

EMERGENCE OF GLOBAL INNOVATION NETWORKS: EVIDENCE FROM THE EUROPEAN MULTINATIONALS

Aslı Tuncay-Celikel

Isik University
atuncay@isikun.edu.tr

Nick von Tunzelmann

University of Sussex
G.N.Von-Tunzelmann@sussex.ac.uk

ABSTRACT

During the past two decades, multinationals have been the major actors for establishing global innovation networks (GINs) via knowledge producing in order to gain new market opportunities. In these networks, innovation is created and shared in different locations around the world among actors like government, non-governmental institutions, and universities or multinational's different partners like subsidiaries and suppliers. Even customers involve in GINs as a source of information for new ideas. Therefore, the objective of the paper is to investigate what global innovation networks are, why they are created and what policy implications they pose for Europe. The findings presented in the paper are based on a survey and case studies conducted by INGINEUS⁷, and on a series of qualitative and quantitative data of three industries: agro-food (agricultural processed products), ICT (information communication technologies) and automotive. INGINEUS project findings reveal that among 1215 European firms, few of them are involved in real global innovation networks.

1. Introduction

As literature suggests, multinational firms (MNCs) have used global production networks (GPNs) to improve the efficiency of their operations. After 1980s, there is an increase in the rise of production networks from Europe to Asia and other low-cost locations around the globe. First, multinationals set up their assembly operations outside; then production facilities closed down in Europe and production was re-located to emerging countries. Thus, if the industry was more knowledge intensive then in most cases there was no relocation which meant that home country continues to be the location of production. On the controversy when the industry was less knowledge intensive, it was easier to re-locate the production. So multinationals outsourced parts of production processes to manufacturers in Asia or other low-cost locations, while retaining the most knowledge intensive assets in the home country.

Then second phase emerges after re-location of production which is; establishing R&D centres as mentioned in the internationalization of R&D literature (Hayashi, 2004, Karabag et al. 2011). It is evident that R&D has undergone a process of internalization, and that the emerging economies are becoming increasingly involved in this process (Cassiman et al. 2003). In the literature, the factors affecting multinational's R&D offshore are first of all the local R&D capabilities (skills, experiences and talents) of engineers (Ansal, 1990, Tunzelmann, 2009). Most of the time through foreign direct investment production could be started by the multinational e.g establishing a plant and then can emerge in terms of opening a R&D centre in the subsidiary. Another way is through international

joint ventures/subsidiaries. When multinationals have joint ventures/subsidiaries in a country, they may prefer to internationalize their with their local partner firms to make local adaptations specific to that market (Tuncay-Celikel, 2010).

It is not only establishing R&D centres, a third phase emerges within the last two decades when large firms and most of the time multinationals build global innovation networks (GINs) in order to increase their market share in already existing markets or to tap into totally new ones. Multinationals have been in this process for more two decades but GINs have been triggered mostly for the last ten years or more. In its definition, global innovation networks are defined as “a globally organized web of complex interactions between firms and non firm organizations (universities, research institutes, government agencies, non-profit organizations) engaged in knowledge production related to and resulting in innovation” (Chaminade, 2009; Borrás and Haakonsson, 2012). In these networks, innovation is created and shared in different locations around the world among different partners in order to gain new market opportunities (Borrás and Haakonsson, 2012). A previous study showing European firms are less engaged in global innovation networks than firms in US and Asia (Ernst 2006).

