The exercise carried out by Hollanders & Arundel (2007), on the influence of socio-economic conditions and regulatory environment in innovation performance, shows many similarities, but also some differences among the three countries. For instance, the 'innovation drivers' indicators for Italy and Portugal are consistently below what might be expected from the overall influence of socio-economic and regulatory conditions, while for Spain they are generally in line with expectations. In contrast, for the 'innovation & entrepreneurship group' Portugal exhibits an above-expectations performance, while Spain shows below-expectations figures. Nevertheless, at the end of the day, similarities are more important than differences.

The similarity of patterns gets further confirmation from the analysis by Hollanders & Celikel-Esser (2007) on innovation efficiency and peer countries. These are defined as those

countries with higher efficiency scores on both EIS output dimensions (applications and intellectual property). It is curious to find that: (1) Spain and Italy (besides Switzerland) are the main 'peer countries' for Portugal; and (2) Italy (together with Switzerland) is the main 'peer country' for Spain. In spite of the limitations of this analysis, due to the weaknesses of the EIS itself, the similarity of patterns among the three countries is noteworthy.

Taking such similarities and the above mentioned stylised facts into account, there are peculiarities of our NSIs which are not fully reflected in the EIS. Particular attention needs to be paid to the following aspects:

1. **NSIs may not correspond to the 'standard' STI-mode.** This requires putting less emphasis on R&D and patent indicators, while introducing knowledge, technology and innovation diffusion indicators;
2. **Different industrial structures**. This demands the use of embodied and disembodied technology flows. This kind of indicators is consistent with the earlier argument that diffusion should be better captured by IS instruments;
3. **Indicators on linkages**. There is a need to include more (and better) information on inter-organisational linkages for innovation, not just between companies, but also between companies and other organizations (including Universities and research and training centres), at both national and international levels;
4. **Entrepreneurship performance**. As mentioned above, the use of early-stage venture capital as the only indicator to record entrepreneurship is biased in favour of equity-based financial systems, discriminating against credit-based ones;
5. **Improving the measurement of innovation performance dynamics.** There is a need to consider indicators that might better document the changes occurred in less STI-orientated countries, namely those of Southern Europe.
6. **Improving the measurement of innovation efficiency.** Even though an interesting study has been carried out on this regard (Hollanders & Celikel-Esser, 2007), the measurement of innovation efficiency leaves much to be desired.

Improving Innovation Scoreboards: A review of the COTEC project

On the basis of the above reasoning, a collaborative project on the development of an IS has been carried out by COTEC Italy, COTEC Portugal and COTEC Spain. Five main principles have been taken into account in the development of the project:

1. *Purpose*. The main purposes of the IS should be policy making and policy assessment, and not so much the building up of international rankings (even though, at the end of the day, these may become inevitable);
2. *Additionality*. The project is intended to build upon similar initiatives, namely the EIS, being consistent with them, instead of endeavouring at arriving at an 'original' instrument;
3. *Theoretical Consistency*. The objective was not to assemble a collection of indicators, but rather to develop an instrument consistent with, and reflecting, a sound theoretical framework, based on the NSI concept;

4. *Feasibility*. It is important to build upon indicators that might be easily obtained from existing statistical databases. However, it should be recognised that there is a dearth of appropriate indicators on some areas, such as: outputs and impacts of innovation (OECD, 2006); linkages, cooperation and entrepreneurship (Gault, 2006; Arundel & Hollanders, 2006; Veugelers, 2006); and innovation in services (Arundel *et allii*, 2007; Miles, 2004).
5. *Parsimony*. An IS should be a selective instrument. Focus must be put on those indicators most suited to reflect very relevant innovation features. Otherwise, one risks becoming lost in the trees, without getting a view of the forest.

Drawing on these principles, the work has been carried out in four main steps:

