



Széchenyi István University
Doctoral School of Regional and Economic Sciences

Attila Tilinger
economist

**DEVELOPMENT OPPORTUNITIES OF REGIONAL
INNOVATION SYSTEMS
BASED ON THE EXAMPLE OF NORTHERN
TRANSDANUBIAN REGION**

Doctoral dissertation
THESES

Supervisor: Dr. András Grosz, PhD

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1. Scientific question and topic of the dissertation

My doctoral dissertation deals with the development opportunities of regional innovation systems. The scientific question of the dissertation is *how do the regional innovation systems and innovation institutions contribute to the stimulation of an area's development?* I would like to analyze this question particularly in Northern Transdanubia, with the use of experience of that place.

First of all it is essential to realise that the performance of the companies working in the given economy identifies the competitiveness of a country's economy. Only the continuous innovation, research and development are able to insure the companies' long-term sustainable development to whose success considerably contributes the environment where the enterprises work. *The regional innovation systems are able to create these optimal circumstances for the economic sphere.* Primarily this is the reason of innovation system's valorisation on international level.

The innovation systems mean the complex functional environment of a region's companies. Because of this *the paper aims for the cognition of regional innovation systems covering all details.* Theoretical background of their formation and different views of the topic's expert are delineated thorough a deep research work but also wishes to point out the deficiencies of the literature. Beside all of these the dissertation takes the development opportunities of innovation systems into consideration.

The empirical researches are aimed at the Hungarian innovation systems. The treatise examines the performance of domestic innovation systems in the area of Central- and Southeast-Europe, then it looks for traces of regional level innovation. First of all the central government's steps to the direction of decentralisation is detailed throughout the overview in Northern Transdanubia. In the paper the most important factors of regional innovation systems get to an exploration and assessment. As the innovation systems are based on the contacts among innovation actors, the examination of the contacts' intensity, direction and depth between the actors in Northern Transdanubia is essential too.

Accoring to these the paper provides insight to the world of regional innovation systems with its help we may receive an overall picture about the situation of Hungary especially of Northern Transdanubia. The dissertation also *points out the practical application of the most important results.*

2. Questions of the research, aims of the paper

The domestic empirical examinations are not holistic, because of this many questions come up, which justifies that I should profoundly deal with this topic. The processing of the international literature is incomplete, and several practical contexts related to the development opportunities of innovation systems hasn't got to an exploration yet.

The primary aim of the literature processing is the examination of innovation systems' identity. The research primarily looks for answers in a regional dimension, because of this in the course of the treatise *my aim is the deeper cognition of regional innovation systems*. During the processing of the literature I followed the next questions:

- What is the reason for the regional level's valorisation?
- What is the regional innovation system? What are its elements?
- What are the criteria of the formation of regional innovation systems?
- Why and how does the system work? What kind of processes are going on inside of a regional system?
- How is it possible to develop the regional systems?

We know that *considerable changes happened in the Hungarian innovation policy in terms of 2002-2003*. The forming of the national innovation system begun. The government structure of innovation and its financing system were transformed (Lippényi 2004). *The decentralisation of innovation processes began* as one of the pillars of the changes. The question is how did these changes determined and what kind of effect did these have to the innovation performance of the regions? What kind of instruments are the regions possess onto influence the innovation?

Since an innovation system is a never of its own, but in all cases it is working in a wider, higher-level area, I think that *a Central-East European looking out is indispensable to the analysis of innovation processes in Hungary*. My aim is the examination of the most important characteristics, mechanisms of innovation systems working in Central-East Europe.

In Hungary the regional distribution of green field investments following the political transformation effected the substantive intensification of regional differences (Nagy 2006). If we do not take the central region into consideration, then Western Transdanubia emerges from the other regions in its economic performance, primarily due to the foreign working capital that appeared because of its excellent geographical position and its infrastructural conditions. The region confronted to considerable problems after the turn of the millennium. *Capital extraction from the area of the activities with low added value* is increasingly often experienced, that may bring

considerable employment problems in the future. The obstructive factor of the long-term continuous economic increase may be the low level of enterprises cooperation. The *very weak contact among higher education, enterprises, and research sphere* is an unfortunate fact. The rate of the research and development is much lower than the region's economic performance (Grosz 2008).