Theoretical Background

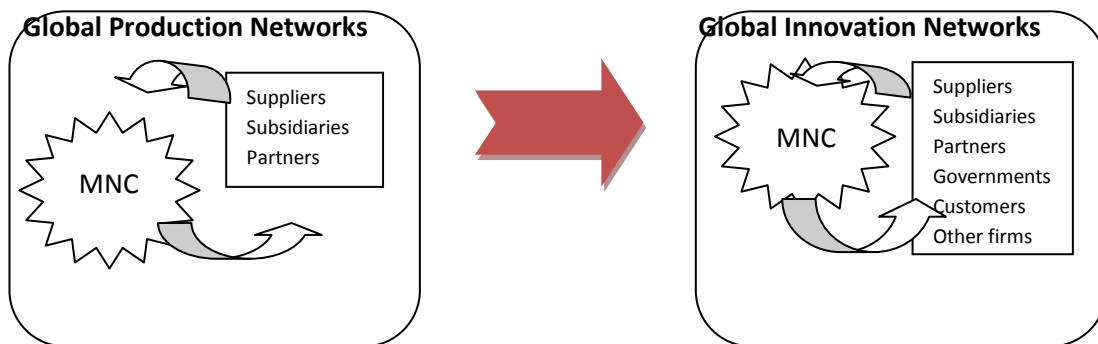


Figure1:
From Global Production Networks to Global Innovation Networks

In this paper, parallel with the objectives of the INGENEUS project, the evolution of global production networks (GPNs) into global innovation networks (GINs) are researched. MNCs have been searching for locations, markets, partners where the local capabilities are sufficient so that they could be more innovative.

2. Research Methodology

INGENEUS is funded by the EU FP7, addresses the impact of globalisation and the rapid growth of selected, emerging economies on the competitiveness and strategies of European Union firms, industries and regions. The objective of the paper is to investigate what global innovation networks are, why they are created and what policy implications they pose for Europe.

2.1. Research Questions

INGENEUS project’s main research questions are:

1. “What are global innovation networks and why are they created?”
2. How are European firms generally performing in terms of creating and participating in these global networks?



3. Is Europe an important node within those networks in terms of knowledge competences and knowledge sources?
4. What can European policy makers do in terms of reaping the benefits and reducing the potential costs and risks associated with the current trends towards global innovation networks?" (INGINEUS, http://ec.europa.eu/research/social-sciences/pdf/policy-briefs-inegus_en.pdf, accessed January 15 2013.)

The INGINEUS data are collected by face to face from European multinational companies' R&D managers in agro-food, ICT and automotive sectors between 2009-2011 by partners of the project. A survey is designed specifically in order to gathering data about R&D internationalisation and innovation activities, as well as their perception regarding institutional barriers. In order to maintain cases, in depth interviewing technique is used. This is both a quantitative and qualitative research including answers regarding descriptive statistical data and open ended questions.

2.2. Sample

The INGINEUS survey dataset includes responses from 1215 companies in three sectors (agro-food, ICT, and automotive) in 12 INGINEUS countries (of which 7 European and 5 emerging countries). The sample consists of EU countries: Italy, Denmark, Germany, Estonia, Sweden, Norway and United Kingdom and emerging economies: Brazil, China, India, South Africa and Turkey. Multinationals have headquarters in EU countries and subsidiaries, partners, and suppliers located in emerging countries.

Case Studies

- **Selection of countries.** Case studies particularly addressing MNCs locating innovation activities in emerging economies was conducted in Germany, Denmark, Sweden, Estonia and Turkey. The Scandinavian countries have been particularly active locating R&D departments in Asia in sectors such as automotive, biotechnology or ICT to tap into the pools of knowledge available in these emerging economies (INGINEUS, http://ec.europa.eu/research/social-sciences/pdf/policy-briefs-inegus_en.pdf, accessed January 15 2013).

Table 1: Selection of counties and comparison of industries

Industries	Countries	Type of industry	Driven from	Importance
Agro-food	South Africa, Denmark, Brazil	low-tech	supplier driven	specialized suppliers
ICT	India, China, Sweden, Norway, Estonia	high-tech	science driven	resource based
Automotive	Brazil, Germany, Italy, Turkey and a small sample from Sweden	medium-tech	production intensive	complex product systems

Source: INGINEUS Survey Data [http://inegus.eu/UserFiles/INGINEUS_D2.2_Fulldatasetandcodes\(1\).zip](http://inegus.eu/UserFiles/INGINEUS_D2.2_Fulldatasetandcodes(1).zip), accessed January 15, 2013.

ANALYSIS

According to INGINEUS project, the calculation on each of the dimensions the from survey questions are as follows:

“1. Global = degree of export market as important market (beyond home region, e.g. Europe), % of sales for export, innovation collaboration beyond home region, offshoring of innovation activities, outsourcing of all activities.”

