

Catching-up and the role of University/Industry linkages in emerging economies: Case of Turkey

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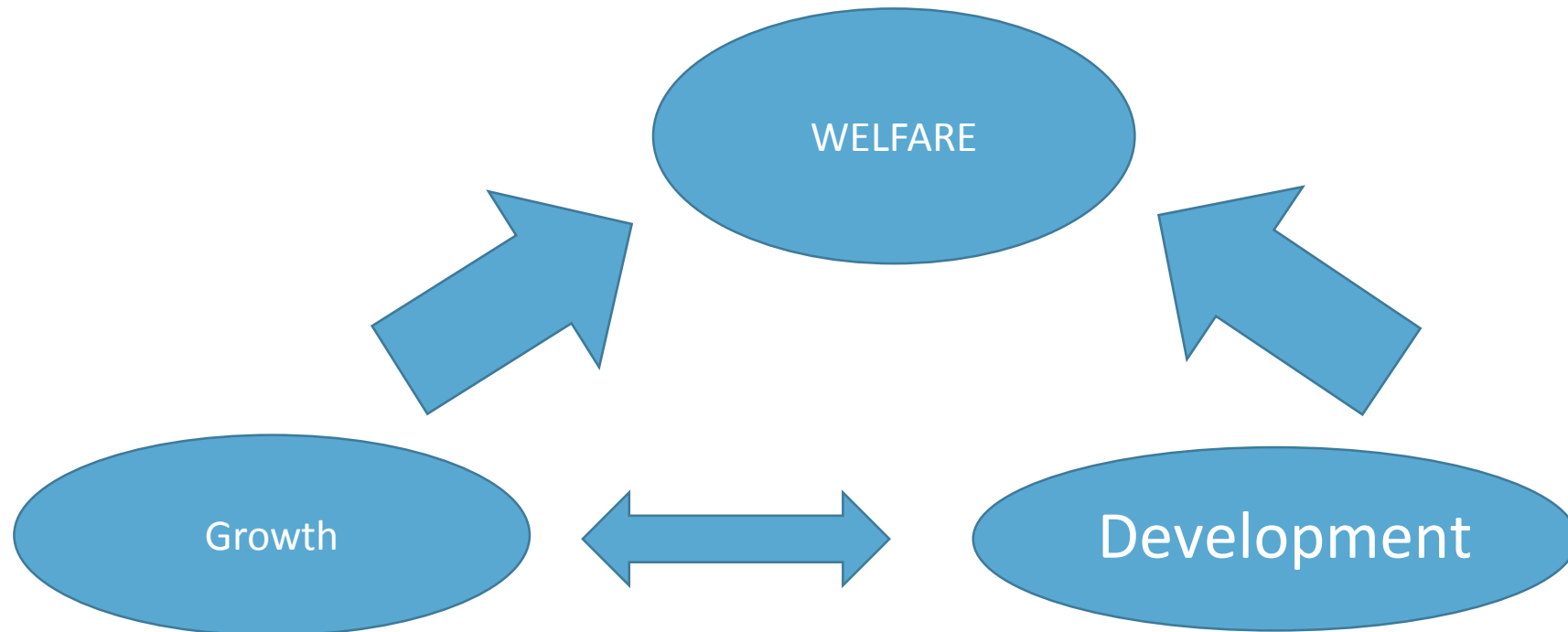


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1. Introduction: Conceptual Background



1. Introduction: Conceptual Background

- Not neoclassical welfare or purely Keynesian welfare
- Not utilitarian or positivist subjectivism
- The existence of a wide variety of different normative principles in various cultures and the fact that essentially the social environment determines which principles a person is going to employ implies that normative principles are not innate but *acquired*. The implications of this are twofold: first, normative principles are subject to change not only in the very long run. This empirically verified fact has to find its explanation in the theory to be developed. Second, the existence of moral conflicts and their emotional manifestation makes clear that the adoption of and compliance with normative principles is not a trivial process.
- But welfare in the evolutionary sense: Gradual improvements of all capital infrastructures including human capital and relational capital through supply and value chains.

1. Introduction: Conceptual Background

Sartorius, 2003*

For a series of reasons, selection in general and social group selection in particular are not fully efficient with regard to the improvement of adaptation and, thus, well-being.

*Sartorius, C., 2003. *An Evolutionary Approach to Social Welfare*, London: Routledge

1. Introduction: Conceptual Background

Binder, 2010

The evolutionary theory of welfare qualifies as a connection between the subjective-objective poles of the spectrum of theories of welfare.