I selected *Western Transdanubia as the target area of the research*, because it is essential and interesting to examine *how can a regional innovation system solve the problems* mentioned above and how can it help the weak research and development activity. But *Central Transdanubia has got parallel conditions* to Western Transdanubia, and according to my preliminary hypothesis tight institution contacts exists between the two areas which are in compliance with the NUTS 2 level regions. Because of this I think it is expedient to extend the empirical examinations of the dissertation onto both regions. This is the reason why *I handle these two regions uniformly as Northern Transdanubia*.

Based on these statements the empirical questions of the dissertation are the followings:

- Do regional innovation systems exist today in Northern Transdanubia? If yes, where are the borders, how are they connected to each other?
- With what kind of method could the innovation system treat the innovation weakness of the region?
- How could the intervention of development policy be the most fruitful?

The development of regional innovation systems is a very complex process. In my dissertation I emphasize among these factors one, the *innovation institutions*. International experiences show that big markets, qualified workforce, big number of scientist and the innovation friendly environment are able to attract mostly the foreign capital into research and development. These investors handle the given region's innovation potential as conditions, whit this object the creation of the innovation infrastructure and its development are primarily local tasks (Dóry 2005). It is essential to understand that in terms of a regional innovation system's efficiency not only the single institutions' efficiency is relevant, but their role as the member of the system (Edquist 1997).

My aim is to examine *how and with what kind of conditions, tasks could the innovation institutions enhance the regional innovation system*. I am looking for those particular contact points where the system and its actors are able to assist the companies in the region. Subjects of the dissertation are institutions, which insure the environment of the innovation, for example universities, innovation and technology centres, entrepreneur development foundations, regional innovation agencies. In my research I take a close look at the roles these actors have to play in a national- or regional innovation system in an ideal case. I look for answers and for conditions of

the system's development, namely what kind of functions should be supplied by the mentioned institutions to build a coherent system. In order to recognise the efficiency of innovation institutions in Northern Transdanubia, it is necessary to examine how innovation actors are able to contribute to the innovations accomplished by the companies.

3. Hypotheses, construction of the paper

Based on the knowledge till now related to the innovation systems the next hypotheses can be formulated:

H1: Such standardized theory of regional innovation systems exist, which is well applicable in every region to the examination of its innovation process.

I suppose that a standardized theory was formed, which is applicable to every regional innovation system, that is applicable among any kind of circumstances. The formulated theory based on the literature may help in the exploration, description and systematization of innovation processes as a keystone, as a logic model it may contribute to their development. The finding of this theory is an essential task, because it may help the empirical examinations based on the theories of the innovation systems independently of a region.

Furthermore it is essential to notice that the hypothesis applies to the regional level systems, thus I'm not looking for the standardized theory only in the literature of the regional innovation systems, but on all fields that serve as the basis of the regional innovation systems. The examination of the dissertation's first hypothesis means the guide of the paper's theoretical part.

H2: The Hungarian innovation system possesses similar conditions as the innovation systems of the Central- and Southeast European countries.

To the understanding of the Hungarian innovation system's present situation it is necessary to examine such countries, that have got similar historical past and socio-economic processes as Hungary. With this object I analyze the innovation systems of Central- and Southeast European countries. I examine the national and the regional innovation systems too.

I make an attempt to set up a model describing the mechanisms of the Central- and Southeast European countries' innovations systems. I examine whether the Hungarian

innovation system fits into the model. This is an essential task as finding Hungary's place the way may open towards the development in the same direction. The opportunity of international cooperation opens, and Hungary may profit from the adaptation of good practices too.

H3: The criteria of regional innovation systems development are not realized in Northern Transdanubia.

In the theoretical part of the dissertation the regional innovation systems are deeply analyzed. The literature defines certain key activities, criteria, conditions and factors of the innovations systems' function. According to my hypothesis the big part of development criteria does not apply in Northern Transdanubia. My aim is to expose the reasons of deficiencies. With the exploration of these weaknesses an opportunity overlooks to make proposal. The object is to improve the efficiency of regional innovation systems.

