Innovation and Globalization Policy in Small Transition Countries

Case study: Macedonia and Slovenia

Inaugural Dissertation
Zur Erlangung des akademischen Grades eines
Doktors der Wirtschaftswissenschaften (Dr.rer.pol.)

im Fachbereich Wirtschaftswissenschaften
der Universität Kassel

Vorgelegt von Jasmina Galevska
Aus Kassel
Am 20.12.2005

Erster Gutachter: Prof. Dr. Hans G. Nutzinger
Zweiter Gutachter: Prof. Dr. Thomas Eger

Table of Content

List of Tables and Figures

1. Introduction

Economic theory has been focusing on innovation and its influence on the economic development in the last decades. According to the European Commission, innovation is "the renewal and enlargement of the range of products and services and the associated markets; the establishment of new methods of production, supply and distribution; the introduction of changes in management, work organization, and the working conditions and skills of the workforce"[1]. Thus innovation does not concentrate on the creation of original inventions, but it is instead mainly concerned with the adoption, application, and improvement of already existing products and processes. The classical ideas that perceive the innovation process as a black box have become obsolete; today it is recognized that innovation is the result of the conscious effort of people. This leads to the idea that the innovative process can be intentionally affected and governed, and not just left to the whims of fate.

As a basis for this dissertation's approach to innovation policy, innovation can be defined as "the successful production, assimilation and exploitation of novelty in the economic and social spheres"[2]. Although innovation is generally connected only with production, for this dissertation, the other characteristics of innovation-namely the assimilation and exploitation of novelties-are of much greater importance. Transition countries lag behind in both technology and innovation. They are not capable of "innovation production". The existence of innovation policy is generally explained through the existence of market failures. Assuming that because of certain public-good characteristics of the knowledge coming out of innovations, the market will not be able to achieve the efficient level of investment, hence there will be under-investment into innovation projects. Thus the role for innovation policy was limited on investing into R&D and direct provision of innovative activities. Unfortunately state intervention has not been able to solve these issues of market failure in the past.

Modern theory recognized the importance of the environment for the innovation processes, so not only in the way that the policy can influence the level of innovation through inputs into the process, but also through creating an environment that is favourable toward innovation. Firms, as they are the main producers of innovation, are not capable as single entities to successfully complete the whole process. There is no single firm that has the knowledge and resources to innovate without any cooperation with others. This cooperation can be with customers, suppliers, competitors, research institutions, education institutions etc. These actors create the innovative environment in which a firm can perform its activities.

This conclusion led to changes in the concept of innovation policy and expended the role of the policy into the field of creation of an appropriate environment which will stimulate the industry and research institutions for more innovations and hence the creation of a national innovation system. This can be done through building specific institutions (rules of the game, e.g. laws, regulations, habits) and organisations (consciously created formal structures with an explicit purpose). Bearing this in mind, North[3] speaks of the importance of the 'adaptive efficiency' as a capability of institutional change that will allow for technological change. For this purpose the innovation policy should not only include elements of R&D and technology policy, but also infrastructure, regional and education policy.

Due to the globalizing processes in the world, the importance and the influence of the nation-state on the economic development inside its borders has

[1] ftp://ftp.cordis.lu/pub/innovation-policy/communications/communication_2003_en.pdf
[2] Nutzinger et al. (2005), p. 36
[3] North (1994), p.367

declined. Therefore national systems of innovation, seen as a necessary environment, can have a strong impact on the level of innovativeness in the country. The capability of production, assimilation and exploitation of new knowledge, technologies and work organisation, can give possibilities for higher competitiveness on the international markets.

This dissertation focuses on innovation policy in small transition countries. As a result from the characteristics of small countries the approach towards innovation policy is differing from the one in big countries. The size of the companies, the markets and the general surrounding, as well as the limitations of options for policy actions, lead the policy architects to take different directions in the development of the policy. For small countries it is not ideal to concentrate on the support for specific industries and projects, since by doing so, it might limit the general development of the industry and make itself dependent on the success of one or small number of sectors or even projects. Instead, they should concentrate on the environment and the creation of broad conditions for innovativeness.