The notion of welfare malleable and changes over time.

The assessment of evaluative well-being is very prone to changing values and social norms.

2. Statement of the Problem for Developing Countries

For developing countries university-industry interactions are great challenges to be urgently dealt with not only for catching up with the advanced economies but also for surviving in today's knowledge economy.

Therefore, understanding how developing countries can foster university-industry interactions and the commercialization of successful results of research conducted in universities is important for social welfare.

2. Statement of the Problem for Developing Countries and Turkey

The share performed by HEIs in the total R&D expenditure is 42.1% in 2013.

The share of private companies in the R&D expenditure is 47.5%.

While 26.6 % of the total R&D expenditure is publicly financed, 48.9 % is financed by private firms and 20.4 % by HEIs

R&D expenditure performed by HEIs is financed mainly from their budget (43%) and through government research grants (33%)

Moreover, universities have a very strong human resources capacity: in 2013, nearly 37.7 % of the total R&D staff in the country is employed by the HEIs.

Hence, in Turkey, universities are still the main locus of scientific knowledge production; and especially in the recent period with some changes in higher education policies university researchers have gained strong research skills which can be measured by the high quality articles published in the international journals

2. Statement of the Problem for Developing Countries and Turkey

Nonetheless, despite some recent efforts to build up and improve connections between universities and firms, the interactions are still limited; according to the data collected by TurkStat for 2010-2012 on innovation capacities of firms only 39.3% of the innovative firms collaborate with universities during the innovation process and 26.9% of firms declare that they use universities as a source of knowledge.

The main reasons are declared to be

- (i) lack of resources at universities;
- (ii) lack of resources and skills on the firm side; or
- (iii) insufficient mechanisms to facilitate knowledge and technology transfer (KTT) between universities and firms

2. Statement of the Problem for Developing Countries and Turkey

In sum, the problems of this presentation are:

- University-industry interaction in Turkey is rather weak,
- the mechanisms and channels facilitating KTT are not effective; and
- there is a need to tackle this issue especially in scientific knowledge-based technologies and
- to develop sound science and technology policies for benefiting from a window of opportunity to catch up with the international level especially in the emerging fields.

2. Statement of the Problem for Developing Countries and Turkey

How do individual and organizational resource endowments on both sides of the university-industry interactions affect the establishment of channels facilitating knowledge and technology transfer between academia and industry?

3. A Snapshot on Literature

First of all, most studies in the literature deal with patent, licensing and creation of academic spin offs as the main channels of university-industry relations; and science and technology policies are mainly based on the encouragement of these few number of channels.

However, the number of studies focusing on a larger number of channels has increased (Schartinger et al., 2001; D'este and Patel, 2007; Link et al., 2007; Arvenitis et al., 2008).

In these studies, it is emphasized that there are many different forms of interactions other than patenting, licensing and spin-offs; and some of them are informal and interpersonal.

Since the channels such as university patenting, licensing, technology transfer offices (TTOs), and academic spin offs and techno-parks are recent phenomena in Turkey one believes that this special focus on a wider spectrum of channels between university and industry is necessary for the systematic analysis of university-industry interactions in Turkey and for formulating realistic / pertinent policy proposals.

3. A Snapshot on Literature

Resource-based view (RBV) is used as a powerful explanatory approach for the formation of strategic alliances among firms (Das and Teng, 2000; Eisenhardt and Schoonhoven, 1996; Mowery et al., 1998; Tsang, 1998); and between universities and firms (O'Shea et al., 2005; Power, 2003; Santoro and Chakrabarti, 2002; Santoro and Bierly 2006); between individual university researchers and firms (Landry et al., 2007; Rijnsoever et al., 2008).

On the other hand, scientific and technical human capital (STHC) approach has recently been popularized among scholars studying the factors influencing university-scientists to engage in KTT (Edler et al., 2011; Boardman 2009; Ponomariov, 2008; Boardman and Ponomariov, 2009; Murray, 2004).

Nonetheless, these two approaches utilize a similar perspective (Boardman, 2009; Bozeman and Corley, 2004), especially to explain university-industry KTT activity.

