THE INNOVATIVE CAPACITY AND LEARNING CAPABILITY OF TURKISH REGIONS[i]

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INTRODUCTION

At the end of 1980s, there was a marked increase in the study of the role of knowledge in creating and sustaining competitiveness, and the role of spatial location in the process of learning and innovation (Storper, 1992). Knowledge is accepted as the central aspect of the emergent mode of production that has been called the "*knowledge-based*" or "*learning" economy* and emphasized as the main ground for both learning and innovation processes. The role of knowledge is accepted as a motor of growth in the new learning economy, and individual and organizational categories of learning are the key processes through which innovations are achieved. Hence, knowledge is the crucial input for competitive economic activity and generation of economic growth. Having competitive power is no longer related with having natural competitive advantages but with having *ideas* (Florida, 1995).

Parallel to these changes, understanding of "region" has changed. The importance of national borders has been declining, flow of trade and capital have been increasing, localities and local production units have been gaining importance and thereby "regions" have become the node of the international network system. The geographical borders and natural resources are not any more the defining criteria of a region, instead, regions are defined through their ability to harness and mobilize knowledge and ideas (Florida, 1995). Related with the increased emphasis in the literature upon the importance of place-specific and non-economic factors in creating differences in regional economic growth and their competitive advantage (Asheim, Isaksen, 2002), regions are regarded as places where knowledge creation, learning and innovation are taking place. Learning ability and innovation capacity are the main issues for sustaining the competitive power

of a region. Some authors consider that the ability of some regions to produce and generate difficult-to-imitate innovations is a major precondition for international competitiveness (Enright, 1993; Saxenian, 1994; Storper, 1992; Brawn, Greabe, Grotz, Okamoto and Yamamoto, 2002).

In relation with these developments that have been taking place since 1980s and regarding the emergence of the new regions that became popular by their economic success such as Emilia Romagna, Baden Wurttemberg, Sophia Anti-Police and Silicon Valley, various approaches have emerged that have attempted to define the innovative character of these productive clusters and emphasized the role of learning as an important element of sustaining competitive advantage. Although they have different starting points and emphasis to explain the competitive power of different regions, they have basically relied upon Marshall's stress on local externalities and geographical concentration in promoting innovation (Evangelista et al., 2002).

Following the focal points of this literature on innovation and knowledge as the starting point and using the data provided from various institutions in Turkey, the study attempts to analyze empirically the capacities and capabilities of Turkish regions in terms of innovation and learning.

The study has two aims; first is to analyze the innovation capacities and learning capabilities of regions in Turkey and secondly, to search for some spatial patterns of innovation and learning, as a synthesis of the variety of regional innovation and learning capacities.

Following this introduction, the next part provides an overview of the literature on innovation and learning. The third part discusses briefly the indicators representing innovation capacity and learning capability, suitable for the Turkish case. In the fourth part we explore the existence of a few spatial patterns in Turkey in terms of innovation and learning. Finally, the empirical results are summarized and their implications are discussed.

THEORETICAL FRAMEWORK

The process of innovation has faced considerable amount of changes in the past years. There has been an observed move from a linear innovation model towards an independent, evolutionary and institutional model (Todtling and Kaufman, 1999).

At the beginning of 1990s, continuing studies on growth as well as on knowledge, innovation and learning gave rise to the development of the systemic approach to innovation. (Lundvall, 1992; Nelson, 1993; Edquist, 1997; Lundvall, Johnson, Anderson and Dalum, 2001). Different from the traditional linear innovation model, the systemic approach viewed innovation as an interactive process where links between many and different actors involving consumers,

producers, science and technology units, which changes over time and according to the type of industry (Todling and Kaufmann, 1999; Simmie et al., 2002).

Early studies on the systemic approach were at the national level. System of innovation is composed of actors and the other elements that are interacting in the process of production, diffusion and the use of economically useful knowledge, which are located inside the borders of a nation state." (Lundvall, 1992; OECD, 1999; Todtling and Kaufmann, 1999). It is considered as a social system where successful learning is viewed as the main activity and as a dynamic system where "…the elements reinforce each other in promoting processes of learning and innovation" (Lundvall, 1992: 2; Todtling and Kaufmann, 1999:3). Interactive learning is believed to facilitate the adaptation of different innovative systems and changing conditions of the market (Simmie et al., 2002). All the actors, organizations, and institutions in the system are included in this process and the interactions and networks between them are important for the level of innovation (Lundvall, 1992).

However, recently the systemic approach has been extended to include the regional level into the system (Edquist, 1997; Lundvall and Borras, 1997; de la Mothe and Padquet, 1998; Malecki and Oins, 1999; Todtling and Kaufman, 1999). In the national innovation system, there is an agreed path and institutions are strongly related within countries. The system is conceptualized and operationalized by looking at institutions, actors and linkages that operated and governed mainly at a national scale (R&D systems, public infrastructure, the education and training systems etc.) (Evangelista et al., 2002). On the other hand, in regional innovation systems, these factors are more regions based. "Regional innovation system is defined as the localized networks of actors and institutions in the public and private sectors whose activities and interactions generate, import, modify and diffuse technologies" (Evangelista et al., 2002: 174). The regional innovation systems approach emphasizes "…significant regional differences in research and technical activity and in the technological specialization of different regions within a national territory." (Archibugi, Howells and Michie, 1999: 19).