“2. Innovative = if they experienced innovation during the past three years, type of innovation (product, process, distribution, and/or supporting activities), degree of innovation (new to the world/industry/firm).”

“3. Networked = Span (many people, different actors, collaborations) and depth (connections, relationships, formalized or not) of collaboration, internal vs. external networks.”

The INGINEUS survey focused on the three dimensions included in a global innovation networks; “Global”, “Innovative” and “Networked”. For each of these three dimensions the companies were categorized as ‘dimensions does not apply’, ‘Low’ or ‘High’. According to Borrás and Haakonsson (2011), only 1 % of all firms are really engaged in GINs but half of them are involved in GINs but not very concrete.

According to INGINEUS final report (2011), six trends are found about GINs:

1. “Advanced countries’ Multinational Companies (MNCs) are deepening the trend to innovate through increasingly global and increasingly networked processes.” This research clearly shows the trend towards GINs by the MNC in developed countries.
2. “Firms and organizations from emerging markets are developing capabilities in the creation and management of global networks to compensate for institutional limitations, e.g. skills shortages.” Especially BRICs have been developing their capabilities towards these limitations.
3. “Outward R&D FDI from Europe has grown substantially from early 2000s”. Within the last ten years, outward R&D FDI is also obvious.
4. “Most R&D offshores goes to Triad countries (Europe, US & Japan) but increasingly to BRICs (Brazil, Russia, India, China and South Africa)”. Bangalore in India is now considered as the Silicon Valley of India and India is not only the world’s software development arena but its design centre with skilled R&D engineers. Today India can mass produce the most economic vehicle in the world, while excelling in software production; where as Brazil consisting of a huge market and design and production hub for ethanol cars. Turkey is a excellence centre for designing and producing light commercial vehicles, passenger cars and buses. South African automotive plants rival OEMs (original equipment manufacturers) for achieving world class manufacturing standards, while Chinese assemblers are aggressively pursuing advanced technology solutions from rivals and partners. Europe is no more a hub for development of advanced technologies. Emerging economies take this important role of technology generation.
5. “Inward R&D FDI into Europe has also grown” Because of the aforementioned changes, skilled R&D employees from emerging economies are also coming to Europe for working via FDI.
6. “Some differences across the three industrial sectors analysed (agro-food, ICT, automotive,): All three industries are represented in strongly globalized networks, but ICT and agro-food (not automotive) are most prominent in highly globalized, highly networked and highly innovative cases.” The reason why automotive is not highly prominent in GINs is because of the complexity in the production system of the automotive industry.

3. Conclusion

The findings reveal that majority of the European firms have their assembly operations and R&D centres mostly in Asia basically in BRIC (Brazil, Russia, India and China) countries. The factors affecting R&D offshore were found to be competencies and capabilities of the emerging country's R&D centre, comparably low cost for R&D, government incentives of the emerging country and more than all skilled R&D labour. INGINEUS survey and case studies show that emerging country's technological level is also found to be an important factor affecting internationalization of R&D. After improving its production capability and absorptive capacity (learning capacity), the local firm becomes capable of forming a R&D department. R&D collaboration starts at this phase and the R&D capability level of the local firm develops. In the final phases, the local firm can create knowledge independently and becomes a center of excellence in the R&D of particular products.

As a result, INGINEUS project reveals that "few firms which are really engaged in GINs but 50 % of the sample consisting of 1215 shows the co-existence of medium/high levels of globalness, innovativeness and networkedness. Few firms are really highly globalized, highly innovative and highly networked" (Borrás and Haakonsson, 2011).

For the policy implications, in order for Europe to compete with US, China and Japan for technology development, European multinationals should be more integrated in global innovation networks, hence working in collaboration with the emerging countries especially BRICs. Our project findings show that more than half of European multinationals should totally improve their systems for innovation to get involved in GINs.