Creation of a national system of innovation, as seen in the modern theory, is the goal of the innovation policy and is important for small as well as big countries. This is of great importance for transition countries, which find themselves in the middle of structural changes and need to redesign and redefine their organization. Policy in these nations aims to create new institutions, or to change or eliminate some institutions and organisations in the national system of innovation. The building of a national innovation system and the creation of an innovation policy in the transition countries carry the specificities of the transition and the changes in the total economic and social environment, with an additional influence of the formerly existing structures on the present and newly built ones.

For the purpose of this dissertation, I focus on Macedonia for the analysis of the status of the innovation policy in small transition countries and I use Slovenia as an additional reference country. These countries were chosen because of their joint characteristics, such as their past participation in the Yugoslav federation, and the comparable size of the two countries (both geographically and demographically). These two countries further share yet an additional characteristic that sets them apart from other transition economies. This is due to their membership in former Yugoslavia, where by the 1960s and 1970s, elements of the market economy were already being introduced (in the form of market socialism and self-managed economy). These allowed certain independence and flexibilities in the management of the enterprises, including investments (predominantly the technical characteristics) and production assortment. On the other hand there were soft budget constrains and no fear of bankruptcy, and prices were not set as market clearing prices, so there was lack of incentives for innovative activities both in the industry and in the universities or research institutions. Only enterprises that were cooperating and competing with the Western markets had to have higher level of innovativeness in order to be profitable, which also helped them to go through the process of transition easier. Hence by the beginning of the transition period the technological level of the former Yugoslav Republics, including Macedonia and Slovenia, was lagging behind the one in the developed countries. This did not improve in the early years of the transition, when the industry was more concerned with its core survival and not much attention was paid to the innovativeness in terms of adaptation and utilization of innovation (and even less on the production of innovation).

Besides the above similarities, the Republics differed due to the decentralisation of the state organisations and the creation of their own administrative bodies with the transfer of the authority to them. This led to the differences in the

institutions and organisations among the Republics and also to their different development paths. Thus by the early 1990s there were big differences in the economic state of the individual Republics.

The literature on innovation and developments in the innovation policies has concentrated primarily on the policies in big countries. Because of the differences in the political approaches and size limitations of the small countries (the modest size of the national economies, and the small size of the knowledge and the capital base), there is the need to more broadly analyze the innovation policies in smaller countries.

The approach to the problem of innovation policy in the reference countries has been different. The importance of innovation and the attention given to it in Slovenia has led to the extensive analysis of the situation and a number of measures taken for its improvement, pushed forward by the Slovenian status of candidacy and later on membership in the EU. The innovation policy analysis and creation in Macedonia has largely been neglected. In Macedonia there is a gap in the theoretical and empirical research done for understanding the situation and the necessary steps needed to be taken by the state in creating and/or improving the innovative conditions. The goal of this dissertation is to initiate the discussion on innovation policy in Macedonia by highlighting its problems and potentials through comparison with Slovenia.

When analyzing the present state of the innovation policy in the reference countries, I concentrate on the following questions:

- How advanced is the innovation process in the country?
- How is the system organized for conducting research?
- How does the system acquire knowledge about new innovations and the innovation process?
- What are the mechanisms for promoting technology transfer within the system?
- Are the technological support organisations doing the right things and doing them reasonably well?
- What is the role that the networking among private firms, as well as between private firms and public sector play in the innovation system?
- How can the relationships between organisations be influenced in order to facilitate innovation?
- How responsive is the system as a whole in terms of monitoring its successes or correcting its failures?
- To what extent, and in what manner, can public efforts substitute for market innovative processes?
- What types of support do the public organisations give to innovation?
- Is there a need for new public organisations to be created?
- What are the most effective institutional arrangements?

The work is organised in five main chapters. Chapter two discusses the process of policy making, setting the phases of the process and the theoretical approaches to the same. In the chapter three the work is concentrated on the importance of knowledge and innovation of small countries in transition, and the specificities of innovation policies and the factors that might influence the innovation policy in those countries. The next two chapters I examine the present situation in both countries, analysing the state of the innovation policies and their problems as well as their positive characteristics. In chapter six I come to my own assessment on the improvement that can be done in the approach to the innovation policy and the

possible areas in which the state can intervene and introduce specific measures in Macedonia, to some extent based on the experiences from Slovenia.