H4: Since the turn of the millennium – due to the steps put into the direction of decentralisation – the regional innovation systems of Northern Transdanubia belong not anymore to the category of centrally governed, regionalized national innovation systems.

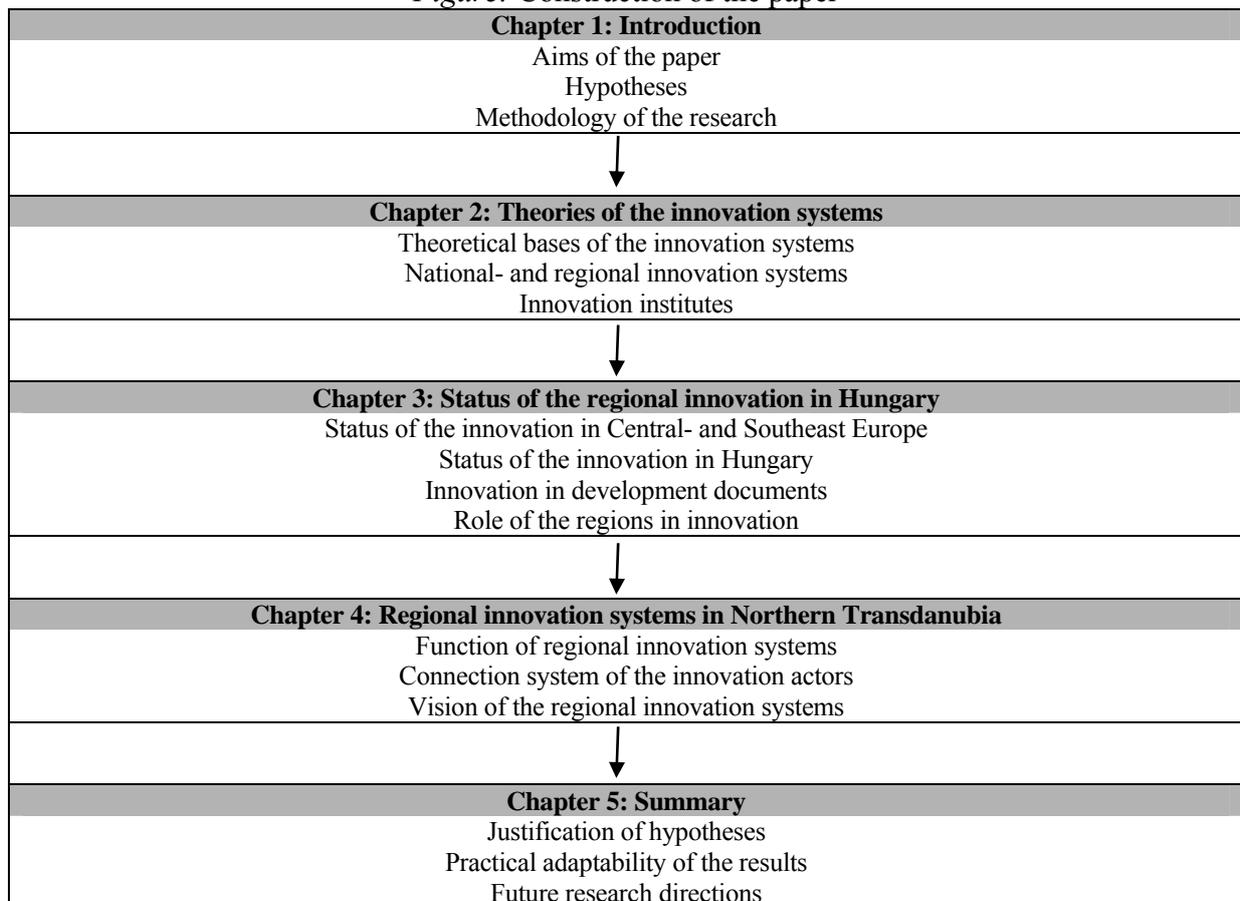
The definition of regional innovation systems' type in Northern Transdanubia, and its placement in various dimensions are relevant task in terms of the innovation systems' development. Earlier researches strengthen (Csizmadia et al. 2007; Dóry et al. 2000; Grosz et al. 2003; Rechnitzer et al. 1999a, 1999b; Rechnitzer et al. 2004) that the innovation systems of Northern Transdanubia belong to the category of centrally governed, regionalized national innovation systems, but after 2004 serious steps were made towards the decentralisation in Hungary, with the Research and Technology Innovation Fund, the regional innovation agencies, as well as the Baross Gábor Program and the Innocsekk program. I suppose that new processes began with this, a new type of building the regional innovation systems begun. With the help of the secondary sources and the information obtained from my empirical research I want to justify that the innovation systems of the examined regions moved into a new direction and not anymore belong to the category defined in the hypothesis.