1. *Agreement on a theoretical framework*: This has been essential to provide a sound background against which the selection of specific indicators might be undertaken. It provided the 'leads' for the identification of indicators. The NSI concept provided the theoretical frame for our exercise. A perspective of the similarities of South European countries' NSIs has been developed. Due account has been taken of the central role played by business firms. Furthermore, it was recognised, in line with Ertl *et allii* (2006) that the working of the system involves Actors, which establish Linkages and perform Activities to generate Outputs and Outcomes.
2. *Review of existing IS approaches*: This has been an 'opening' step. The knowledge and critical assessment of what is already available provided relevant perspectives and insights. Such critical assessment has been guided by the fit with the theoretical framework. The key reference for this task has been the EIS 2007. A close analysis of its merits and shortcomings from the perspective of South European countries' NSIs has been undertaken.
3. *Key Dimensions and Indicators of an 'ideal' IS*, drawing on the theoretical framework and building upon the EIS 2007. An exercise of weighting of the dimensions has been carried out at this step, but it still needs to be refined.
4. *Analysis of the feasibility of the 'initial' set of indicators*: This required namely the checking of the availability of sound statistical information for calculating the indicators identified at step 3.
5. *Proposal of an IS.* This is a 'closing' step. On the basis of the feasibility check, the basic dimensions have been defined and a consistent set of innovation indicators has been selected. A central concern has been that all the indicators should be available or be easily derived from available databases; it was not ruled out, however, that an indicator deemed as critical might not be proposed, even if still unavailable. Another key concern has been to contribute towards the improvement of the EIS, namely by better taking into account the specificities of South European countries' NSIs. As mentioned above, our exercise has been intended to improve the quality of the EIS and its adaptation to our NSIs, and not as a 'rival' instrument.

The outcome: an Innovation Scoreboard proposal

The development of the project so far, led to the IS proposal presented on Table 1 below. This is still a preliminary version, which needs to be further improved.

An analysis of Table 1 enables to identify the main features of the IS proposal. The first concerns the fact that the majority of the indicators is common to the CIS 2007: there is an overlap with the EIS for 16 out of the 25 indicators suggested; the EIS indicators which were not considered are mentioned in a footnote to the Table. The second deals with the dimensions. In line with a systemic perspective, three main dimensions were defined: *Innovation Conditions*, which broadly corresponds to the 'Innovation Drivers' of the EIS 2007; *Business Engagement*, translating the central role of business firms in the NSI; and in *Innovation Outputs*, to express the value implications of the innovation process. Note that all indicators this dimension are defined in monetary terms. This is a key difference with regard to the EIS 2007, where employment indicators are considered as outputs. Another difference concerns intellectual property, which has been included as an Activity under Business Engagement. Our suggestion is consistent with the "rethinking" of the EIS by Hollanders & van Cruysen (2008).

TABLE 1
Improving Innovation Scoreboards: A Proposal

		EIS	New
	INNOVATION CONDITIONS		
1	S&E graduates per 1000 population aged 20-29	X	
2	Population with tertiary education per 100 population aged 25-64	X	
3	Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)	X	
4	ICT expenditures (% GDP)	X	
5	Participation in life-long learning per 100 population aged 25-64	X	
6	Public R&D expenditures (% of GDP)	X	
7	Scientific publications (SCI) per milllion population		X
	BUSINESS ENGAGEMENT		
	Capabilities		
8	Employment in medium-high and high-tech manufacturing (% of total workforce)	X	
9	Employment in Knowledge-intensive business services - KIBS (% of total workforce)		X
	Activities		
10	Business R&D expenditures (% of GDP)	X	
11	Innovation expenditures other than R&D (% of turnover)		X
12	SMEs using organisational innovation (% of all SMEs)	X	
13	Disembodied Technology Acquisition (TBP Payments as % of GDP)		X
14	EPO patents per million population (**)	X	
15	Triadic patent families per million population (**)	X	
16	New Community designs per million population (**)	X	
17	New Community trademarks per million population (**)	X	
	Linkages		
18	Innovative SMEs co-operating with others (% of all SMEs)	X	
19	Share of S&T organisations receipts due to services provided to firms (as % of turnover) (***)		X
	New Actors		
20	INDICATOR ON ENTREPRENEURSHIP (*)		X
	INNOVATION OUTPUT		
21	Productivity growth		X
22	Sales of new-to-firm products (% of turnover)	X	
23	Exports of high technology products as a share of total exports	X	
24	Exports of knowledge-intensive services as a share of total service exports		X
25	Disembodied Technology Exports (TBP Receipts as % of GDP)		X

(*) The possibility of merging the four Intellectual Property indicators into a single indicator will be explored.
(**) It is recognised that, in the short term, it might be difficult to find appropriate data to buid this indicator.

Note: The following EIS 2007 indicators were not included in this proposal:1.3. Broadband penetration rate; 2.3. Share of medim-high-tech and high-tech R&D; 2.4. Share of enterprises receiving public funding for innovation; 3.1. SMEs innovating in-house; 3.3 Innovation expenditures; 3.4. Early stage venture capital; 4.1. Employment in high-tech services; 4.3. Sales of new-to-market products; and 5.2. USPTO patents per million population.