2. The policy-making process

In this chapter I will be discussing the policy-making process with all the different stages in it, also some of the characteristics that are important for the public policy and are of interest when the innovation policy is concerned as well, namely: the actors, the problems, the goals and the means of achieving those goals.

2.1. Definitions of public policy

The different political actors or groups of actors that are involved in the policy process interrelate and depending on their perception of the problem, selection of the goals and the means of achieving those goals within a specified situation where those decisions should, in principle, be within the power of those actors to achieve, make a set of interrelated decisions which present the public policy. This definition of public policy is coming back on the definitions from William Jenkins and James Anderson. Jenkins recognizes that there are limitations on governments which constrain the range of options they can choose from within the policy area and he defines it as “a set of interrelated decisions taken by a political actor or a group of actors concerning the selection of goals and the means of achieving them within a specified situation where those decisions should, in principle, be within the power of those actors to achieve” [1]. Whereas Anderson highlights the link between government action and the perception, real or otherwise, of the existence of a problem or concern requiring action in his definition of policy as “a purposive course of action followed by an actor or a set of actors in dealing with a problem or matter of concern”[2]. Everyone is aligned that public policies result from decisions made by governments.

It is also important to stress that decisions by governments to do nothing are just as much policy as the decision to do something, as noted by Howlett and Ramesch[3], as long as that decision was made aware of and in the conscious consideration of the problem.

When defining the public policy there were many variables that are influencing the policy content. In order to understand the policy one needs to focus on these variables (policy determinants) and on their content. When analyzing the public policy, different communities concentrate on analyzing different aspects for example the policy incomes or the policy outcomes. Private analysts and research institutes remain interested in the practical side of policy issues and tend to concentrate either on policy outcomes or upon the instruments and techniques which generate those outcomes. They usually enjoy a certain level of independence from governments, but may be influenced by the preferences of their founding organization. Academics on the other hand, have

[1] Jenkins (1978)
[2] Anderson (1984)
[3] Howlett/Ramesch (1999)

independence and no direct personal stake in the outcome. They examine much more abstractly, and tend to deal with the theoretical, conceptual and methodological issues surrounding public policy-making. They also tend to look at the entire policy process and take into accounts wide range of factors including policy regimes, policy determinants, policy instruments and policy content. This brings us to the differentiation between "policy study" and "policy analysis" as a study "of" policy and a study "for" policy, first one mainly by academics, related to meta-policy and are concerned with the understanding of the public policy processes, the second from government officials or researchers and directed at designing actual policies.

In the wide range of public policies that exist, I concentrate my interest on the innovation and technology development policy. Important constraints to take into consideration here are knowledge and information. For the policy it is important to consider the different stages of the existence of the knowledge and information, which are: 1. creation; 2. distribution or communication; 3. storage and retrieval; and 4. use/application. Dunn[4] observes that a nation's information infrastructure is its most valuable resource. Information policies are concerned primarily with the management of this resource at the local, state, and national level. Lamberton[5] presents a more functional scooping of the problem: 'National information policy can be viewed as embracing efforts to put into practice the basic notion that the social and economic system will function more efficiently if improved information-flows to the policymaking centers can be ensured. This notion underlines much of the effort directed to such seemingly diverse activities as mass education, marker research, financial analysis, research and development and social management techniques, such as national income accounting and input-output analysis. Each reflect a belief in the efficiency of expenditures on better information: in each case a variety of problems emerges'[6].

