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A summary description of project context and objectives

The recent shift of events in the world economy has brought the internationalisation of innovation activities in centre stage of debates on globalisation. The European Commission seeks to fulfil its Europe 2020 goals of achieving smart, sustainable and inclusive growth, by seeking innovation policies that retain, foster and attract innovation.

The globalisation of innovation presents challenges and opportunities for both European and Southern countries. But are these truly challenges, or could they be converted to opportunities? Firms may reduce their R&D investments at home, while moving or opening new facilities abroad to profit from specific competitive advantages. Brain drain, deskilling and job losses are among the main sources of conflict between country-partners engaged in the offshoring of R&D and innovation activities. Firms and institutions should face the challenge by placing themselves in a position where they could not only attract mobile knowledge assets, but also exploit knowledge assets generated elsewhere by engaging in GINs, growing phenomenon that may turn these challenges into opportunities.

The research project INGINEUS maps the new geography of knowledge-intensive activities and put an initiative in understanding the concept of Global Innovation Networks (GINs). It analysed the policy-related institutional aspects that affect the features and development of GINs between Europe and some of the fastest growing emerging economies in the world (notably Brazil, India, China and South Africa). INGINEUS proposes that setting the Europe 2020 strategy in a *global* context is inevitable for a successful implementation of its goals when basing growth on knowledge, shedding light on the importance of tapping into international pools of knowledge in the structure of any upcoming European innovation policy.

Methodologically, the project adopted a dynamic, global, multi-sectoral and multi-method approach. It combined the analysis of existing datasets with the collection of new data through a survey and in-depth case studies. The macroeconomic analysis covered all industrial sectors for which data is available, while the micro and meso analysis of the project focused on the three industries of agro-processing, automotive and ICT, to represent different extents of R&D intensity. Such five-dimensional approach was crucial to address our main research questions: Why and how do GINs arise? What are some barriers that work against their formation? Are there any sectorial difference in the offshoring of R&D? Do firms go global to complement or substitute their R&D at home?

The INGINEUS survey has been conducted on ICT firms set in China, India, Norway, Sweden and Estonia; agro-processing firms located in South Africa and Denmark and automotive companies operating in Germany, Italy and Brazil. Case studies have followed for in-depth studies of regional innovation systems, innovation strategies of and competence building in firms, as well as institutional frameworks and local-global university-industry links. The aim has been to understand

the aforementioned in the emergence and evolution of GINs. Econometric analysis on the same fields accompanied the cases to also obtain a more general global perspective of the phenomenon.

A description of the work performed and the main results achieved

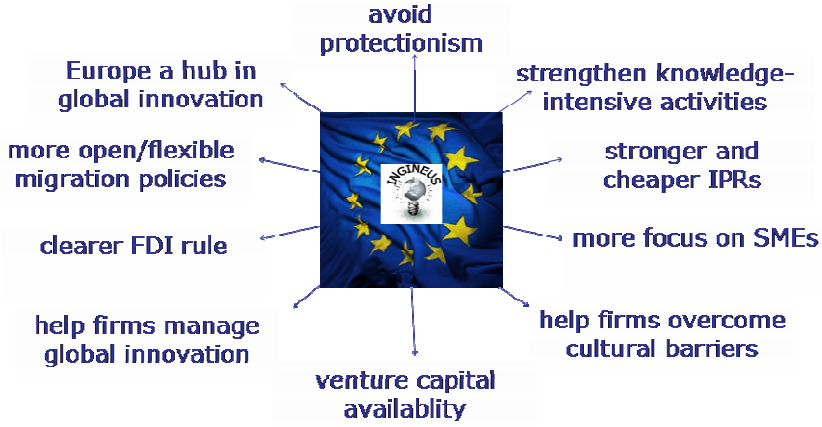
The investigation suggest that more than half of the 1215 firms polled in the INGINEUS Survey (a) operate across national borders, (b) are at least somewhat innovative and (c) rely on some form of networks for their offering. Nonetheless, *global innovation networks* is only a new phenomenon and not yet exploited by policy makers and industry representatives as just about one percent of the total number of firms in the survey are highly involved in all three components of GINs (Borrás and Haakonsson, 2011).

A total of 82% of European firms interviewed between 2009 and 2010 were facing some type of barrier or challenge when engaging in innovation-related collaborations with foreign firms. INGINEUS revealed that (i) migration regulations for employing foreign scientists and technicians, (ii) regulations, practice and jurisprudence around intellectual property rights, (iii) access to international research networks and (iv) rules for foreign direct investment and trade, are among the most important policy-related factors that could improve the internationalisation of European firms' innovation activities.

At sectoral level, barriers to international collaborations risk slowing GINs formation and evolution mostly for those industries dominated by complex engineering knowledge and advanced production equipment. INGINEUS survey findings revealed that only the few large biotechnology related MNCs from advanced countries are those highly engaged in GINs, and very few European ICT firms offshore innovation or production. European industries face a limited domestic supply of highly trained personnel and the challenge of attracting skill from abroad or going global to search for talents. In the South, Chinese and Indian ICT firms present a more global reach, strongly motivated by being highly export oriented and highly specialised in sub-fields.