The key features of regional systems of innovation approach can be summarized into five headings:

- *Endogenous* or *internal dynamics* of regions are at the center of the regional innovation systems approach. Internal dynamics, in terms of interactions between firms, institutions, organizations and other actors within the innovation system, create different innovation systems.
- *Institutions*, both formal and informal (in terms of norms, routines, habits, etc.) are emphasized, which interact with each other and with the other elements and actors of the

system. The interactions between them determine the innovative performance of regions and each interaction defines a different innovation system since each institution and each actor has different characteristics (Cooke, Uranga and Etxebarria, 1997).

- *Interactive relations* (related with local institutional capacity) based on trust, reciprocity and collaboration are stressed as important components of the interactive learning process. The tacit character of knowledge makes cooperative and collaborative relations important means of this process since they facilitate the flow of knowledge between different types of actors, institutions and organizations.
- *Clustering* or *agglomeration* of innovative firms, especially the small firms, becomes an important point of focus (Simmie et al., 2002), related with the importance of interactive relations within the interactive learning process. This is because the geographical proximity facilitates face-to-face contacts, collaborative relations, and the formation of information links or networks between different members of the regional innovation system. Thereby the acquisition, transfer and exchange of knowledge, information and other externalities will be possible.
- *Regional industry specialization* is emphasized to reflect differences in regional innovation performance since it has influence on regional innovation infrastructures and institutions. Each industry sector necessitates different infrastructures, institutions, inter-firm relation, all of which affects the innovative characteristics of these sectors.

In the late 1990s, a considerable amount of researchers have analyzed the role of different types of learning within innovative dynamics: "The impacts of learning by doing (Arrow), of learning by using (Rosenberg and Vonttipel), of learning by diffusion (Saha) and learning by interacting (Lundvall)" (Kirat and Lung, 1999: 28). They have indicated the importance and the need of the production of new knowledge or novel techniques, which occur endogenously and are inherent to the processes of providing and/or propagating innovation (Kirat and Lung, 1999).

It is argued that, with respect to the developments that take place in the economic environment, regions should adopt themselves to continuous learning and knowledge production (Florida, 1995). As an outcome of this process, they in turn should be learning regions. Asheim (1998: 3) defines a learning region as "representing the territorial and institutional embeddedness of learning organizations and *interactive learning*" (Landabaso and Morgan, 1999: 6-7). Here, learning depends on capabilities and promotes the formation of competences.

Like the systemic approach, the learning region approach emphasizes interactive/collective learning process as an important source of continuous updating and

innovation mechanism (Eraydin, 2002). The effectiveness of the learning process depends on the quality of interactions.

The distinctive characteristic of learning regions is their ability to learn new knowledge and forget the old ones, to replace old capabilities with new ones and transform their structures rapidly according to the changing situations (Lundvall, 1992). *Human and* s*ocial capital* are highlighted as factors that enhance this process; human capital as carriers of knowledge, information and technical capabilities, and social capital since it facilitates the formation of effective social interactions and eases interactive learning and the transmission of knowledge.

Moreover, learning regions have the ability to avoid lock-in during their developments, caused by specific local institution, rules and regulations. Malmberg and Maskell (1999) highlight the role of *external knowledge* to avoid lock-in situations, as well as local knowledge, on successful competitiveness. In this respect, interactions and links with the external environment are as important as local relations and networks.

INNOVATION CAPACITY AND LEARNING CAPABILITY: CONCEPTS AND MEASUREMENT

To summarize the important issues emphasized by the mentioned approaches; firstly, innovation is the outcome of the interaction process between customers, suppliers and knowledge centers. On the other hand, learning serves to incorporate new information into this interaction process. Sharing the same locality is the key factor that leads to the success of this process. Units (firms) locate and build their competitiveness upon the success of the interaction process that takes place within the local capabilities.

Depending on the focal points of these perspectives, we approach the issue from two dimensions; one is the local or internal dimension and the other is the external dimension.

The local-specific elements when viewed from the previously mentioned perspectives are listed into three headings:

- The region's local/internal capacities
  - level of cooperation,
  - entrepreneurial power,
- Region's knowledge (use-production) and skills level
  - human and social capital,
- Region's specific institutional endowment.