There is a wide acceptance of the role of the government on the development of technology, the reasons being market failure, with insufficient appropriability being a central one[7]. The market does not offer enough incentives for creating appropriation and diffusion of new knowledge because of the nature of information itself. The result might be that the market will create too much information (competitions, winner-takes-it-all), but the usual presumption is that too little will be done if the market is left on its own devices. On the other hand, the problem of governmental involvement into the knowledge creation, appropriation and diffusion on the market is the lack of information on its side. The information on externalities (positive and negative) which create the market failures, which the government is trying to correct with its policies, is not available even for the regulators. Thus the government might want to correct the level that the market would choose to deliver, but the market should stay as the final 'arbiter of the direction of investment in new technology, with the government simply raising the overall momentum of investment by favoring research and

[4] Dunn (1982), p.21
[5] Lamberton (1974)
[6] Rooney/Hearn/ Mandeville/ Joseph (2003), p.117
[7] Stoneman/Vickers (1988)

development with variety of stimulatory policies'[8]. The regional knowledge spillovers, for example, can be supported by the state through support of aggregation and regional cooperation.

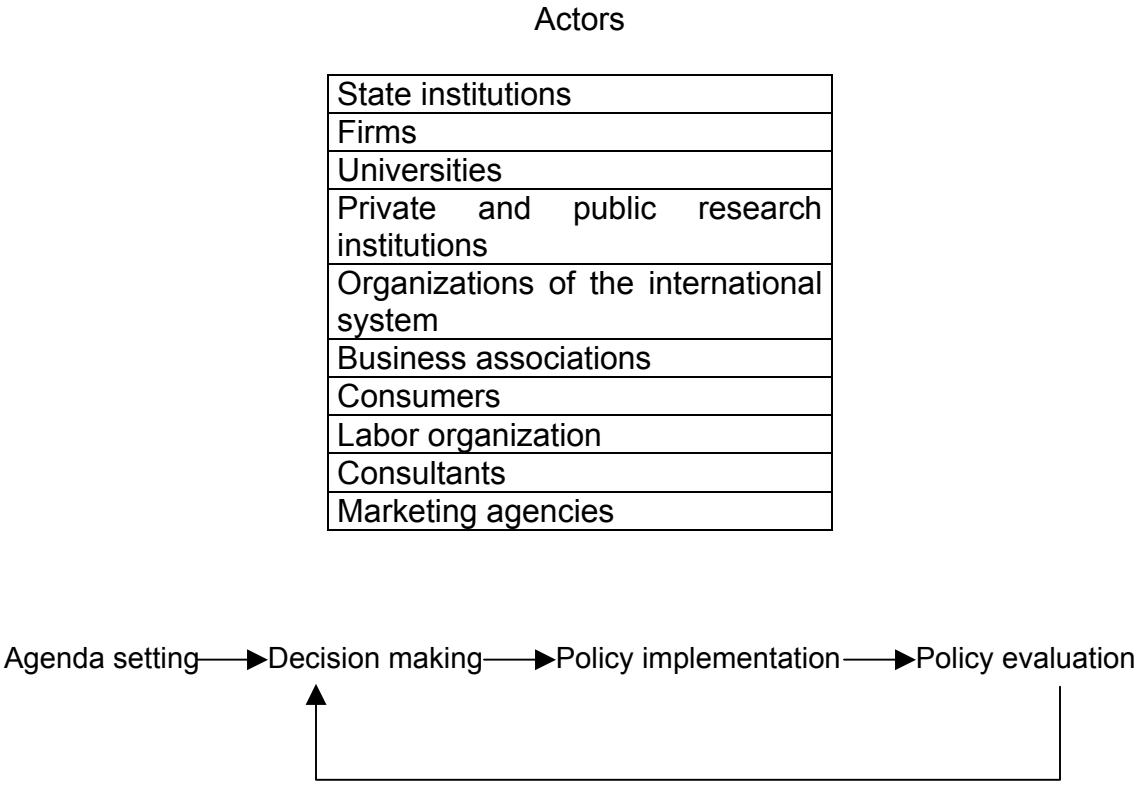

Figure 1: Policy-making process

[8] Cowling/ Sugden (1998), p.247

2.2. Stages of policy-making process

The literature comprises a lot of different models in describing the various stages of the policy-making process. The phases of the process are given by Brewer[9] as invention/initiation, estimation, selection, implementation, evaluation and termination; or by Jones[10] given as: agenda-setting, policy formulation, decision-making, policy implementation, and policy evaluation.