3. A Snapshot on Literature

Table 1 A sample of empirical studies focusing on universities' organizational capabilities / resources in KTT activities

Publication	Country	Data source	KTT activity under investigation	Observations in the sample	University resources / capabilities
Schartinger et al. (2001)	Austria	Questionnaire	Joint research; contract research; supervision of graduate thesis; mobility of researchers	421 departments	Personnel structure; international publications; university experience in contract research; intensity of graduate students
Bercovitz et al. (2001)	USA	Interviews	Patenting; licensing; sponsored research	3 universities	The organizational structure of the TTO (Matrix structure; hierarchical structure; multidivisional structure)
Friedman and Silberman (2003)	USA	AUTM	Licensing	83 universities	Policy; university mission; TTO experience
Di Gregoria and Shane (2003)	USA	AUTM	Spin-off	116 universities	Intellectual eminence; policy; commercially oriented research; venture capital
Powers (2003)	USA	AUTM	Patenting, licensing	108 universities	Physical resources; human capital resources; organizational resources; financial resources
O'Shea et al. (2005)	USA	AUTM	Spin-off	141 universities	Institutional resources; human capital resources; financial resources; commercial resources
Powers and McDougall (2005)	USA	AUTM	Spin-off	120 universities	Financial capital; human capital; organizational resources
Arvenitis et al. (2008)	Switzerland	Questionnaire	Formal and informal KTT activities	241 departments /institutes	Applied research; funding; time allocated for teaching activities; obstacles; motivations; disciplines
Perkmann et al. (2011)	UK	Higher Education Business and Community Interaction survey	Collaborative research; contract research; consulting.	164 universities	Faculty quality; academic disciplines

3. A Snapshot on Literature

Table 2 A sample of empirical studies focusing on university scientists' characteristics and capabilities in KTT activities

Publication	Country	Data source	Number of KTT channels /activities under investigation	Observations in the sample (# of researchers)	Factors under investigation
Landry et al. (2007)	Canada	Questionnaire	7 knowledge transfer activities	1,554	Financial assets; organizational assets; relational assets; personal assets; knowledge attributes
D'Este and Patel (2007)	UK	Questionnaire	5 channels	1,528	Individual; department and university characteristics
Link et al. (2007)	USA	Questionnaire	3 channels	1,502	Research grants; gender; tenure
Azagra-Caro (2007)	Spain	Questionnaire	Any type of contracts with firms	380	Type of university; academic discipline; time for R&D activities; seniority; gender; administrative position; mobility
Bozeman and Gaughan (2007)	USA	Questionnaire	9 activities	1,564	Industry grants; government grants; gender; career; affiliation with a research center; academic disciplines
Bercovitz and Feldman (2008)	USA	TTO data	Patenting, licensing	1,780	Training effect; leadership effects; local peer effects
Ponomariov (2008)	USA	Questionnaire	8 activities	1,638	Academic quality; patenting; total R&D expenditure; industry funded R&D
Boardman (2009)	USA	Questionnaire	8 activities	1,647	Types of university based research center
Boardman and Ponomariov (2009)	USA	Questionnaire	9 activities	1,643	Industry funds; government grants; affiliation with a research center; no. of collaborators; no. of graduate students funded; tenure status; gender
Chang et al. (2009)	Taiwan	Questionnaire	2 channels	474	Institutional legitimacy; organizational resources; network capabilities; personal entrepreneurial capabilities
Edler et al. (2011)	Germany	Questionnaire	Any type of KT activity	958	The frequency and length of visits to research institutes outside of the country

3. A Snapshot on Literature

Table 3 A sample of studies focusing on firms' characteristics and capabilities influencing KTT

Publication	Country	Data source	Form of relationship under investigation	Observations in the sample	Factors under investigation
Laursen and Salter (2004)	UK	Innovation survey	Use of university knowledge	2,655	Firm strategy; R&D expenditure; age of firm; firm size
Veugelers and Cassiman (2005)	Belgium	Innovation survey	Research collaboration	325	Information sourcing strategy; firm size; barriers to innovation; industrial sector effects
Mohnen and Hoareau (2003)	France, Germany, Ireland, Spain	Innovation survey	Use of university knowledge; research collaboration	9191	Firm size; belonging to science-based sector; government support; R&D intensity; number of patents; being a radical innovator;
Fontana et al. (2006)	Denmark, France, Germany, Greece, Italy, Netherlands, UK.	KNOW survey	Research collaboration	558	Openness of the firm; firm size; firm R&D activity; firm innovative activity
Santoro and Bierly (2006)	USA	Questionnaire	Knowledge transfer	173	Social connectedness (key persons); trust
Bercovitz and Feldman (2007)	USA	Questionnaire	Research collaboration	45	Internal R&D (i.e. share of exploratory research); R&D organization (centralized vs decentralized); industry effect
Santoro and Chakrabarti (2002)	USA	Questionnaire	Research support; cooperative research; knowledge transfer; technology transfer	202	Firm size; organizational structure; firm capabilities; presence of champions
Eom and Lee (2010)	S. Korea	Innovation survey	Cooperative research	538	Participating national projects; firm size; R&D intensity; reasons for collaboration (cost c-sharing, risk sharing); affiliation to business group; firm location; sector
Cohen et al. (2002)	USA	Carnegie Mellon R&D managers survey	Using public research results	1,267	Firm size; start up; industry
Schartinger et al. (2001)	Austria	Questionnaire	Joint research; contract research; supervision of graduate thesis; mobility of researchers	99	Firm size; firm age; motivations for interaction; barriers to interaction