Level of cooperation: As knowledge has become a crucial asset in the modern production system, knowledge creation becomes a key process when trying to increase and sustain the competitiveness of the region (Lundvall, 1992; Malmberg and Maskell, 1999). Knowledge is produced within the interaction process that forms innovation and learning. Different types of knowledge are created through tight cooperation and inter-firm relations between different units. The key importance of inter-firm interactions is attributed to the geographical proximity factor (Jorre and Gilly, 2000; Brawn, Greabe, Grotz, Okamoto and Yamamoto, 2002). Cooperative types of relations based on trust and reciprocity form the basis of long term, close and mutually advantageous relationships. Proximity is important since it facilitates non-market, tacit and informal relations which increase the cooperative dimension. They are the vehicles of this process and they constitute a fundamental axis for the promotion of territorially based regional innovation system (Santos, 2000).

You and Wilkinson (1994) are of the opinion that a high degree of cooperation may be an important ingredient of industrial success (You & Wilkinson, 1994; Asheim, 1996). During the co-operation process, their primary relations (subcontracting) largely influence research and knowledge creation activities of co-operating partners with other firms (Graeber, 1993; Crewe, 1996). Subcontracting links between manufacturing firms offer considerable amount of benefits in the innovation and learning processes.

Additionally, there is an emphasis in the literature on the role of *small and medium sized enterprises* in facilitating the cooperative relations. It is agreed that flexibly specialized SMEs are the key actors of the innovative clusters whose inter-firm relations promote the diffusion of knowledge.

Indicators such as the number of SMEs[ii], the number of sub-contracting firms are used to measure the level of inter-firm relations. In terms of subcontracting firms, the two industrial sectors are taken into consideration, textile and fabricated metal products industries. These two sectors are the most dynamic sectors in Turkey and they represent the wider face of the industry. The subcontracting firms grouped into three for easy interpretation of the data[iii]. These groups are: enterprises, which *are* subcontractors and producers for themselves, enterprises that *use* subcontractors and are producers for themselves; enterprises, which are subcontractors, use subcontractors and are producers for themselves.

In addition, informal links based on old friendships and within-family relationships are also accepted as a major element in the interaction process where, through reciprocal and trusted-based relations, different types of knowledge and information are produced. According to Storper (1992) the economic logic of family type of relations is to unify the family budget; i.e. to share

the income and having the goal to maximize the income of whole, rather than the individual parts. However, within friendship type of relations, 'gentlemen agreements" (Crewe, 1996) usually take place. These types of agreements serve to illustrate the trust-based relation's depth, confidence and an atmosphere of stability in the climate of upheaval and change (Crewe, 1996).

To represent family and friendship type of relations, and gentlemen agreements the number of joint-stock companies and courts on economic crimes are used. Corporations in Turkey are usually partnerships with the family members or friends. Therefore, the number of joint-stock companies indicates the level of family or friendship relationships in business. On the other hand, the number of courts in economic crimes indicates that economic problems between entrepreneurs are not solved through gentlemen agreements.

A large amount of literature emphasized the importance of sectoral composition on differences in regional innovation. It is argued that more dynamic sectors, rather than the traditional ones, devote their resources more to innovative activities. Accordingly, the sectoral specialization has influence on the institutions and organizations, which affect the innovative capacity of the region. This issue is proxied in the analysis by sectoral specialization indexes. Here, specialization in textiles, fabricated metal products and food industries are taken into consideration, since they are the significant sectors in Turkey.

Entrepreneurship: Local entrepreneurial capacity should be considered as another important factor in the innovation and learning process evolution and development. Malecki (1997: 157) argues that "entrepreneurship, defined broadly, embraces small firms, innovation, and regional and local development policy." In this respect, entrepreneurship refers to small firms on one hand and to new firm formation. It is widely accepted that locally embedded knowledge and endogenous capabilities have influence on new firm formation.

The number of firms opened and closed can be used as an indicator through which the local entrepreneurial power could be measured in different regions in Turkey. The total number of firms and also the number of joint-stock companies opened and closed in the period 1996-1998 and the increase in the number of firms in this period are used in the analysis. The reason for the selection of this period is to see the effect of the crisis on firms.

Human and social capital: The main source of economic growth in the knowledge-based economy is the human mind (Florida, 1995). Human and social capitals are considered to be the milestones of both innovation and learning processes and as the essential elements that produce the required knowledge. Florida denotes that, both R&D scientists and workers on the factory are

the sources of ideas and continuous innovations (Florida, 1995). Therefore, it would be correct that universities are the sources and interface for the production of new ideas, as well as the partners in R&D processes and sources for highly qualified labor (Todtling and Kaufman, 1999). However, in recent years there is a widespread emphasis upon the informal channels that provide education. Knowledge generation, learning and as a result information could be achieved through learning by doing that takes place in factories, work-shops and informal training courses. On the other hand social capital is needed to ensure the transfer and dissemination of knowledge and product that is formulated and developed by human capital.

The indicators that represent human and social capital are the numbers of graduates from universities, number of students who registered an MS or PhD programme, the number of academics, the numbers of cinema and theatre spectators are significant indicators. Data on measures of learning-by-doing and the informal channels that provide education are not available and therefore are not taken into consideration in the analysis.