Going more in-depth in the analysis of the proposal, it is important to underline the following aspects:

1. Regarding *Innovation Conditions*, there has been just one indicator added to the EIS ('Scientific publications per million population'), intended to translate the productivity of 'Public R&D expenditures'. All the EIS indicators under 'Innovation Drivers' were kept, with one exception – 'Broadband penetration'. Since in a few years this indicator will no longer be discriminating, it has been considered more appropriate to include here 'ICT expenditures (as a percentage of GDP)'. In contrast with the EIS, 'Public R&D expenditures' are envisaged as an 'Innovation condition', in accordance with our broad framework.
2. *Business Engagement* includes 12 indicators (or 9, if the four indicators on Intellectual Property were merged into just one), organised in four groups ('Capabilities', 'Activities', 'Linkages' and 'New Actors'), following with the

theoretical framework presented in the previous section. Below, an explanation on the rationale for each group is provided.

3. 'Capabilities' is aimed at translating, in an aggregated manner, business firms' capabilities. We are convinced that the structure of the employment, according to the characteristics of the industries, is the best way to express such capabilities. The CIS indicator on 'Companies innovating in-house' might be a candidate for this group; however, in our opinion, this indicator has some problems, since it is based on perceptual assessments.
4. The 'Activities' set encompasses a large number of indicators. Two groups come from EIS: 'Business R&D expenditures', which is a classic, structural indicator; and four indicators on Intellectual Property that should, if it will be acceptable from a statistical standpoint, be merged. There are three new indicators: 'Disembodied technology acquisition', to translate an important feature of South European countries' NSIs, technology diffusion; 'SMEs using organisational innovation', intended to seize the organisational dimension of innovation; and 'Innovation expenditures other than R&D', in order to express the non-R&D side of company innovation expenditures. The set of indicators selected seems, in our opinion, able to better capture the multi-faceted nature of innovation.
5. As mentioned above, inter-actions are a central tenet of a NSI. There is a consensus in innovation indicators literature about the need to improve the statistics on that regard. The 'Linkages' group is intended to express the intensity of relationships. Two indicators are suggested: one concerning cooperation seen from companies standpoint ('Innovative SMEs cooperating with others'), and another looking at the issue from the perspective of supporting S&T organisations ('Share of S&T organisations receipts due to services provided to firms').
6. Change is also a key feature of every NSI. Entrepreneurship is a basic driver of change. Therefore, a group entitled 'New Actors' has been considered. The problem, however, is how to measure entrepreneurship. So far, the EIS has used 'Early stage venture capital' as a proxy for entrepreneurship. Unfortunately, this approach has its own drawbacks, since it is very much influenced by the characteristics of the financial system. So, the use of an entrepreneurship indicator taken from the Global Entrepreneurship Monitor is suggested.
7. The last dimension concerns *Innovation Output*. Its purpose is to translate the value added by innovation. Therefore, the indicators are expressed in terms of the "measuring rod of money" (Machlup, 1980). Two of them come from the EIS: 'Sales of new-to-firm products' and 'Exports of high technology products as a share of total exports'. The relevance of this dimension requires, however, additional information, namely on productivity (an aspect already mentioned by Hollanders & van Cruysen [2008] in connection with the revision of the EIS), and on international trade in knowledge intensive business services (KIBS) and disembodied technology exports (which captures the receipts coming from technical assistance and licensing).

Conclusion

This communication has provided the key aspects of the joint effort undertaken by the three COTEC with regard to IS, not with a view of planting a 'new tree' in the Scoreboards 'forest', but rather with the intent to contribute towards the improvement of the main existing 'specimen' – the European Innovation Scoreboard. Such effort has not been concluded yet. But we do think that the work undertaken so far deserves to be shared, particularly at the present juncture, when the EIS is being subject to a major revision.

Our purpose has been to develop a sound analysis, based on a consistent theoretical frame, better able to mirror the common specific characteristics of South European countries' NSIs. While recognising that the aggregating drive, to enable inter-country comparisons, is almost inescapable, we to stress that this should not be the prime objective of an IS instrument. This should be mainly focussed on policy design and assessment. An intelligent time-series (more than just cross-country) analysis of specific groups of IS indicators, selected problem-wise, may be extremely helpful for policy making and assessment.

There is therefore a need to refine Innovation Scoreboards. More specifically, there is a need for better statistical information on innovation conditions, behaviours, relationships, diffusion, and outcomes. These are important objectives that should mobilise all of us, from NSI players and their associations to national governments and the European Commission. We think that this COTEC project contributed to those endeavours, paying particular attention to the specificities of South European countries.