3. A Snapshot on Literature

I can derive following conclusions:

(i) national science policies under the discourse of 'new' form of knowledge production have been re-designed to support more industrially applicable research; and to encourage universities in their engagement with the industry; and their transformation from isolated, ivory tower-fashion knowledge generating entities to more entrepreneurial organizations;

(ii) Bayh-Dole Act in the USA and equivalents in other countries provide initiatives to universities for the commercialization of scientific discoveries and increasing their income; new form of intermediary organizations (i.e. TTOs) has emerged; and the information asymmetry between academia and industry has been considerably reduced ; and finally

(iii) in spite of the great emphasis on the role of Bayh-Dole fashion regulations on the formation of KTT linkages between universities and industry, recent empirical studies provide evidence that universities and firms interact each other in various ways; and among them the share of patenting, licensing or spin-offs which are encouraged by the regulations is very small proportion.

4. UIRs in Transition

- The concept of university-industry relations first emerged in the UK, The Royal Society of London
 - Codifying and disseminating knowledge
 - Artisan-scientist relations
- Two factors have changed industry and university since then
 - Technology
 - Globalisation
- In a rapid changing environment the only thing that did not change is the university organisation!
 - The faculty-institute-department

5. Societal Relevance

- The ongoing discussions about the new Law on Turkish Higher Education Council
 - Does anyone talk about the system?
 - Where do university-industry relations stand?
 - Does it offer anything new in terms of organisation of activities in the university?
 - Does it offer anything new regarding the organisation of the interfaces (Technology parks, incubators, TTOs etc.)
 - We talk about entrepreneurial university

6. Future of the Universities

- Developments in technology and education
 - Geography may lost its power
 - > Many education activities and some research activities could be done through wire
 - > e.g., open course ware, open universities, life long learning
- Interdisciplinary research
 - Many new research areas are conducting cross-boundary research
 - e.g., experimental economics, nanotechnology, biotechnology etc.
 - Can the faculty-department system cope with this?
 - > New experiments: the case of Arizona State University

6. Future of the universities

- Why interdisciplinary research is on rise?
 - There is a lot of knowledge! One research field cannot cope with the amount of accumulating knowledge
 - › Solution: divide in pieces and increase specialisation. Research teams coordinate activities. Now easy with rapid developments in communication technology
 - Sophistication in academic output
 - › We now conduct much more sophisticated and demanding research
 - › Otherwise you cannot get published!
 - › Find interesting topics, establish a nice team and network

6. Future of the Universities

- Cost of research and education
 - This is a global challenge:
 - › costs are rising but the funding is not
 - › There is funding only for applied research
 - › Pure science departments are closing down
 - How did universities respond
 - › Cut teaching expenses
 - › Merge activities with some other universities
 - e.g., libraries, electronic resources
 - › Push faculty to commercialise research
 - How I read this: There is place only for applied researchers in the university (in science and engineering)

6. Future of the Universities

- Global competition for education
 - a Turkish student can
 - › Go abroad and enrol in a university
 - › Enrol in an open university program in Turkey
 - › Enrol in an open university program abroad
 - In the first and third case competition is global
 - › Universities have to attract students
 - › That is why many universities in developed countries are 'hunting' students in developing countries
- Global competition for attracting funds
 - e.g., EU framework funds

7. Future of the Industry

- Production is globalising
 - Developments in technology
 - Cost of moving people, things and ideas is reduced to a great extent
 - Geography is losing importance. e.g., new Boeing Dreamliner is produced in 135 different locations, 43 countries
- Sophisticated products
 - e.g., intellicap or the “ipill”
 - You need an interdisciplinary team of scientists to produce ipill
- Sophisticated products demand sophisticated knowledge which are generally embedded in universities
 - That is why we talk about university-industry relations