H5: In Northern Transdanubia the contacts among the regional innovation system's actors close into the borders of NUTS 2 level regions.

Due to the geographical position and to the same inflow of foreign working capital the two regions in Northern Transdanubia dispose with similar conditions in the point of innovation potential. My assumption is that before the institutionalization of NUTS 2 level the connection system was intensive among the two planning-statistical regions, however the present development policy has an effect that divides this relatively homogeneous area into two. According to my hypothesis the institutionalization of the planning-statistical regions and the processes of decentralisation the contacts among the innovation actors was deformed substantially. I consider the examination of the hypothesis important, because the exploration of the contacts' direction and intensity may justify a potentially common development policy.

The construction of my paper is the following:

Figure: Construction of the paper



Source: Own construction

4. Methodology of the research

The dissertation builds onto the following five methodological pillars:

1. Literature processing

Since a quite scant expert deals with the topic in Hungary, and the big part of the Hungarian literatures based on international sources, the literature processing of the paper based on international sources primarily. In the course of processing of the theoretical part I aspired to use the primer source always. The literature concentrates onto the next topics:

- to understanding of the innovation systems' function
- deep examination of national- and regional innovation systems
- the definition of regional innovation systems' actors, and the definition of their tasks fulfilled in the system

2. The analysis of statistical data

The analysis of the statistical data is an excellent instrument of the examination of national and regional level innovation. Placing Hungarian innovation performance in international relation an excellent basis was provided by the data of Statistical Office of the European Commission, Eurostat. Onto the exploration of Hungarian regions' innovation potential the Hungarian Central Statistical Office's publications provided help. The paper includes the available actual data and analyses.

3. Analysis of documents

It was an essential to use document analysis to confirm of some hypotheses. I analyzed INNO-Policy TrendChart and ERAWATCH documents (reports of the European Commission) to recognize the innovation systems of Central- and Southeast European countries. The appearing of innovation on regional level was examined with the processing of national and regional documents, such as Economic Development Operational Program, regional development operative programme and regional innovation strategies. To the examination of the domestic regions' role played in innovation an exceptionally good basis was ensured by the reports of Hungarian Academy of Sciences Centre for Regional Studies West-Hungarian Research Institute.

4. Interviews

To the examination of regional innovation systems it is crucial to apply additional research methods. I think interviews are the best method. Because of this, the empirical research was

prepared with the stakeholders of innovation processes (September-November 2009). Interviewees were the innovation institutions of Central- and Western Transdanubia. The most different types of institutions were visited in order to achieve more authentic results. Namely innovation centres, regional innovation agencies, universities and chambers of commerce and industry. Altogether 24 interviews were made. The aim of the interviews was the cognition of the regional innovation systems in Northern Transdanubia primarily. The interviews affected four capital issues fundamentally: the function of innovation systems (1.), the elements of regional innovation systems (2.), the conditions of the formation of regional innovation systems (3.) and the connection system of institutions involved in the research (4.).

5. Corporate questionnaires

The basis of the research was ensured by the corporate survey of the Hungarian Academy of Sciences Centre for Regional Studies West-Hungarian Research Institute. The „NETINNOV - The contact networks' effect on the innovation, the regional and sectoral differences of the economic cooperation in the domestic SME sector” project comes true with the support of the National Office for Research and Technology and the tender of Socialisation of the Innovation (INNOTARS_08) from 1 of May 2009 until 30 April 2011.

