

Analyzing the Role of University Industry-Collaboration to Regional Development: The Case Study of Bursa Region in Turkey

Assoc. Prof. Dr. Çağatan TAŞKIN

Department of Business Administration

Uludağ University, Bursa, Turkey

Tel: +90 224 294 10 12 ; Fax: +90 224 294 10 11

ctaskin@uludag.edu.tr

Assist. Prof. Dr. Cem Okan TUNCEL

Department of Economics

Uludağ University, Bursa, Turkey

Tel: +90 224 294 11 77; Fax: +90 224 294 10 11

cotuncel@uludag.edu.tr

Abstract

This study examines the contributions of university-industry collaboration to regional development. Regional development that becomes possible through allocation of the regional resources to technology development efforts provides competitiveness. In addition, university-industry collaboration is a vital centre of competence to help tackle social challenges and drive regional development. When companies and universities work in tandem to push the frontiers of knowledge, they become a powerful engine for innovation and economic growth. Due to having limited R&D capability and human capital university-industry collaboration is the main source of the innovative skills trigger the regional development and provides competitive power in the developing countries. This study aims to address the challenge of bridging the industry-university in regional development process and analyzing university-industry connection problems from local firms' perspectives in Bursa region, Turkey. University-industry collaboration is the main important driving force for Bursa economy, a bridge between Istanbul and South Marmara region and an old city that has strong industrial infrastructure in Turkey. It has a great potential to become a competitive region because of the fact that it has many innovative firms clustered under different sectors. Some technological spillovers, provided by breakthroughs in Bursa economy, will enable to the creation of an innovative region from South Marmara. To reach the success in this process, an interfaced institution which construct and coordinate university-industry collaboration have to be developed. In this study, university-industry collaboration is evaluated from the viewpoint of firms. A structured questionnaire was formed through a literature survey. The main population of this research consists of manufacturing industry in Bursa region, Turkey. The data was collected from selected manufacturing firms in order to evaluate the challenges and the expectations of these firms. Based on the obtained results, policy alternatives that aim to develop university-industry collaboration more effectively in the region were also discussed. ¹

¹ This work was supported by The Commission of Scientific Research Projects of Uludag University, Project number KUAP(I)-2012/33.

Key words: Regional Development, University-Industry Collaboration, Bursa Economy

Introduction

This paper deals with a conceptual framework of regional development and industry-university relationship. University-industry collaboration has been considered an important mechanism for building up innovation capacity. In regional innovation systems, interaction between firm, universities, and research institutes has a critical impact on innovation processes and performances. The strong linkage between them has become a determinant factor leading to the success of industrial innovation and been vital for regional competitiveness. According to innovation system approach, new technological opportunities are created via synergies by bringing together different technological, social and institutional competencies. High education institutions play major role in this synergetic process. Due to insufficient R&D facilities of developing economies, technology transfers from university are the main source of technological development to latecomer firms. Effective knowledge sharing between public science and industry is recognized as one of the cause sustainable economic performance. Project cooperation between research institutions, industry and long-term partnerships in networks of excellence where industry and research institutions pool their resources, and improved knowledge transfer between public research and industry contribute effectively to the effective knowledge sharing between public science and industry (Leydesdorff & Etzkowitz, 2001). Extensive university-industry relationship can contribute to improve technological capabilities of industry. These successful relationships are the most important factor for industrial upgrading in less developed economies.

Given the context, this paper explores the dynamic nature and reality of university-industry collaboration in Bursa region of Turkey. This region is defined as an old industrial area which is based on low and middle technological intensive sectors such as clothing, food, furniture, automotive supplier etc. and weak university-industry collaboration. The case could analysis explains whether region have transformed to globally competitive regions over time, through the investigation of how interactive learning for innovation between university and industry has been developed and pursued successfully. This study consists of three subsections. First section deals with the role of university in regional development process. Second section is dedicated to explain data gathering process and results of empirical analysis. In conclusion, an assessment has been made on university-industry relationship and main propositions for policy framework are discussed.

Role of University-Industry Relationship in Innovation Systems and Regional Development

System of innovation has emerged as a new topic on the research agenda of innovation studies in the last decade. Concept on innovation system has changed the analytical perspective about innovation from linear model to systematic view of interaction among different actors. Second generation innovation studies, called system approach, emphasize on the importance of not only understanding the creation of technology, but also its diffusion and utilization (Geels 2004:898). In addition, system approach analyzes economic and technical changes which primarily focus on the flow of knowledge, institutional environment and interacting actors. According to this approach, the accumulation of knowledge within firms or by individual entrepreneurs is not independent from external sources. It is pointed out that innovation does not only emanate from firm activities, but also from supplier of materials, interaction of firms and institutions such as universities and research centers. Lundvall (1988) developed the concept of learning by interactions to reflect these complex interactions in his leading study on systematic approach. In addition, learning by interactions has become a crucial notion that can be used to understand novelty creation in networks. System approach, in which the innovation network is the main factor, can be handled in different levels such as national innovation system (e.g. Freeman, 1987; Lundvall 1992; Nelson, 1993) regional innovation system (e.g. Cooke, 2001; Cooke, 2008) and sectoral system of innovation (e.g. Malerba, 2002, Malerba, 2003, Breschi and Malerba 1997). In system, economic success of particular innovations is dependent on the actions of other firms and organizations (Beije 1998:270). Innovation networks have three components which are actors, activities and resources.