8. Summary: Future of the University and Industry

- Interdisciplinary approach in both university and industry
- The level of sophistication will increase which creates further scope for university-industry relations
 - Industry needs knowledge that reside in universities
- Universities have to diversify funding
 - The government funding seems to get smaller each day
 - This is a continuing global trend (like it or not!)
- Universities are being loaded with new functions
 - Three functions: Produce, keep and disseminate knowledge
 - But now: entrepreneurial university, an important node in national innovation system, help regional development

8. Summary: Future of the University and Industry

- The new law of Turkish Higher Education Institution
 - Our expectation was it at least address some of the issues raised in this presentation
 - But it is silent on systemic changes
 - Everything but “a new university system” is covered in the law
- What can we do to increase the efficiency of the university-industry relations?
 - We have five suggestions

9. Suggestions

Suggestion 1

- University research centers should be activated
 - URC's have no legal definition in current Turkish university system
 - > With the new YÖK law this will change
 - > There is another law in preparation for large research centers in science and technology
 - What they can offer?
 - > Interdisciplinary character
 - > Hybrid researchers
 - Can maintain academic research standards but also can communicate with the industry
 - > Locate somewhere between academic and industry research
 - > Entrepreneurial spirit
 - > More flexible

9. Suggestions

Suggestion 1

- University research centers should be activated
 - What to do?
 - › URC's should have legal entity
 - › In Turkey interdisciplinary research is an exception rather than the rule
 - Interdisciplinary research is not rewarding
 - URC's could help to promote interdisciplinary research

9. Suggestions

Suggestion 2

- The “researcher” concept should be established
 - In US and Europe “researcher” is an occupation and it is quite rewarding
 - But not in Turkey
 - > There is no definition of ‘researcher’ in the law
 - What to do?
 - > Universities should be able to hire researchers
 - One way to do this is to employ researchers in URC’s
 - > Technology development zone law and Higher Education law should be complementary
 - > Affiliation is a huge problem
 - You cannot work in two different research units within a university at the same time
 - > Employment of foreign researchers should be easier

9. Suggestions

Suggestion 3

- Interfaces that help commercialisation of research do not work in an efficient way
 - Interfaces like technology parks, incubators, TTO's etc.
 - Why they do not work?
 - › We do not know! The government should spend time and money to first identify the reasons of inefficiencies and try to fix them
 - › But instead the government creates new interfaces
 - e.g., entrepreneurial university TTO's will be funded by the government
 - What to do?
 - › Turkey is a “mechanism heaven” but on paper
 - › Investigate why interfaces do not really work
 - › There is no real strategy plan on knowledge transfer among university and industry

9. Suggestions

Suggestion 4

- There is no real concept of “research project”
 - In most developed countries some researchers fund themselves through research projects
 - In Turkey research is publicly funded (mostly)
 - We as researchers do not know how to create research projects
 - > Not in our culture
 - > Not rewarded by the university system
 - What to do?
 - > Where do research projects stand in the university system?
 - > There should be some reward mechanisms for research project proposal
 - > Many inefficiencies in the ‘research project’ funding
 - Expect good research with little money and little time (in Turkey)
 - This won’t happen

9. Suggestions

Suggestion 5

- University-society relations should be re-activated
 - Before: Universities of culture
 - Now: Universities of innovation system
 - > This is too mechanical
 - > The functions of universities are reduced down to creating economic value
 - > The fault is partially ours: We cannot explain to the society what we do in universities
 - But in fact universities do create important value but not measurable
 - What to do?
 - > We have to show that universities create value for people
 - > The public should be able to access university campuses

10. Future Research Directions*

1. Move from a university-industry focus to amore expansive university-industry-societal focus
2. Employment of social network analysis with industry and non-industry stakeholders
3. Quantifying the importance of product or process innovations with new indicators at different levels (local, regional, national)- value creation and social cost
4. Developing future survey instruments on existing barriers and incentives (e.g. trust and proximity)
5. More research on less industrialized countries that do not have very high and statistically measurable impact at early stages of the catch-up process.

*Albuquerque, E. et al., 2015. *developing National Sytems of Innovation: University-Industry Interactions in the Global South*, Cheltenham: Edward Elgar

11. Summary

- Technology and globalisation is reshaping our lives
 - Industry is flexible to act upon
 - But universities are not
- Increasing dependence between the university and industry
- What can we do to increase the efficiency in university-industry relations? (within the existing system)
 - Activating research centers (or institutes)
 - Interfaces that help commercialisation of research
 - The concept of “Researcher”
 - The culture of “research proposal”
 - re-establish universities of culture

Thanks