References

- Ansal, H. (1990) Technical Change and Industrial Policy: The Case of Truck Manufacturing in Turkey, *World Development*, Vol. 18, No 11, 1990.
- Aschhoff, B. and Schmidt, T. (2005) Empirical Evidence on the Success of R&D Co-operation: Happy Together. Center for European Economic Research, Discussion Paper, no. 06-059, Mannheim, Germany.
- Arvanitis, S. and Hollenstein, H. (2006) Determinants of Swiss Firms' R&D Activities at Foreign Locations: An Empirical Analysis Based on Firm-Level Data. Swiss Institute for Business Cycle Research, Working Papers, Swiss Federal Institute of Technology Zurich, no. 127, January, Switzerland.
- Bader, M. A. (2006) Managing Intellectual Property in Inter-firm R&D Collaborations: The Case of the Service Industry Sector. PhD Dissertation no: 3150, University of St. Gallen, pp. 15-23, Switzerland.
- Baranson, J. (1971) International Transfer of Automotive Technology to Developing Countries. United Nations Institute for Training and Research (UNITAR) Research Report, no. 8, USA.
- Belderbos, R. Carree, M. and Lokshin B. (2004) Cooperative R&D and Firm Performance. *Research Policy*, vol. 33, issue 10, December, pp. 1477-1492.
- Belderbos, R. Carree, M. and Lokshin B. (2006) Complementarity in R&D Cooperation Strategies. *Review of Industrial Organization*, vol. 28, pp. 402-426, Springer Publishment.
- Buckley, P. J. (1989). *The Multinational Enterprise*, London: The Macmillan Press Limited.
- Cantwell, J. and Harding, R. (1998) The Internationalization of German Companies' R&D. *National Institute Economic Review* 1/98, no. 163, pp. 99-115, January.
- Carr, C. (1999) Globalisation, Strategic Alliances, Acquisitions and Technology Transfer: Lessons from ICL/Fujitsu and Rover/Honda and BMW. *R&D Management* 29, 4, pp. 405-421, Blackwell Publishers, Oxford, UK.
- Cassiman, B. and Veugelers, R. (2003) Which Firms have Cooperative R&D Agreements with Universities? Some Empirical Evidence from Belgian Manufacturing. Working Paper 502, IESE Business School University of Navarra, Barcelona, Spain.

- Chaminade, C. (2009). On the Concept of Global Innovation Networks. Electronic Working paper Lund, Sweden CIRCLE, Lund university.
- Clark, K. B. and Fujimoto, T. (1991) Product Development Performance: Strategy, Organization, and Management in the World Auto Industry. Harvard Business School Press, Boston, MA.
- Dunning, J. H. Lundan, S. M. (2008) Multinational Enterprises and the Global Economy. Edward Elgar Publishing, Second Edition, UK.
- Fujimoto, T. (1997) The Dynamic Aspect of Product Development Capabilities: An International Comparison in the Automobile Industry, in A. Goto and H. Odagiri (editors), Innovation in Japan. pp. 56-87, Oxford University Press.
- Ge, D. and Fujimoto T. (2006) Suppliers' Involvement in New Product Development in the Japanese Auto Industry: A Case Study from a Product Architecture Perspective, in C. Herstatt, C. Stockstrom, H. Tschirky and A. Nagahira (editors), Management of Technology and Innovation in Japan. pp. 236-247, Springer Berlin Heidelberg.
- Gerwin, D. and Meister D. (2002) Coordinating New Product Development in an International Joint Venture. International Journal of Technology Management, vol. 24, no. 1, Inderscience Enterprises
- Gerybadze, A. and Reger, G. (1997) Globalisation of R&D: Recent Changes in the Management of Innovation in Transnational Corporations. Discussion Paper 97-01, February, Stuttgart, Germany.
- Gerybadze, A. (2006) Innovation Dynamics in the Auto Industry: R&D and Innovation Capabilities in Germany. Workshop of WZB (Social Science Research Center of Berlin), 28 March 2006.
- Gupta, A. K. and Govindarajan, V. (2000) Knowledge Flows within Multinational Corporations. Strategic Management Journal 21, pp. 473-496, John Wiley & Sons, Ltd.
- Hagedoorn, J. (2001) Inter-firm R&D Partnerships: An Overview of Major Trends and Patterns since 1960. Proceedings of the Future of Innovation Studies Conference, 20-23 September 2001, Eindhoven Center for Innovation Studies, Eindhoven University of Technology, The Netherlands.
- Hayashi, T. (2004) Globalization and Networking of R&D Activities by 19 Electronics MNCs, in M. G. Serapio and T. Hayashi (editors) Internationalization of R&D and the Emergence of Global R&D Networks. Research in International Business, vol. 8, pp. 85-111, Elsevier Ltd.
- INGINEUS, http://ec.europa.eu/research/social-sciences/projects/406_en.html, accessed 15 January 2013.
- INGINEUS, http://ec.europa.eu/research/social-sciences/pdf/policy-briefs-ingineus-february2012_en.pdf, accessed 15 January 2013.
- Jürgens, U. (2003) Characteristics of the European Automotive System: Is There a Distinctive European Approach? Discussion Paper SP III 2003-301, Wissenschaftszentrum Berlin für Sozialforschung, pp. 29-30, Berlin, Germany.
- Karabag, S. F., Tuncay-Celikel, A., and Berggren, C. (2011) The Limits of R&D Internationalization and the Importance of Local Initiatives: Turkey as a Critical Case, World Development, Vol. 39, No. 8, pp. 1347-1357, Elsevier.
- Kuczmariski, T. (1995) Innovation: Leadership Strategies for the Competitive Edge. American Marketing Association, NTC Publishing Group, p.2, Chicago, USA.
- Lakemond, N. Berggren, C. and Weele A. (2006) Coordinating Supplier Involvement in Product Development Projects: A Differentiated Coordination Typology. R&D Management 36, 1, pp. 55-65, Blackwell Publishing, Oxford, UK.
- Lane, P. J. Salk, J. E. and Lyles, M. A. (2001) Absorptive Capacity, Learning, and Performance in International Joint Ventures. Strategic Management Journal 22, pp.1139-1161, John Wiley & Sons, Ltd.
- Mora-Valentin, E. M. Montoro-Sanchez, A. and Guerras-Martin, L. A. (2004) Determining Factors in the Success of R&D Cooperative Agreements between Firms and Research Organizations. Research Policy, vol. 33, issue. 1, January 2004, pp. 17-40, Elsevier Publishing.