In evolutionary perspective, co-evolution is a crucial concept for understanding system dynamics. In opposition to the evolutionary theory of economic change of Nelson–Winter stemming from Darwinian natural selection mechanism in co-evolutionary approach argued that not firms but coordination mechanisms are evolving systems. In biology, co-evolution is the mutual evolution influence between two species. Each part in a co-evolutionary relationship exerts selective pressures on the other, thereby affecting each others' evolution. In a co-evolutionary model of innovation system, two sub dynamics are assumed to operate upon each other and thus the variation in interaction is prestructured (Leydesdorff and Meyer

2006:1446). Changing may lead to improvements of existing technologies or introduction of new technologies. By means of new technologies, policy makers may develop new rules to regulate it and user may develop new behaviors. The consequence of these multiple interactions is that key elements of innovation system coevolve (Geels 2004:909). in sum, innovation systems consist of interactions among actors and co-evolving subsystems.

High education system is the key component of innovation systems. Due to transformation from an industrial society to a knowledge society and a global knowledge economy is characterized by the increased importance of knowledge; functions of university have changed since last two decades. Besides traditional functions such as training and basic research, universities have begun to play entrepreneur role in the knowledge-based economy. Today's knowledge economy, knowledge produced by R&D, and inventions created in universities and industrial laboratories are creating the so-called knowledge industries. and universities have become the main partner of these knowledge industries. Hence The Entrepreneurial University is a central concept to new type of university industry relationship. As firms raise their technological level, they engage in higher levels of training and knowledge sharing. As universities develop links, they can combine discrete pieces of intellectual property and jointly exploit them. The academic 'third mission' aim to go beyond traditional missions of teaching and research of University. The Entrepreneurial University also has an enhanced capacity to provide students with new ideas, skills and entrepreneurial talent. Students are not only the new generations of professionals in various scientific disciplines, business, culture etc., but they can also be trained and encouraged to become entrepreneurs and firm founders. in addition entrepreneurial universities are also extending their capabilities of educating individuals to educating organizations, new modules such as science parks, academic spin-offs, incubators and venture capital firms and new interface institutions namely Technology Transfer Office (TTO) , Technology Licensing Office (TLO).

in the other hand impact of global shift (e.g. Dicken, 2007) on the national economies made to change concept of regional economy. Starting from 1980's the literature on regions started to focus on transformation of industrial geography of global economy and new types of production organization. During this period the role of regional economies in national and global scale has been popularized by pioneer study of Piore and Sabel (1984). After this theoretical contribution, new concepts namely increasing return, positive externalities, regional agglomeration have turned out to be the main academic topics about regional economy (Fujita and Krugman, 2004). This trend was consolidated by innovation system approach in late 1980's and Regional Innovation System (RIS) approach has become the most considerable analyzing tool about regional development. Cooke et. al. (1997). argues that RIS concept allow the analysis of the regional scale of economy which is the vital for designing new development strategies. According to RIS approach, the interactions among actors such as universities, local government, local non- firm organizations, firms, financial institutions are crucial for quality of the whole system (Cooke,2008)

This perspective corresponds to Triple Helix model that is the potential for innovation and economic development in a knowledge economy. Triple Helix model provides way to understand how generate new institutional formats for the production, transfer and application of knowledge (Etzkowitz 2008; Etzkowitz and Leydesdorff, 1995). Moreover, Triple Helix theoretical and empirical research has grown over the last two decades that provides a general framework for exploring complex innovation dynamics and for informing national, regional and sectoral innovation. Universities increasingly become the source of regional economic development and academic institutions prompt to regional stakeholder for making regional development vision.