Institutional capacity: The final topic that is taken into consideration within the local dimension is the local institutional capacity. According to Kirat and Lung (1999) "Institutions consist of formal rules and informal constraints (such as behavioral standards and social convention) and ultimately, they constitute the "rules of the game" (patent laws etc.) in the society. Through institutions the most important problem of the process of innovation and learning, that is, uncertainty could be solved.

On the regional basis, "industrial associations and institutions like business innovation centers, science parks or technology transfer centers aim to support particular segments of firms (e.g. SME or new firms) trying to lower their specific innovation barriers (Kaufman and Todtling, 1999: 702). On the other hand, informal institutions are prevailing locally set of rules and norms which act and aim to stabilize the environment, alone with a reciprocal, trust based and collaborative behavior among the agents of the society. As an indicator of institutional capacity of the regions in Turkey the numbers of associations and cooperatives are taken into consideration and used in the analysis.

External knowledge: Although internal dynamics or the local dimension is a crucial element of competitiveness because of the importance of tacit knowledge as the essential source of the competitive power, a further element needs to be considered, given its role in innovation and learning: interactions with the external environment.

Within the increasing importance of knowledge, there is a big concern in the literature related with acquiring knowledge either from internal or from external resources. Tacit Knowledge is embedded in local areas. At this stage, the skills and knowledge of labor force are very important. It is emphasized by the evolutionary approach that tacit knowledge embodied in the labor force obtains an increasing importance during innovation and learning processes that take place within local milieu (Kaufman and Todtling, 1999). Furthermore, R&D organizations, laboratories and universities act as local knowledge providers if they interact with the firms on regional basis.

On the other hand obtaining the codified and /or external knowledge is also an essential factor for both innovation and learning. This aspect, that is, the external dimension, associated with the innovative capacity and learning capability of regions, is grouped into two main categories:

- capacity to reach external knowledge,
- ability to adapt and use external knowledge.

Access to external knowledge: There are different resources and channels that provide the transfer of codified knowledge. Foreign direct investment has an important role in the economic structure of a region as a source of codified and external knowledge. Joint ventures, representative units of international companies are also considered important in this respect. They exploit the locally embedded knowledge on one hand, and try to adopt themselves to the local conditions on the other. Moreover, they provide interactions beyond the local borders, which enhance interactions with the global network and thereby facilitate the sustainability of local innovative capacities (Lyons, 1999). Malmberg and Maskell (1999) are of the opinion that, through the interactive networks, common norms, values and routines, multinationals have the ability to coordinate activities and share the knowledge of their geographically dispersed units. Additionally, the subcontracting relations and agreements with the local enterprises promote the diffusion of the recent knowledge, information and technologies at the local. On the other hand, the internet, international exibitions and conferences are some sources that external knowledge could be acquired through and used by firms to innovate.

However, the data on indicators of access to external knowledge is problematic. There are very few multinationals in Turkey and the existing ones are concentrated only in a few districts. On the other hand, data on the number of firms following international exhibitions and conferences or periodicals is not available. Therefore the number of joint-ventures is used as a measure of the existence of foreign capital in Turkey.

Ability to use external knowledge: R&D expenditures are one of the common indicators used in the empirical studies. It gives some idea about the extent firms devote their resources to generate technological knowledge and introduce innovations (Evangelista et al., 2002). Textile and fabricated metal products industries being the major sectors of the Turkish industry, these are the ones which devote their resources on R&D activities.

On the other hand, besides R&D activities, the evolutionary theories emphasize the *organizational change* as important to have and sustain the competitive power. Organizational changes aim to increase the quality of production. Certifications such as ISO 9000 as well as the more comprehensive total quality management are used as the proxies of the quality of the output of the innovation process (Kaufman and Todtling, 1999: 705).

It should be noted that it is difficult to measure knowledge flows and innovation activity because of their informal and tacit character (Evangelista et al., 2002) and the variables used in this analysis capture vaguely the characterising features of innovation and learning. However, we believe that, in spite of the problems and insufficiencies, our attempt to identify the innovative capacity of regions in Turkey and to explore some patterns of innovation and learning using these variables gives at least an idea about the existing situation.

SPATIAL PATTERNS OF INNOVATION AND LEARNING

Having described the indicators to be used in the analysis shortly, in this section we attempt to explore the existence of a few regional patterns in Turkey in terms of the innovation capacity and learning capabilities of Turkish districts.