The aim of the project is making a representative, national survey by the examination of the domestic small- and medium enterprises. Bases on this the firms' innovation capacities, the economic and innovation cooperation, and the factors hindering the cooperation are introduced. In the first quarter of the year 2010 nearly 2 000 companies were involved in the research. I may have complemented the questionnaire with my own questions. So I had the opportunity to use the database implying the results of the research. The analysis was made by SPSS software.

5. Justification of the hypotheses

H1: Such standardized theory of regional innovation systems exist, which is well applicable in every region to the examination of its innovation process.

In the course of the literature processing I faced a number deficiencies, which are hindering the standardized interpretation of the regional innovation systems. The identification of regional innovation systems is rendered more difficult by the not obvious conceptual definitions. There is no agreement in the identity of the system's actors. The conception of regional innovation

systems takes only the high technology representative and the producing sector into consideration. The focus is always on the metropolitan and successful regions. With this object the conception is adopted in the less-developed areas restricted only. The reason of differences among regional innovation systems is the different organizational and institutional construction of sectors. Due to the complexity they may totally differ from each other.

In spite of the innovation systems' many interpretation the formation of a framework was succeeded. It incorporates the general conditions of innovation systems. This framework system turns into regional, if the conditions come true inside a given region. It is essential to note, since the framework implies the common elements of the literature only, it is the basis, but not enough condition of the regional innovation systems' development.

Based on the above ones *I refuse the hypothesis*, while there is no such standardized theory of regional innovation systems, which is well applicable in every region to the examination of its innovation process.

H2: The Hungarian innovation system possesses similar conditions as the innovation systems of the Central- and Southeast European countries.

It was succeeded to set up a model of the Central- and Southeast European countries' innovation systems. Based on the mentioned ones, it is unambiguously adjustable that the domestic innovation system perfectly suit into this model:

Governance: there are too many innovation institutions in the country, while neither the economic organisations, nor the innovation institutions know the competences. Unpredictable, insecure economic environment and the quickly changing legal environment are the obstructive factors of the innovation activities. All these circumstances indicate the weak coordination of the innovation processes.

Finance: The R&D expenditures percentage of GDP compared to the EU27 average is very low. The number of sources using with regional decision competence is few, the distribution of R&D sources is not efficient on national level. In Northern Transdanubia the financing of innovation is the weakest link of innovation systems.

Cooperation: In Northern Transdanubia there are only a few enterprises in contact with innovation institutions. Amongst just some of the contacts is bilateral between companies and institutions. The contacts among the institutions are very elementary.

Human resources: Although the scientist and engineers staff number is growing dynamically, the quality of higher education and vocational training system is medium level only. The innovation and entrepreneur skills, knowledge orientation is missing from people in Northern Transdanubia.

Regions: Due to the metropolitan concentration of R&D capacities regional inequalities are observed in the country. The real socio-economic contacts were not taken into consideration by the forming of planning-statistical regions. This affects unfavourably the development of innovation actor's cooperation.

Competences: Decentralisation processes started to begin late. The regions were not able to engage in the control of the national level policies. The regional level doesn't possess decision making competences.

Infrastructure: Setting up of the regional innovation infrastructure is inadequate. Although numerous innovation institutes are working in the country, there is lack of coordination, lack of role and function sharing.

Based on the above ones *I accept the hypothesis* that, the Hungarian innovation system possesses similar conditions as the innovation systems of the Central- and Southeast-European countries.

H3: The criteria of regional innovation systems development are not realized in Northern Transdanubia.

Based on the following facts *I accept the hypothesis*. The existence of the most important key activities to the formation of innovation systems and it's development was tested in Northern Transdanubia (*Chaminade-Edquist 2006, 150-156; Edquist-Hommen 2008, 10*). The results are:

- In Northern Transdanubia there are only a few new, technology oriented enterprises, and the private and public R&D institutions are not able to achieve smashing results, the conditions to create new knowledge are not ensured.
- The entrepreneur-friendly environment is missing, taxes are very high, the economic environment is insecure, the system is very bureaucratic.
- The competence building is not adequate. In the region only a few people possess skills and qualification for the innovation.
- The innovativity of the region's atmosphere is very weak. The innovation and entrepreneur skills, knowledge orientation is missing from people in the examined area.