Policies pursued by regional governments can enhance the economy via improving technological capability and competitive advantage (Lagendijk and Cornford 2000) . University-industry relationship by promotion of cooperative practices among actors, prompt regional economic development. Hence regional policy makers must take account of quality of lineages between local university and industry (OECD, 1999)

Data and Method:

The study obtains benefit from the data which was collected from 150 firms in which operate Bursa region, Turkey by using random sampling method. Within the sample, the major business activities are the automotive supplier industry (35 percent of firms) followed by machine manufacturing industry (23 percent of firms) and metal industry (17 percent of firms) and cloth manufacturing and textile industry (15 percent). 3,3 percent of sample firms operate in construction sector. Service firms (security service, health etc) has a minor part of sample (only 5 percent)

During the data collection process, employees of a professional research firm have interviewed with top managers (e.g., manager, production managers) of these firms on telephone. The scale, employed in this study, was prepared from literature review. Then, the scale was presented to two managers who have worked in the academic industry joint research

for many years and two experienced academics. After some minor changes in terms of advices coming from manager, engineers and academics,

Results:

The main aim of this study was to evaluate the university-industry relationship activities of firm operating in bursa region and analyze potential benefits and expectations of firms from university-industry collaboration. for this purpose, quantitative research method was preferred and data was gathered from firms by using questionnaire. and this data was analyzed via using SPSS packet program.

Sample firms consist of micro-sized enterprises (% 26,7), small medium-sized enterprises (% 38,7) medium-sized enterprises (,% 21,3) and big-sized enterprises (%13,3).Results exhibit that 34,7 percent sample firms carry out in-house R&D activities and 34,7 percent firms. Firms were asked to evaluate their innovational activities in last three years. Results show that 59 percent firms in sample are innovative. It is clear that external source such as public R&D supports, staff training supports is vital factor for innovation process. As it is commonly accepted innovation activities require large amount of funds and it is impossible to fund these activities by the firm's internal source only. 30,7 percent firms which answered the questionnaire benefit from external support namely TÜBİTAK (The Scientific and Technological Research Council of Turkey), KOSGEB (Small and Medium Enterprises Development Organization) etc. When 57 percent firms use KOSGEB support, 42 percent firms benefit from TÜBİTAK supports. Regional Development Agency provides external support for 8 percent firms.

Results of Types of university-industry relationship were exhibited in Table 1. These results show that the most common University-Industry Relationship activities are university student internship facilities. These facilities not only provide to student learning opportunities, but also firms benefit from students' workforce. The second most widespread facilities are Joint R&D Research. This linkage plays a critical role for firm which is aim to technological upgrading. and firms that want to benefit from public funds for their R&D project prefer to join research project with university. These joint projects simplify to fund firm's R&D research. These opportunities encourage to firm for building linkages to university. After establishment of Technology Transfer Office (TTO) in Uludag University, the oldest and the biggest university of the region, these joint research activities have increased. But neither firm use of university patent and benefit from science park facilities. This result reflects weak linkages between industry and university for advanced technology development activities. 33 percent firms in sample benefit from consulting. Firms found consultant scholar via using face to face relationships owing to lack of the interface organization. The results in Table 2 show the potential benefits of university-industry collaboration to industry and university from firms' aspect. These results explain how firms perceive the potential benefits of university-industry collaboration in regional context. Most of firms recognized potential benefits of university-industry collaboration. According to sample firms, when the highest benefits of university-industry collaboration to industry are early access to current research the highest benefits of university-industry collaboration to university are Internships for students.

Discussion & Conclusion:

University-industry collaboration has been considered an important mechanism for building up innovation capacity. in regional innovation systems, interaction between firm, universities, and research institutes has a critical impact on innovation processes and performances. The strong linkage between them has become a determinant factor leading to the success of industrial innovation and been vital for regional competitiveness. in Turkey, since implementation technological promoting strategy in 2000, collaborative innovation between public and private sectors has been promoted vigorously by a series of government's science and technology (S&T) programs to optimize the diffusion and utilization of new knowledge. As a result, there has been a growing recognition that many Turkish enterprises have participated in collaboration with science sector—research institutions and universities—through joint R&D projects, technology licensing, consulting, internship, and so on. But university and industry collaboration is not reach sufficient intensive level which provides high technology transfer to firms. This supply side technology polices aiming reducing cost and uncertainty of R&D facilities for firms have become the main motivation of firms to begin joint research with university and other research institutions such as TÜBİTAK (The Scientific and Technological Research Council of Turkey), TTTGV (Technology Development Foundation of Turkey).

Study results show that many firms expect great benefits from industry university linkages for both industry and university. Due to weak linkages and network facilities between regional actors (firms, local government, university scholars), this potential benefits have not became reality. On the other hand university-industry relationship facilities intensified traditional

types such as consultancy, university student internship. Companies of region industry have different technological capabilities but they do not have sufficient relations with the universities in technology developing. Especially, long term partnership researches and activities of technology development regions are low. Establishing more intensive relationship to academia makes firms more competitive. for this reason all late comer firms should focus on university based technology project.