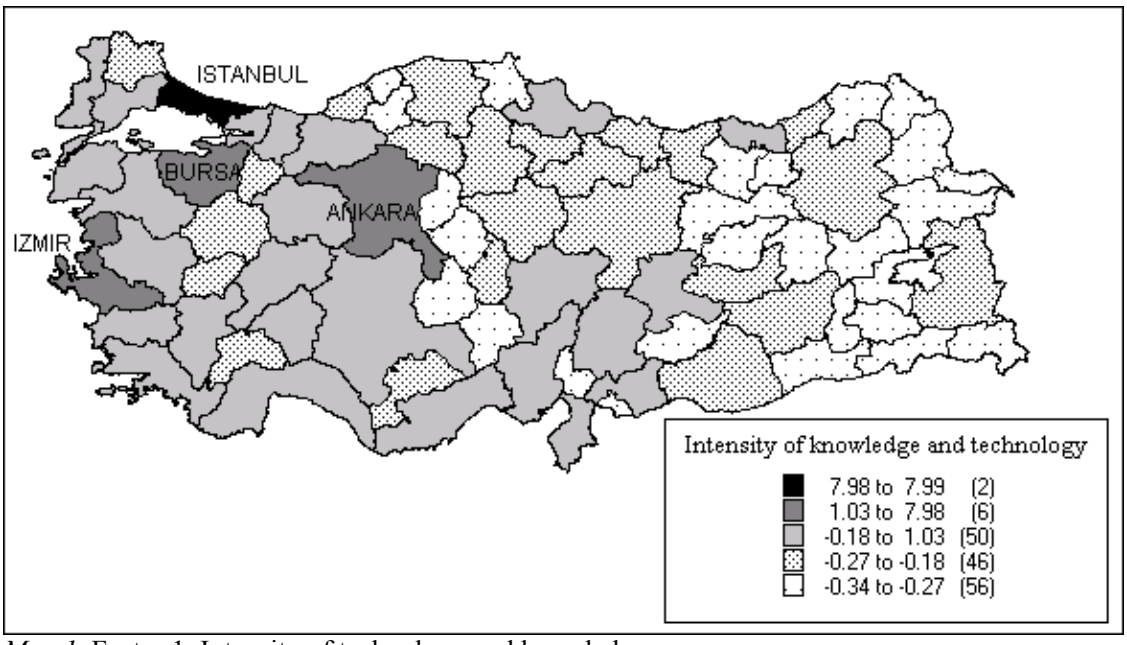
We have concluded with twenty-five indicators in total that represent innovation and learning capacity of 81 provinces of Turkey (*Appendix 1*)[iv]. Given the complexity of the concepts of innovation and learning, we have a large set of variables at hand, most of which are highly correlated with each other. This fact makes it difficult to interpret the data. To tackle this issue, principle components analysis is used. This analysis gives the correlation between indicators and groups the correlated ones without losing their powers of explanations and concludes with a smaller number of factors representing the large number of variables. The analysis resulted with 2 factors which explain together almost 90 % of the total variance of the twenty-five variables determined in the previous section (Appendix 2). Our assumption is that, these factors represent the various numbers of indicators most of which are interrelated with each other and can be used to represent the concepts of innovation and learning.

If we come to interpret the resulting factors of the analysis (Appendix 3):

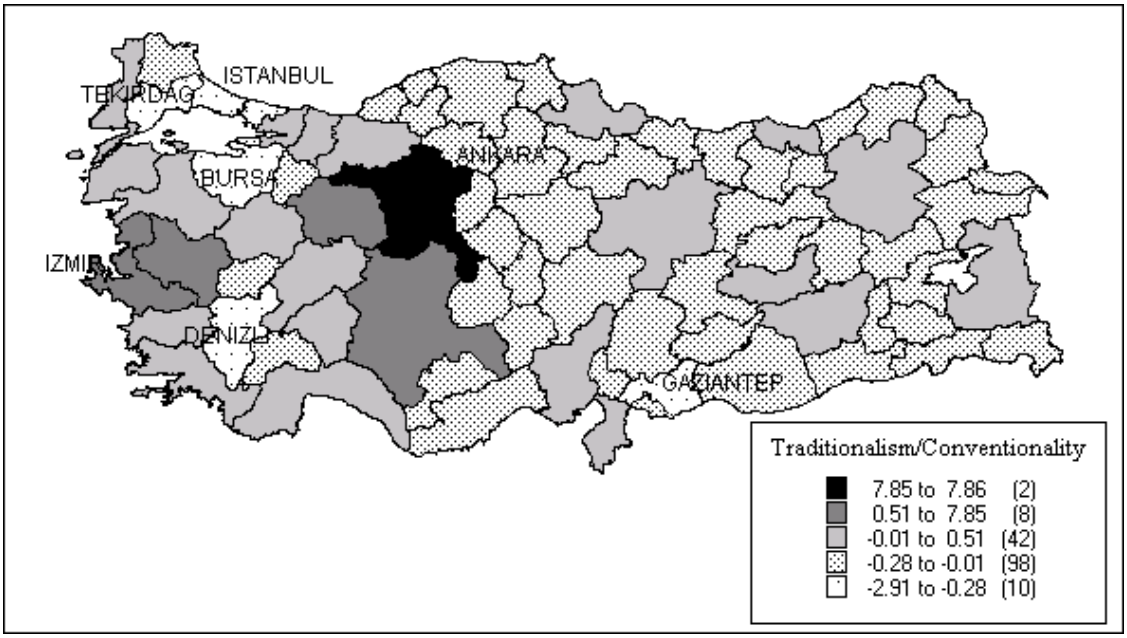
1. The first factor is a measure of the *intensity of knowledge and technology*. It is strongly related with all the variables that represent the inter-firm relations, entrepreneurship, capacity to invest, the level of human and social capital, local institutional capacity R&D capacity, capacity to improve product quality and the existence of foreign capital. Shortly, this factor measures the local innovation capacity, local institutional capacity and interactions with the external environment.