In reality, the process of policy-making does not happen in such a systematic and linear fashion. These linear models do not give any information on the causation and it does not consider moving from one phase to another. But identifying the stages of the process makes the studying and analyzing of the policy-making process easier.

This work is concerned specifically with the innovation and technology development policy. I consider the policy-making process as a circular, never ending process, as given in Figure 1. Starting with agenda-setting, followed by decision making, policy implementation and policy evaluation which again influences the decision making or the agenda setting and starts the process from beginning. There are different actors involved and different variables that influence the flow of the process and the policy coming out of it.

2.3. Actors involved in the process

Policies are made of policy subsystems consisting of actors dealing with a public problem. The term “actor” includes both state and societal actors, some of whom are intimately involved in the policy process while other are only marginally involved. Actors who participate directly in the policy process are members of policy networks and those involved in a more general sense belong to policy communities. Policy subsystems are forums where actors discuss policy issues and persuade and bargain with others in pursuit of their interests.

According to OECD[11] the political actors differ according to their function, political and social “contexts” (in which they act) and “resources" (that they can use); they can also be separated on individual (micro actors) as institutions and organized systems (macro actors). Political institutions are not actors themselves. They are rule systems that are independent from the actors. This is true for processes (elections) as well as organized systems (Ministries)[12]. In this context the role of the state is dependant on certain actors, but also limited by the institutional structures. Its goals and competences are institutionally given and that individual actors have to follow their institutional roles.

[9] Brewer (1974)
[10] Charles (1984)
[11] OECD (1995)
[12] Jänike at al. (2000)

2.3.1. Policy Networks

Policy networks, as said before, are presented by the actors who participate directly in the policy process. R.A.W. Rhodes[13] argued that interaction among various departments and branches of the government and between the government and other organizations in society constitute policy networks which were instrumental in formulating and developing policy. Peter Katzenstein[14] referred to policy networks as those links joining the state and societal actors together in the policy process.

Howlett/Ramesh[15] made a summary of the literature concerned with the characteristics of the networks and created taxonomy of policy networks (see table 1). For some it is the level of 'integration', which is a function of their stability of membership, restrictiveness of membership, degree of insulation from other networks and the public, and the nature of the resources they controlled[16], similar to this is the opinion that the important characteristics are their internal complexity, functional autonomy, and levels of (internal and external) cooperation or conflict[17], or as given by Wilks and Wright[18] the interests of the members of the network, the membership, the extent of members' interdependence, the extent to which the network is isolated from other networks, and the variations in the distribution of resources between the members. Salisbury, Heinz, Laumann, and Nelson[19], argued that networks tended to have 'hollow cores' in that even the most institutionalized networks appeared to have no clear leadership. Others argued that networks could be classified according to whether or not state and societal members shared the same goals and agreed on the same means to achieve those goals. Still others argued that the number of discernible interests participating in the network was the crucial variable defining different types of networks. Erans van Waarden[20] argued that networks varied according to seven criteria: number and type of actors, function of networks, structure, institutionalization, rules of conduct, power relations, and actor strategies.

The taxonomy of policy networks given by Howlett and Ramesh[21] divides the networks according to the participants in the network (their number and type) and the state/societal relations within the network.

[13] Rhodes (1984)
[14] Katzenstein (1985)
[15] Howlett/Ramesh (1995), p.130
[16] Rhodes (1984)
[17] Hamm (1983)
[18] Wilks/Wright (1987)
[19] Salisbury/Heinz/Laumann/ Nelson (1987)
[20] van Waarden (1993)
[21] Howlett/Ramesh (1999)

	Number/type of network participants			
State/societal relations with in network	**State agencies**	**One major societal group**	**Two major societal groups**	**Three major societal groups**
State directed	*Bureaucratic network*	*Clientelistic network*	*Triadic network*	*Pluralistic network*
Society dominated	*Participatory statistic network*	*Captured network*	*Corporatist network*	*Issue network*