Bursa region is the most important industrial center of Turkey. Because of historical background and technological capability it is the main export center of Turkey as well. So it has a great potential for transformation from old industrial area to high technology center. Joint R&D projects, university spin-offs and new technology transfer from university to firms are the critical factor for regional development process in knowledge based economy. Stakeholders of regional innovation system namely local government, university, industry, citizens are in charge of development of region. The more network facilities among stakeholder for allocation for regional resource to development technological capabilities are made, the more competitive regional economy is created. It is clear that university industry relationship plays the key role in this process.

The results of this study find that Bursa has somewhat weak university research systems join as well as poor networks of local actors. The findings also suggest that it is important for regional government to establish supporting routines as well as to provide efficient managements which facilitate the interface process between university and industry collaboration. Firms in Bursa should built stronger university-industry linkages with better innovation environments which could help build and develop its innovation capabilities over time. Extensive university-industry relationship can contribute to improve technological capabilities of region.

Acknowledgements:

This work was supported by The Commission of Scientific Research Projects of Uludag University, Project number KUAP (İ)-2012/33.

References:

- [1] Beije Paul (1998) Technological Change in the Modern Economy, E:E ,USA
- [2] Breschi, S. and Malerba, F. (1997). "Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics, and Spatial Boundaries", in C Edquist (ed.), *Systems Of Innovation: Technologies, Institutions, and Organizations*,Pinter, London,130-56.
- [3] Cooke, P. (2001). Form Technopoles to Regional Innovation Systems: The Evolution of Localized Technology Development Policy. *Canadian Journal of Regional Science*, 24(1), 21-40.
- [4] Cooke, P. (2008). Regional Innovation Systems: origin of the species. *Interanational Journal of Technological Learning, Innovation and Development*, 1(3), 393-409.
- [5] Cooke, P., Uranga, G. M., Etxebarria, G. (1997). Regional Innovation Systems: Institutional and Organizational Dimnesions, *Research Policy*, 26(4-5), 475-491.
- [6] Dicken, P. (2007) *Global Shift: Mapping the Changing Contours of the Word Economy* 5th Edition, SAGE, USA
- [7] Etzkowitz, H. (2008). *The Triple Helix : University-Industry-Government Innovation in Action*. New York ; London: Routledge.
- [8] Etzkowitz, H., & Leydesdorff, L. (1995). The Triple Helix---University-Industry-Government Relations: A Laboratory for Knowledge-Based Economic Development. *EASST Review*, 14, 14-19.
- [9] Fujita, M., Krugman, P.,(2004). "The new economic geography: past, present and the future". *Papers in Regional Science* 83, 149-164.
- [10] Freeman, C. (1987). *Technology Policy and Economic Performance : Lessons From Japan*, Pinter London

- [11] Geels, Frank (2004), "From Sectoral Systems of Innovation to Socio-Technical Systems: Insights About Dynamics and Change from Sociology and Institutional Theory", *Research Policy*, 33, pp. 897-920.
- [12] Lagendijk A J. Cornford (2000) "Regional Institutions and Knowledge -Tracking New Forms Of Regional Development Policy" *Geoforum* 31 209-218
- [13] Leydesdorff, Loet & Etzkowitz, Henry (2001). "The Transformation Of University-industry-government Relations." *Electronic Journal of Sociology*: 5, 4 (
- [14] Lundvall, B. Å. (1988) "Innovation as an Interactive Process: from User-Producer Interaction to the National System of Innovation", in Dosi, G. et al. (eds.), *Technical Change and Economic Theory*, London: Pinter, pp. 349-369
- [15] Lundvall, B.-Å., (ed.), (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers
- [16] Malerba, F. (2002). "Sectoral Systems of Innovation and Production" *Research Policy* 31, 247–264.
- [17] Malerba, F. (2003). "Sectoral System and Innovation and Technology Policy", *Revista Brasileira de Inovacao*, 2, 329-374.
- [18] Nelson, R. (1993). *National Innovation Systems: A Comparative Study*. : Oxford University Press,
- [19] OECD (1999). *The Response of Higher Educational Institutions to Regional*, OECD Paris
- [20] Piore, M. & Sabel, C. (1984): *The Second Industrial Divide*, New York: Basic Boks

Table 1: Types of University-Industry Relationship

(Frequency-Percent)

Types of University-Industry Relationship	Firms (%)
University Student Internship	66,6
Interaction With The Academia in Terms Of Course Content	3,7
Interaction By Attending A Conference and Seminar	25,9
Interaction With The Academia in Terms Of Staff Training	6,7
Interaction With The Academia for Determining Dissertations' Topics	11
Consultancy	33,3
Joint R&D Research	37
Use and Licensing Of University Held Patents	0
Exchange Of Information and Knowledge for academic research	18,5
Science Parks Facilities Of University	0