When we look at the spatial distribution of this factor, we see that knowledge and technology are concentrated in the western part of Turkey. Moreover, the picture allows us to make a distinction between a nodal and a homogenous spatial pattern for the western and eastern parts of the country, respectively. In the western part, three knowledge and technology intensive nodes drive our attention, from which knowledge and technology are diffused to their near periphery.

2. The second factor is a measure of *traditionalism/conventionality*. Contrary to the first factor, this factor is negatively related with almost of all the variables, or when related, the relation is very small. The map of this factor indicates a homogenous and stable regional pattern in the eastern part of Turkey.



Map 1. Factor 1. Intensity of technology and knowledge



Map 2. Factor 2. Traditionalism/Conventionality

The chart performed on the two contradictory factors allowed us to identify 4 spatial patterns in Turkey in terms of innovation and learning (figure 1). The horizontal axis of the figure measures the first factor, namely, the intensity of knowledge and technology, while the vertical axis represents the second factor named as traditionalism. Each quadrant of the chart demonstrates a regional pattern of innovation and learning.

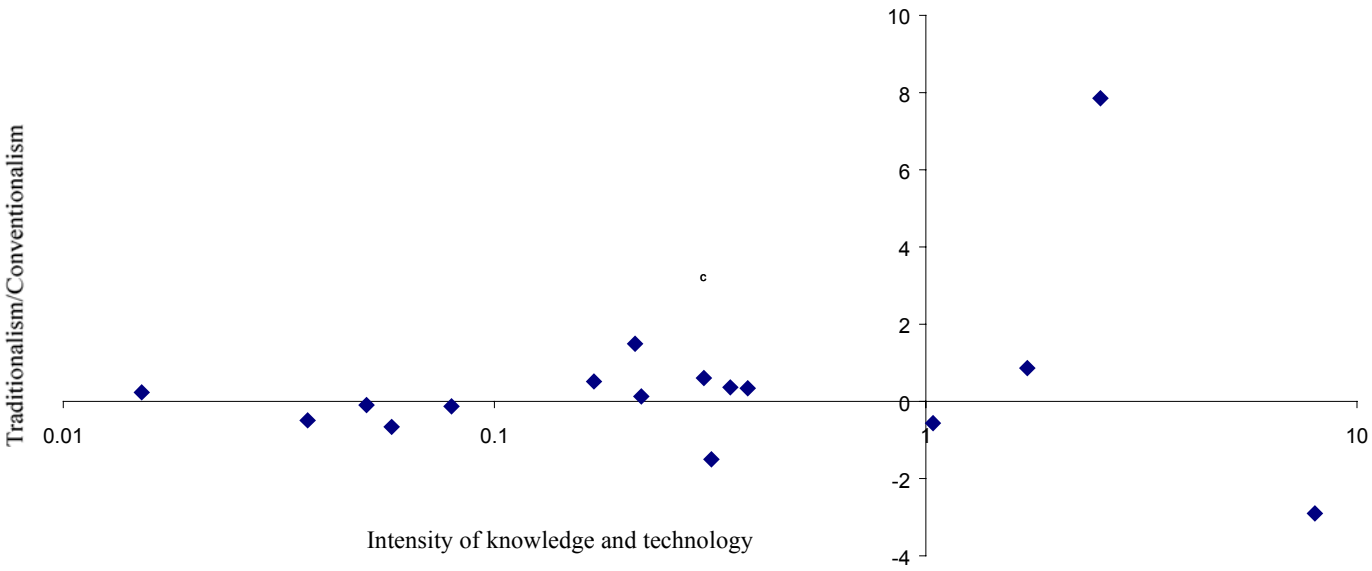


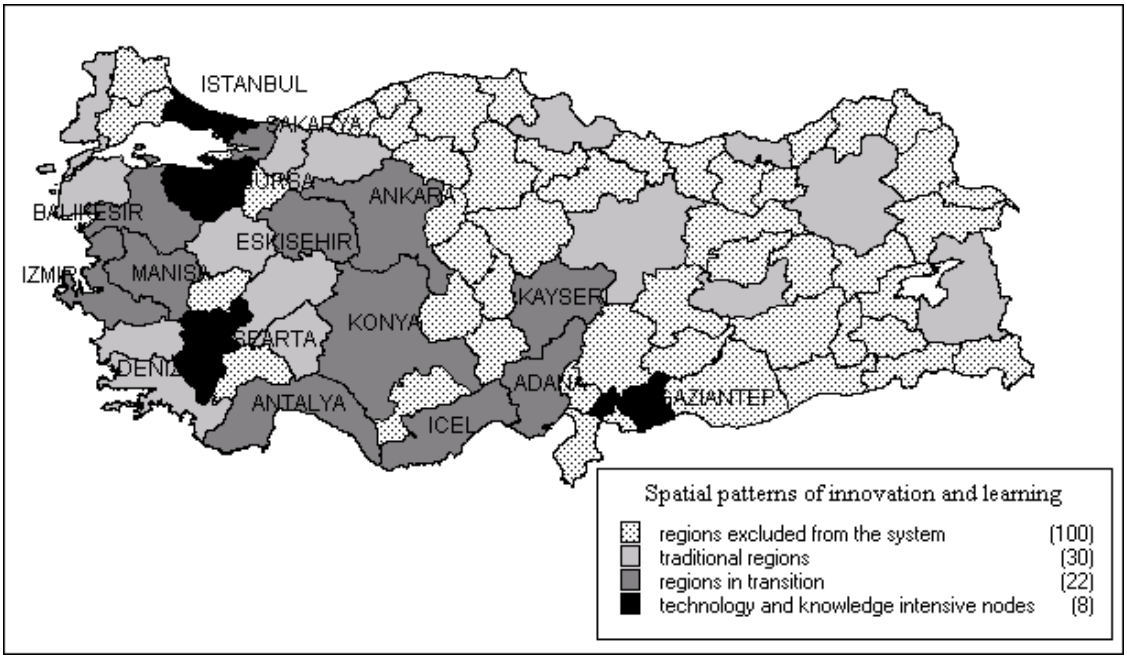
Figure. Spatial patterns of innovation capacity and learning capability in Turkey

Pattern 1: knowledge and technology intensive nodes

The first spatial pattern encompasses knowledge and technology intensive nodes. These are the cores of Turkish industry and form the most dynamic regions of the country. Although the industrial profile of these nodes is different from each other, it is based on the regional competence of these nodes and the relationships they have built through history.

Istanbul has always been the heart of the industrial, financial activities and concentrates social, physical infrastructures and technological activities. As expected, it appears to be the most knowledge and technology intensive node. The knowledge accumulation of Istanbul has jumped to Bursa via the links it has developed with Istanbul through history. The appearance of Denizli and Gaziantep as knowledge intensive nodes is because of their successful growth after the 1980s through their locally embedded competence and capabilities, accumulation of an industrial culture from the past. The local initiatives together with government incentives given these provinces after 1980s, lead to the development of these provinces as centers of industry. Studies regard Denizli and Gaziantep as the examples of less developed country industrial districts (Eraydin, 1995, 2002).