Table 1: Taxonomy of political networks

2.3.2. Policy Communities

Wilks and Wright[22] argued that 'Community is not the same as network, although they are frequently used synonymously in the literature. 'Community' refers to a more inclusive category of all those involved in policy formulation, and 'network' is restricted to a subset of community members who interacted with each other on a regular basis. "Policy community identifies those actors and potential actors drawn from the policy universe who care about a common policy focus. Network is the linking process within a policy community or between two or more communities"[23]

Howlett and Ramesh[24] give the taxonomy of policy communities as followed:

	Dominant Episteme	
State-society consensus	**Yes**	**No**
Yes	*Hegemonic community*	*Leaderless community*
No	*Imposed community*	*Anarchic community*

Table 2: Taxonomy of political communities

Actors participating in policy communities (those involved in more general sense) are:

1. elected officials (executive and legislature)
2. appointed officials
3. interest groups
4. research organizations (difference between university research and think thanks)
5. mass media

[22] Wilks/ Wright (1987)
[23] Howlett/Ramesh (1999), p.128
[24] ibid

6. organizations of the state (strong and weak states[25]).
7. intra-governmental division of power-the executive, legislature and judiciary
8. the structure of bureaucracy
9. organization of society
10. business
11. labor
12. organization of the international system[26]

2.3.3. Advocacy coalitions

When talking about the different actors involved in the creation of a public policy, one should mention the Advocacy Coalitions[27] as well. According to Jenkins-Smith and Sabatier[28] 'an advocacy coalition consists of actors from a variety of public and private institutions at all levels of the government who share a set of basic beliefs (policy goals plus casual and other perceptions) and who seek to manipulate the rules, budgets and personnel of governmental institutions in order to achieve these goals over time'. The policies an advocacy coalition will seek to adopt will be based on the coalition's belief systems and interests. The ability to succeed in their goals is affected by a host of factors as the coalition's resources such as 'money, expertise, number of supporters, and legal authority'. External factors also affect what it can achieve by making some objectives easier to accomplish than others.

2.3.4. Actors of innovation policy

When it comes to economic innovation, companies are the main actors. But companies' results are dependent, besides on their own working success, also on certain framework conditions in which they operate[29]. The institutions that produce knowledge and innovation traditionally were universities and R&D institutions, and the businesses were the institutions for knowledge implementation and commercialization. However, the distance between the businesses and the universities is reducing, and they are getting closer and more

[25] Strong states-there is no reason to believe that strong states will necessarily develop policies which will serve the interests of the society as a whole, in that situation a weak state is better than a strong one; also no state is strong in all sectors, so there cannot be an overall characterization. Rather than characterizing states as strong or weak, we must devote efforts to examining empirically the role of the governmental institutions in reinforcing or weakening states' policy capabilities and their effects on the actors' behavior in the policy process

[26] International trade regime, international financial regime, assessing the effect of international institutions

[27] Howlett/Ramesh (1999)

[28] Jenkins-Smith/Sabatier (1993)

[29] Nelson (1993), Lundvall (1992), OECD (1999b), Tidd/ Bessant/ Pavitt(2001)

dependent on each other. Universities are doing research for the business and becoming more entrepreneurial in their work and the businesses are educating their employees and conducting their own research. As a third party come the government and as addition to this triple helix model[30] comes the financial institutions. All of them support each other in an effort to promote knowledge and innovation and stimulate economic growth[31].

Thus, key factors for the success of the framework conditions for fostering innovation are the relationships of the companies with research and development institutions, with education and training institutions, with financial institutions and with regulatory institutions. In other words, the innovative success of individual companies depends on the national systems of innovation. Besides these, also important for innovation, are the industrial relations[32], in their different forms[33]: competition, transaction and cooperation.

Therefore, actors in the production and innovation system are:

- Business companies,
- Universities
- Private and public research institutes
- Other organizations of technology transfer
- Government and state organizations
- Banks
- Institutions of further education
- Actors in the industrial relation system

The institutional actors involved in innovation can be divided as:

- Implementation agencies: Patent office, Organizations for scientific research (providing funds for basic and applied research, implementation of technology policy that involves transfer of subsidies to private business);
- Research institutions: institutes, laboratories and specialized branch centers;
- Advisory organizations: scientific councils, policy analysts and evaluators, advisors for the government and the parliament for science and technology
- Public information and intermediary organizations: organizations informing private sector and the general public about technological issues, intermediary organizations (concerned with the network of transfer points, coordination between the supply and demand of technological knowledge, and provide general advisory services)[34].