In general across all countries and sectors, it resulted that working for consistent global standards is increasingly crucial to motivate innovative activities, to supply new products and to facilitate market access. European respondents emphasised the need to harmonise tools, structures and processes for international collaboration and to facilitate the management of globally dispersed projects. Some EU policy recommendations suggested by results from the INGINEUS survey and case studies that have are summarized in Figure 1:

Figure 1: EU policy recommendations from INGINEUS results



Emerging markets clearly represent opportunities to European innovative firms to expand their operations, to gain access to low cost labour and to take part in new knowledge networks. INGINEUS has spotted the changing strategies of European and Southern firms in the internationalisation of their innovative activities and the effects of R&D offshoring on economic growth at home and in host locations. Results confirm Naghavi and Ottaviano (2010), who suggest that it is sectors with lower R&D entry costs that networks conducting complementary innovation tend to occur and enhances growth. If the internationalisation of innovation is not aimed to decrease R&D investments and employment at home, discouraging R&D offshoring may risk reducing the competitive standing of firms in the global market. In Europe offshoring regions experiment higher productivity growth, while R&D offshoring activities boost the host region productivity only when investments are large enough (Castellani and Pieri, 2011). Indeed, innovative firms may go abroad to undertake complementary R&D activity or to substitute R&D undertaken at the headquarters. The case studies revealed that MNCs still conduct core R&D in the HQ and that they internationalised innovation for the purpose of product adaptation, customer support and access to local markets. This is the case of the automotive industry and of the agro-food industry. Differently, both substitution and complementarity are observed in the ICT sector. Here, cost factors and market proximity matter and products are developed abroad for both local and global market.

The expected final results and their potential impact and use

The project INGINEUS has brought us a step closer in achieving a multi-dimensional approach by creating a new perspective from which we believe Europe must view innovation to attain and maintain long-term growth. The project focused on GINs: their existence, impact, and implications. Presently, we can observe two different categories of global networks of innovation: one seeing large multinational corporations as central node, and the other involving many different actors, some tied together through ownership, and others through R&D agreements or partnerships

An important upshot of the project was providing evidence that the widespread fear that R&D offshoring may have detrimental effects on growth and competitiveness is unfounded. Offshoring R&D activities by European firms tend to be complementary to those carried on at home. Therefore, measures aimed at providing disincentive to offshoring activities may actually reduce firms long-term competitiveness by limiting the opportunities of technological upgrading. On this basis we can conclude that offshored R&D is in most cases complementary to R&D activity conducted at home and as such should not have a negative impact on R&D activity and employment in Europe. The findings suggest that policies aiming to discourage offshoring may reduce the competitive standing of EU firms in global markets.

A tentative taxonomy on university-industry links proposed along with the fieldwork of the project INGINEUS have helped us to evaluate one central question: whether GINs in emerging countries are a path for improvement within the international division of labor or they block the development of globally integrated national innovation systems: GINs may be a “mixed blessing”, even a “poisoned chalice”. On the one hand, the preservation of hierarchies is a barrier to more advanced technology-rich international interactions. On the other hand, existing GINs may, under certain conditions, trigger processes, which can lead to technological upgrade of peripheral countries. However, public policies matter for the positive development of GINs. In our theoretical framework, this is one feature of the national innovation systems determining the nature of GINs.
In sum, both Europe and its Southern partners must face the challenge of establishing a virtuous cycle that could foster and attract new knowledge from abroad. That is, regional and national policymakers must not only ensure that their locations is an attractive node in firms’ global networks, but also present the ability to identify and absorb technologies. Given the expansion of knowledge-based economies and the globalisation of innovation, INGINEUS underpins the importance of a shift of context to an outward-looking rather than a protectionist perspective in European innovation policy and growth strategy.

INGINEUS has itself functioned as a successful GIN; its science outreach has been summarized in Figure 2. Immediate impacts of the project include: (i) The notion of “global innovation networks” has been explicitly mentioned in the 80 pages governmental program of the new government in Denmark, who took power in early October. The government aims at positioning Danish firms in strong global innovation networks and will develop a series of internationalization policy initiatives

to achieve this political goal; (ii) an special issue of Research Policy will be devoted to global innovation networks derived from works within INGINEUS; (iii) following the study and the findings of Naghavi and Strozzi (2011) on the interaction between intellectual property rights and skilled migration and the role of diaspora in turning brain drain into brain gain, WIPO is planning to launch a research agenda on the relationship between intellectual property and "South-North" mobility of talent (in both directions) and on the use of political instruments like IPRs to reverse the brain drain phenomenon into a win-win game.

Figure 2: INGINEUS science outreach