At the end of the day, we all share the same perspective that innovation, at every level, is essential for Europe to thrive in an increasing globalised and competitive World!

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Competitiveness through Innovation. BRICs Challenges to Southern EU Economies

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Introduction: looking beyond Lisbon

The 'Lisbon Strategy' (LS) was established in 2000 as an ambitious roadmap for the EU to achieving a long-term, sustainable, steady and healthy growth. A shared implication was that any reaction to different situations, i.e. challenges posed to the EU by a country or various countries in terms of competition, was to be analyzed through the lens of the LS.

After eight years, a mid-term revision and other minor adjustments, there is today a rationale for questioning the LS for failing to achieve a number of its originally expected results. For instance, EU R&D expenditures have never exceeded 2% of GPD, while the fixed target was 3%. According to a 2007 Commission Report *"the proportion of GDP spent on R&D in the EU has recently failed to keep up with stronger economic growth rates and decreased to 1.85 % in 2006, with large differences between Member States".*

The LS does certainly need a fresh, careful and open-minded assessment, as the goal of making the EU *"the world's most dynamic knowledge-based economy by 2010"* is now unlikely to be achieved.

The LS and its main goal, nonetheless, stemmed from a sound premise: *in our globalized world,innovation is the main engine of competitiveness and growth.*

One could ask, of course, whether the common effort needed to improve competitiveness through innovation was and is equally felt among the different social, political, scientific, cultural actors in our European societies. There is certainly scope for improvement here, as too many countries have moved at too slow a pace.

Whatever will come after 2010, however, the main premise of the LS should be retained, together with one of its consequences: *competitiveness through innovation does not concern firms only.* It obviously requires a wider institutional network (including universities and research centres, banks and financial institutions, public institutions and social forces), where public policy retains a crucial role.

BRICs today challenges to EU countries (with a focus on Southern Europe)

According to a recent French report preparing the next EU Presidency: *"in a world developing atunprecedented speed, Europe risks being overtaken in certain sectors by major emerging countries such as China, India or Brazil"*.

This remark reflects a concern that is increasingly felt in the EU countries for the challenges arising from BRICs (Brazil, Russia, India, China) and – in a more distant future – from other emergent economies.

According to *2007 Transatlantic Trends* survey, for 48% of the EU citizens China is a main threat to European economies, whereas only 35% stresses the opportunities made available to our economies by the opening up of the Chinese market. Pessimism is at its most in France (57%), Italy and Portugal (55%).

As a consequence, a protectionist feeling - sharpened by recent finance and energy turmoil as well as gloomy economic prospects for many OECD countries – seems to be gaining favour among sectors of EU public opinion and politicians alike.

We strongly believe that protectionism is the wrong answer. As history suggests that protectionism is highly ineffective and self-defeating in the long-run, a new "Fortress Europe" will be a deadly mistake.

On the contrary, we do believe that a more open, market-based approach is needed to consider emergent economies fully integrated in the trade and investment flows, subject to the international rules, to reap the benefits of vast markets in terms of volume and investment opportunities.

Opposing any form of protectionism does not, however, mean overlooking BRIC challenges, in the present and in the future.

Today BRICs are a global driving economic force increasingly integrated in the globalized

economy. Despite several problems (social, political, environmental, and others) still affecting their growth, the economic power of these four countries is expected to increase in the coming years.

It is well known that traditional manufacturers and low-skilled labour industries are more subject to competition from BRICs, which may profit from lower labour costs drawing on their enormous manpower reserves. This challenge is not new (keeping in mind the intense competition coming from Asian tigers in the 80s and 90s) and concerns specific sectors, namely textiles, shoemaking, toys, furniture, electrical and electronics. Southern EU countries partially share similar economic structures (high proportion of SME and of low-educated workers, among other features) that are prone to job losses due to the increased competition.

The issue at stake today, however, is: *are BRICs serious competitors also on technologies andinnovation?*

There is, *prima facie*, plenty of evidence that this is the case. In recent years BRICs have been showing, with considerable differences among each other:

i. a fast growth in R&D expenditures and in productivity;
ii. a good average quality of relatively highly skilled and technologically developed human capital;
iii. an interest in expanding investment in its training.

All in all, BRICs are showing some genuine capacity of real technological innovation.