- Motohashi, K. (2006) R&D of Multinationals in China: Structure, Motivations and Regional Difference. Draft Working Paper, Tokyo, Japan.
- Mudambi, R. (2002) Knowledge Management in Multinational Firms. *Journal of International Management* 8, pp. 1-9, Elsevier Science.
- Narula, R. and Zanfei, A. (2003) Globalization of Innovation: The Role of Multinational Enterprises. Danish Research Unit for Industrial Dynamics (DRUID), Working Paper 3-15, Denmark.
- Pearce, R. (1994) The Internationalisation of Research and Development by Multinational Enterprises and the Transfer Sciences. *Empirica* 21, pp. 297-311, Kluwer Academic Publishers, The Netherlands.
- Susana Borrás and Stine Haakonsson, INGINEUS, European Policy Brief, Global Innovation Networks: Evidence & Policy Challenges, February 2012, http://ec.europa.eu/research/social-sciences/pdf/policy-briefs-ingineus-february-2012_en.pdf, accessed 15 January 2013.
- Serapio, M. G. Hayashi, T. and Dalton, D. (2004) Internationalization of R&D: Empirical Trends and Theoretical Perspectives, in M. G. Serapio and T. Hayashi (editors) *Internationalization of R&D and the Emergence of Global R&D Networks*. *Research in International Business*, vol. 8, pp. 3-19, Elsevier Ltd.
- Tuncay-Celikel, A. (2010) *Research and Development Collaborations: Turkish Automotive Industry*, ISBN: 9783639230963, VDM Verlag Berlin/Germany.
- Tunzelmann, N. v. 2009. Competencies versus capabilities: A reassessment. *Economia Politica*, 26(3).
- Tunzelmann, N. von and Grimaldi, R. (2002) Assessing Collaborative, Pre-competitive R&D projects: The Case of the UK LINK Schem. *R&D Management*, 32, 2002, pp.165-73.
- Wasti, S. N. and Wasti, S. A. (2008) Trust in buyer-supplier relations: The Case of The Turkish Automotive Industry. *Journal of International Business Studies* 39, pp. 118-13.