One interesting point is that, while Istanbul, Bursa and Denizli diffuse their knowledge intensity to their near periphery, the collective characteristic of Gaziantep prevents the development of its peripheral regions. Gaziantep appears to make use of the capacities of its peripheral regions but not to allow the diffusion of its accumulated knowledge and capacities.



Map 3. Spatial patterns of innovation and learning

Pattern 2: regions in transition

The second spatial pattern in terms of innovation and learning is characterised by the ability of regions to transfer their structures from traditional to a knowledge-based one via the knowledge diffused from the technology intensive nodes. It should be noted that these regions do not have the ability The development of these regions is dependent on the accumulated knowledge and technology generated by the knowledge intensive nodes. They are imitative and do not have the ability to produce economically new knowledge and technology.

Pattern 3: traditional regions

This regional pattern encompasses those regions, which are in a trial to compete with the past competencies and capabilities they have had. However, the traditional character, which dominates them, prevents these regions from finding a niche and thereby transferring their structures to a modern one.

It is worth emphasizing that these three regional patterns are distributed in the western part of Turkey and is the source of the dynamism in this part of the country. Contrary to this nodal, dynamic structure, a fourth pattern dominates the eastern part of the country.

Pattern 4: regions excluded from the system

This pattern represents the most backward regions of Turkey. Although we coincide with it in the western part of Turkey, this pattern dominates the eastern part of the country. This situation results in a more homogenous profile in the eastern part of Turkey. These regions are lacking infrastructure, access to the market, physical and human resources, local capabilities, institutional features and contact with the external environment. Therefore, they appear to be in isolation regarding their position. It is evident that these regions are faced with being excluded from the national and the global system.

CONCLUSION

This study explored the existence of some spatial patterns in Turkey in terms of innovation and learning. The results indicated the expected gap between the eastern and the western parts of the country. Contrary to the dynamic structure of the west, the east has a homogenous and stable character. Moreover, while there are signs of innovative capacity and learning capability in the west, the east remains at the periphery, even being excluded from not only the rest of the country but also from the global system.