- Innovation contacts among institutions get changed by experience. There are only a few contacts among enterprises and innovation institutions.
- Incubation services exist in the region, but the number of well working institutions is very slight.
- In the financing of the innovation European Union and state sources dominate currently. The amount of innovation financed by the private sector is quite small.
- The business development services are very relevant, but among these there is a lot of overlap, there is no specialisation, and the quality is not adequate.

In a criteria system which builds on the regions' competences, the adverse conditions are dominating in Northern Transdanubia (*Cooke et al. 1997, 483*):

- The regions are not working, they haven't got own regional governance. The regional level has no tax- and financial autonomy.
- Apart from Research and Technology Innovation Fund there is no other opportunity onto the use of regional financial sources to finance the innovation.
- The socialisation of innovation is not solved.
- Innovation institution is financed by the state, there is no regional control.
- The number of innovation institution is adequate, but they are not able to fulfil their mission.
- The innovation institutions are concentrated in the biggest cities.
- There is a public educational and training system in Northern Transdanubia.
- The contact among higher education institutions and enterprises is very weak.
- The regions haven't got own industry- and technology policy. The regional science and technological programs are missing.

H4: Since the turn of the millennium – due to the steps put into the direction of decentralisation – the regional innovation systems of Northern Transdanubia belong not anymore to the category of centrally governed, regionalized national innovation systems.

In 2004 the central government started the decentralisation of the technology and innovation policy, but the achievement of the desired effect did not succeed. The process has three main elements:

1. *Research and Technology Innovation Fund*: From 2004 until 2009 the regions received increasingly more sources, but the central region received 60 percent more sources than the

other regions altogether. The 25 percent regional innovation source distribution prescribed in the law never come true. In 2010 regional tender wasn't announced until the submission of the paper. The regional innovation subsidises do not have a long term conception.

2. *Regional innovation agencies:* They are the key institutes of the regional innovation system in Northern Transdanubia, but this result is not obvious, because the interviewees were not sure. The conclusion is that the activity of regional innovation agencies is not ready yet for using. In 2010 the tender's source ends, the two agencies in Northern Transdanubia consider themselves independent from the system. After 2010 they will able to obtain their function, but a part of their services will break off. This means that a part of the supporting services of the regional innovation systems will end up.
3. *Baross Gábor Program and Innocsekk program:* Because of the continuous changes the functions of the programs were not clear. In 2006 the decentralization checked, the regions' role was significantly smaller in the Baross Gábor Program. The calls for tenders were shifted continuously. The Baross Gábor Program ended up on 19th October 2009, and the Innocsekk program broke up on 12th March 2010. The continuation of the programs is currently really unstable.

The steps towards the direction of decentralisation were not completely successful. So the local initiations are not strong enough, the changes are not considerable enough to move the regional innovation systems in another category in Northern Transdanubia. *I refuse the hypothesis*, the regional innovation systems in Northern Transdanubia still belong to the category of centrally governed, regionalized national innovation systems.

H5: In Northern Transdanubia the contacts among the regional innovation system's actors close into the borders of NUTS 2 level regions.

In the course of the hypothesis' justification it is important to distinguish the contacts among institutions, and the contacts among institutions and enterprises. The contacts among enterprises were not influenced by the regional structure. Because of the next reasons *I accept the hypothesis*:

- The most important institution partner of the innovation institution always works in the given region.
- The institutions' corporate contacts narrow down into the given region.

- The contacts among the innovation institution were influenced by the institutionalization of the regions and the processes of decentralisation. According to the half of respondents this is restrict the development largely.
- The professional and development contacts are rendered more difficult by the new regional structure.
- The system is operated only by sources, the consortium is excluded in a big part of the regional tenders.
- A big part of earlier contacts between counties ceased, and regional contact didn't set up among the actors of innovation system.
- If an enterprise wants to have resort to the regional innovation institution system, then it must orientate to the institutions in the given region.
- Both planning-statistical regions have an own regional innovation system currently.