It is clear that BRICs competition through innovation may appear more impedingly troublesome for those EU countries (among others, Italy, Portugal and Spain) which lag relatively behind the technological leading powers (being less strong in R&D, horizontal multi-purpose technologies, and so on).

More in-depth investigations, however, generally agree that the innovative and technological capacity of BRICs is far from being fully developed.

A few highlights of a multifaceted and non-linear process. China is by far the most dynamic BRIC country and its growth in R&D expenditure has been outstanding, recently exceeding that of the US. Chinese gross domestic expenditure on R&D (GERD) as a percentage of GDP reached 1,4% in 2006, redoubling in 10 years. Although now exceeding that of several European countries (Italy, Portugal and Spain included), it remains, however, about half of OECD technological leading countries (US, Japan, Germany). In other BRIC countries, performances have not been as strong: Russian GERD as a percentage of GDP is just above 1%, Brazilian just below 1%, while India does not exceed 0.6%, with a recent slowdown that made Indian analysts worry about the *"risk of an increasing technological gap between India and OECD countries"*.

The number of triadic patents is another good indicator of innovation and technological capacity. In 2000-2005 China multiplied it by five, India by three: a rapid growth indeed. Their quota over the world total, however, remains very small (0.8% for China, 0.5% for India), while the US, Japan and Germany together make over 70% of world triadic patents.

Educational systems in BRIC countries are moving in the right direction, at all levels.

The growth of highly trained human capital in these countries has certainly been very fast in recent years. Generally speaking, the catch-up process in the international rankings is being remarkable. For most BRICs, however, the point of departure is so distant that they still have a long way to go. Growing investment in education has brought about a considerable increase in the number of graduates in BRICs. Some of them are choosing a very selective strategy with a good number of universities and other higher education centers being transformed, in a short period of time, into centers of excellence. Moreover, a focused effort is being made

on S&T degrees. According to a US National Academy of Sciences recent report, in 2004 China graduated 600,000 engineers and India 350,000.

The meaning of these figures, however, is often over-emphasized. "*These totals included graduates of two or three-years programs training students in simple technical tasks (…) the quality of highereducation in China and India remains extremely poor, which is why so many students leave thosecountries to get trained abroad"* (F. Zakaria, «Foreign Affairs», May-June 2008).

In 1998-2005 China has nearly redoubled the number of researchers, reaching 1.5 per 100,000 workers. This ratio, nonetheless, is still far below that of most developed countries, including Southern Europe (10 researchers per 100,000 workers in the US; 5.7 in Spain; 4.1 in Portugal; 3.4 in Italy, the latter ranking at the very bottom of OECD countries).

Conclusion: despite their many remarkable successes, BRICs capacity to bring innovation to the market is still at the very beginning. Insofar as they will be able to keep moving in the right direction at a pace similar to that shown over the last few years, in a decade or two their innovation capacity will bring a serious challenge to OECD knowledge-based economies. Among the most easily approachable targets, we are likely to find those European countries (Italy, Portugal and Spain included) which do not rank in the technological top league.

What should EU actors do?

As far as firms are concerned, they should always be a step ahead in exploiting technological breakthroughs. Today's feature of innovation is that the competitive advantage provided by innovation becomes shorter and shorter. Incremental or organizational innovation is no longer sufficient to sustain competition over time.

Hence, in order to gain a permanent advantage, companies need to develop breakthrough innovation. In case EU firms are unable to continuously produce and sustain a number of technological breakthroughs over time, they will likely lose out against competitors with similar technological capacity and lower labour costs.

To this end, more investment in R&D, a greater effort in creating networks with universities and research centres, and more lobbying activities aimed at the enforcement of widely agreed rules about intellectual property and patents are needed. It is also essential to EU firms that regulations in terms of quality standards are observed to guarantee a fair trading relationship.

Cooperation and agreements with BRIC firms and governments on innovative projects do not conflict with strategies for maintaining leadership in innovation. There is evidence that locating R&D in BRICs countries is a useful tool to address these emerging markets.

Competitiveness through innovation does not, however, only concern firms.

Hence, political guidance is needed, particularly at the EU level, to improve the environment for R&D, partnerships among academia, private companies and public institutions, and venture capital, with the view of creating an environment conducive to technological development and innovation, especially SME.

Most challenges at sector level relate to establishing differential goods and services by introducing selective quality and adding value. The conceptual importance of innovation is that it allows for a permanent creation of goods and services on the industrial base already established. It is crucial that the EU and its Member States allow the necessary transformation of knowledge applied to the industry, in the form of goods and services, as well as to the processes of organization and marketing.