Although the used indicators have problems and insufficiencies, they take into consideration not only the physical resources of regions but also more importantly, their endogenized capacities and capabilities and their interaction with the external environment. The results showed that the expected gap between the west and the east is much more serious than being an income inequality problem. The eastern part of Turkey is faced with the serious problem of being isolated and excluded from the system of innovation and learning.

It is evident that innovation and learning are the main sources of having competitive advantage and developing innovative capacities and learning capabilities is a necessity. Obviously, this is harder for those regions, which lack the necessary physical and social resources and local capabilities and the ability to set their existing capacities in motion. Such a problem points to the insufficiencies of the existing approaches to solve the problems of isolated regions. This insufficiency points to the necessity of a re-consideration of local development as a part of both national and global macro-economic policies and strategies.

Appendix 1: lists of variables used in the analysis

Indicator	Acronym	Year
Basic indicator/ability to innovate		
Patents and utility models per 10 000 capita	PATFAYD	1997
Local innovation capacity		
Interfirm relations		
The number of SMEs in the manufacturing industry	SME	1997
Number of subcontractors in textiles and metal goods sectors	FAS	1997
Sectoral specialization indexes in the manufacturing industry	SPE	1996
Number of joint-stock companies	ANONSIR	1998
Number of courts based on economical problems	EKONDAVA	1998

Local entrepreneurial capacity		
Number of firms opened in the period 1996-1998	ACILSIR	1998
Number of firms closed in the period 1996-1998	KAPSIR	1998
Number of joint-stock companies opened in the period 1996-1998	ACILANON	1998
Number of joint-stock companies closed in the period 1996-1998	KAPANON	1998
Number of conjoint-stock companies opened in the period 1996-1998	ACILANDIS	1998
Number of conjoint-stock companies closed in the period 1996-1998	KAPANDIS	1998
Increase of the number of firms in the period 1996-1998	SIRARTIS	1998
Capacity to invest		
Fixed assets in the manufacturing sector	SABITSER	1996
Level of human and social capital		
Number of graduates of Ms and PhD	MASDOK	1997
Number of university graduates who registered an MS or PhD	MASDOKYENI	1997
Number of academic staff	OGRELEM	1997
Number of theatre spectators	TIYATRO	1997
Number of cinema spectators	SINEMA	1997
Institutional endowment		
Number of associations	DERNEK	1997
Number of associations, which are active	AKTIFDER	1997
Number of Wild life Foundations	DOGALHAY	1997
Interactions with the external environment		
Ability to use and adapt external knowledge		
R&D expenditures in textile and metal goods industries	R&D	1997
Number of TSE and ISO9000 per 10 000 capita	TSEISO	2000
Access to external knowledge		
Number of joint-ventures	YABSER	1998

Appendix 2. Results of the factor analysis

Factor	% of variance explained	cumulative %
1	83.118	83.118
2	6.849	89.967

Appendix 3. Component matrix

Variables	Factor 1: intensity of knowledge and technology	Factor 2: traditionalism/ conventionalism
ACILANDIS	.994	2.356E-02

ACILANON	.984	-8.179E-02
ACILSIR	.945	-7.558E-02
AKTIFDER	.955	-.201
ANONSIR	.985	-4.301E-02
DERNEK	.973	.179
DOGALHAY	.955	-.201
EKONDAVA	.897	.273
FAS32GR1	.923	-.336
FAS32GR2	.946	-.302
FAS32GR3	.925	-.340
FAS38GR1	.951	-2.405E-02
FAS38GR2	.971	-9.406E-02
FAS38GR3	.979	-.150
KAPANDIS	.696	.171
KAPANON	.957	.195
KAPSIR	.955	-6.895E-03
LISMEZUN	.558	.382
MASDOK	.851	.488
OGRELEM	.824	.545
PATFAYD	.984	.112
R&D32	.910	-.349
R&D38	.649	.702
SABIT31	.580	.107
SABIT32	.842	-.340
SABIT38	.853	9.931E-02
SINEMA	.966	.184
SIRARTIS	.994	1.880E-02
SME	.981	-.168
SPE31	.883	.116
SPE32	.947	-.291
SPE38	.991	-6.074E-02
TIYATRO	.978	-.123
TSEISO	.947	-6.039E-02
YABSER	.961	-.184
MASDOKYENI	.886	.427

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[ii] SMEs are defined as enterprises, which employ 10-249 workers.

[iii] Turkish State Institute of Statistics has defined five groups of subcontracting firms in the mnufacturing statistics. These are: enterprises, which are subcontractors, use subcontractors and are producers for themselves; enterprises, which are subcontractors; enterprises which are subcontractors and use subcontractors; enterprises, which use subcontractors and are producers for themselves.

[iv] Data is obtained from various institutions in Turkey, namely, State Institute of Statistics Prime Ministry Republic of Turkey, TUBITAK, and TSE.