6. The most important outcomes of the dissertation and the opportunities of its practical application

A very important result of the treatise is *the delineation of the innovation systems' theoretical framework*. This framework can help in the exploration and in the appreciation of the innovation processes on the regional level as a logic model. It may contribute to increase the empirical researches' efficiency.

The model of the *Central- and Southeast European countries' innovation systems* is a new result of the paper that *describes the mechanisms of the national- and regional innovation systems*. The result is exceptionally useful, because the domestic innovation system fits this model perfectly, and a complex development packet turns into visible form for the economy and for the innovation policy too.

The key institutes have a very important role in the regional innovation system. Their existence displays that the given region's innovation actors are able to think together to achieve a common aim or not. The result is connected with *the key institutions in Northern Transdanubia* is a new outcome of the dissertation. The innovation institutions were not able to define only one key actor. The regional innovation agencies get the largest number of the votes, but there was no agreement in the determination of the regional innovation systems' key actors in Northern Transdanubia. The main reason of this is that there are too many institutions assist the innovation. Neither the enterprises nor the institutions see their competences. This situation means a hindering factor in the

regional innovation systems. My opinion is that the key institution has to define the aims of the regional innovation system, has to coordinate the actors which participate in the innovation of the given region, has to inspire the innovation, and has to manage the financial issues.

The basis requirement of an optimal regional innovation system is to *share the functions and the tasks*. The most innovation institutions do not fulfil their mission. There is no feedback, it would be necessary to introduce a qualifying system and to bring the institutions closer each other, which function is not effective now. Parallel this, it is very important to confirm the high specialized institutions. It must nominate the key institution of the innovation system. The decision must be taken according to the vocational actors of the given region. The key institutions should be working autonomous on the regional level, because neutral organizations should provide the financial sources. It is necessary that a stable institution make that which can be supported in long term.

The establishment of a *regional government* could enhance the region's efficiency which is a new result of the dissertation. This organ could improve the regions' innovation performance significantly. The efficiency and the utilization of the regional sources could grow by the creation of financial autonomy and a big part of the innovation institutions could be taken under regional control. The own budget would eventuate a more efficient distribution of sources, and the development policy could be realized on the regional level.

The consequence of the interviews was that *the innovation actors can not be thinking on a regional level*. This is the paper's very essential and new outcome. According to my opinion, a numerous action should be started on the regional level. Forming the regional identity and mentality the launch of innovation campaigns is necessary on the regional level. The regional innovation actors have to recognise each other's activities. The key element of the development is the cooperation's exploitation, the innovation actors have to think together and have to take advantage of the others' complementary capacities. It is necessary to harmonize the services supporting the innovation.

It is a new result of the dissertation that *the contacts among the innovation actors were influenced by the institutionalization of the planning-statistical regions* on the NUTS 2 level and by the processes of the decentralisation in Northern Transdanubia. The innovation actors' cooperation was distorted by the new regional system. Due to the financing system the contacts were closed inside the planning-statistical regions. It is urgent to solve this problem by the opportunity of common tenders, which facilitate the innovation actors to achieve their common aims.

The possible *common areas of the cooperation among the regions* were defined in the paper. I suggest the common thinking in the defined development policies among the regions in Northern Transdanubia, which appear in the regional innovation strategies too. The potential

common aims have to be defined in the strategies. The two regions have to lobby for the collective interests' appearing on the regional level together.

To achieve the significant results in the area's innovation the *long-term strategic aims* have to be defined clearly and they have to be realized. It is necessary to renew the regional innovation strategies in every five years. The strategies have to be adjusted to the actual world- and national economic circumstances. It is an essential statement of the paper that a regional innovation strategy has to build on the basis of a long-term, international and responsible research. According to my own recommendation the regional innovation systems have to specialize on that area, where they have comparative advantage. With this step new opportunities would open to create the basis of the sectoral innovation systems. This could be the ideal vision of Northern Transdanubia.

The *determination of steps contribute to the future development opportunities of the regional innovation systems* and means new input to achieve the optimal regional innovation system can be utilized in the practice anyway. The action plan proceeds from the present state of Northern Transdanubia's innovation systems, and it traces the – real and feasible – steps, which are necessary to the forming of effective regional innovation systems and to the maintenance of their function.

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8. The author's publications regarding the topic

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