To address these questions, a strengthening of activities such as the Competitiveness and Innovation Programme (CIP), recently set up by the EU for the period 2007-2013, should be sought after. Some particular features of the CIP may be underlined: promotion of eco-innovation, IT for all, energy efficiency and promotion of new and renewable energy sources, in all sectors including transport, among others. These new strides in unchartered territories will constitute the base for the European firms to be prepared for competition, at the edge of innovation.

Fostering human capital and talent in the EU

Competitiveness through innovation depends, of course, on a number of mutually cooperating factors.

There is little doubt, however, that the real challenge for the EU countries in the long-run will be mainly about human capital and education.

The demographic side of the question should not be ignored. Population studies suggest that a new balance of demographic powers is emerging, with new opportunities and threats.

Contrary to the past, in the 21st century sheer population weight (BRIC countries make half the world population) is not *per se* a comparative economic advantage. In today's global knowledge society supply and mobility of skills and competencies are much more important.

Nonetheless, a careful assessment of the impact of the changing proportion of young and ageing people in the overall population in present-day Europe and the rest of the world should be kept in mind.

Despite remarkable differences among each other (as any country is following its own pattern of the so-called "demographical transition", whose pace may be increased or decreased by government population policies, like in China), BRICs - except Russia - have a relatively young population.

This *may* be a comparative advantage for competition through innovation, provided that such an opportunity is exploited by an effective investment in education.

Conversely, many EU countries are facing the consequences of stagnation or the decline in the proportion of the young population.

Italy, Portugal and Spain are in this lot. Among other consequences, ageing may bring about a dangerous lack of 'innovation spirit' and give rise to a social conservatism, which frustrates merit and hampers the emergence of new talents. This is particularly evident in Italy.

Such a trend seems at odds with the requirements of a knowledge-based economy, whereby a welleducated population is essential to ensure a competitive labour force and the role of talent and merit is enhanced by factors like innovation, technology and capital market rules.

To limit the combined effects of our demographic "short bench" (few young and even fewer talented players) and social inertia, education and higher education systems in Southern Europe (and, more generally, in the EU) have a crucial role to play in fostering highly skilled human capital and talent.

Consequently, two main goals should be pursued:

1. increasing the general rate of school attendance and the average quality of education: ageing countries and the EU in general cannot afford wasting any single student);
2. identifying, attracting and promoting young talents from any part of the world.

A few proposals to this effect that should be part of any future 'competiveness through innovation' EU strategy:

i. a renewed effort for getting more high school diplomas and a declining number of 'dropouts';
ii. fully achieving the Bologna 1999 Joint Declaration's main goal: a truly harmonized structure of European university curricula. A common space should be created effectively at the EU level to stimulate universities and other higher education centers via competition, specialization and excellence. Such a European wider educational space (with compulsory Erasmus exchanges) would not only provide improved higher education to Europeans, it would also be able to attract worldwide students, as it has successfully been the case of the US, UK, and recently Australia or other Asian countries.

Although education is not among its competences, which largely remain to Member States, the EU has a leading role to play. For instance:

a) by promoting independent evaluation agencies to assess positive outcomes and failures of Member States in educational performances. Not just system

assessment, but – at least at the university level – institution assessment and ranking;

b) by creating and running first rate higher education institutions specialized in scientific and technological training, which may help establish benchmarking standards and practices, against which assessing university performances in Member States.

Conclusions

Innovation developments in BRIC countries can be seen as a threat in the near future, but also as an opportunity for Europe.

Europe still has a good quality of life that can attract talent from BRICs. To this end, an improvement in the quality, and marketing, of European universities is needed, so that young students and graduates may decide to come to Europe instead of going to the US. In some areas there is a shortage of qualified workers in Europe that could be overcome with graduates from BRIC countries.

To address these new markets it will be also crucial to locate R&D and innovation facilities, from European companies, in BRIC countries.

The internationalization of BRIC companies will also create the possibility of attracting foreign investment to Europe, if possible to Southern countries.

To compete with BRIC countries, Europe must also improve other aspects of its innovation strategy:

- services, business models, design/brands, organizational and work-life innovations should be seen as important as science and technology in the innovation process;
- the intersection of "knowledge" areas and sectors, like energy, environment and ICT, should be exploited and promoted;
- new markets for innovative service solutions should be created especially in the public sector;
- within the shared goal of fostering competition and removing barriers to open markets, public regulation and competition policy may be useful innovation policy instruments and innovation drivers.