[30] Leydesdorff/Etzkowitz (2001)
[31] Sporer (2004)
[32] Amable/Barre/Boyer (1997)
[33] OECD (2002)
[34] Schilder (2000)

2.4. Factors for policy

Factors or variables that are influencing the policy differ a lot depending on the policy in question. Since the discussion here is on innovation policy, I will concentrate only on the factors that are important for it.

As said before, firms are the main actors for innovation; however they can not be looked at separately from their environment because in their performance they are influenced by many factors which are limiting their activities, different cognitive and organizational constrains[35] (there is no perfect information and infinite set of options for them to choose from), as well as technological and other limitations.

The level of technological development and adaptability to changes are influenced by, and at the same time affect, the organizational structure. For strengthening the competitive capability and development firms are dependent on the capacity for learning and adaptation to change, rather than static efficiency, and these can be achieved better with flatter organizational structures, co-operative, decentralized management and a multi-functional, multi-skilled workforce[36].

The investment in knowledge, the technological level achieved and the adoption capacity give the boundaries for the further development. The innovation process is a selective process and is developed in specific directions following certain goals, depending on the technological paradigms. The present technological advances are dependant on the already achieved technological level.

Not only can the organizational structure of the firm be determined by the innovation policy, but the structural characteristics of the whole economy. Since there are a number of actors (firms, universities, different research organizations, professional organizations) involved and affected by the innovation policies, hence an important factor for the development and outcome of the policies are the relationships among them. The firms' technological development is strongly dependent on their contacts and relations with other firms, customers, suppliers and competitors[37]. The characteristics of all these relationships are dependent on the industrial structures in which they operate[38], as well as the industrial relations and organizational traditions[39], or the National systems of innovation[40].

Additional factors of innovative capability:

- research and development
- diffusion and flows of technology, that are not only research related
- institutional learning
- managerial capacity
- public support for innovation

[35] March/Simon (1993)
[36] OECD (1992b), Garvin (1993)
[37] Pavitt (1984c), von Hippel (1988)
[38] Porter (1990)
[39] Kogut (1992)
[40] Lundvall (1992); Nelson (1993)

- availability of technology transfer infrastructure
- how good actors are in absorbing new information and technology
- how innovation is integrated into the business strategy
- capability of the national system of innovation in providing the necessary risk capital.

2.5. Agenda setting

According to John Kingdon[41] "the agenda …. is the list of subjects or problems to which governmental officials, and people outside of government closely associate with those officials, are paying some serious attention at any given time….out of the set of all conceivable subjects or problems to which officials could be paying attention, they do in fact seriously attend to some rather than others. So the agenda-setting process narrows this set of conceivable subjects to the set that actually becomes the focus of attention".

There are a lot of factors that influence the bringing of a certain subject to the agenda: the nature of the problem itself and how the problem is being perceived from the political actors and from the general public; the policies 'stream'[42], which consists of experts and analysts who are examining the problem and proposing solutions; the process of decision making; the institutional framework of governments, administrative and legislative turn over; interest groups pressure; the distribution of power in the society and interplay of politics and economics (governmental interventions on the market); the socio-economic and physical environment; the prevailing ideas and ideologies (history, traditions, attitudes and beliefs of the people)[43].

All these variables jointly create a pattern of mutual interaction in which the decision making occurs in the institutions. Institutions exist within prevailing sets of ideas and ideologies, where ideologies exist within relations of power in society, and relations of power exist within a large social and material environment[44]. In addition to these factors Prittwitz[45] argues that problems are being perceived as such and being brought to the agenda when there is capacity for their solution. According to Baumgartner and Jones[46] the agenda setting is dependent on the creation of 'policy monopolies' in which specific subsystems gain the ability to control the interpretation of a problem and the manner in which it is conceived and discussed. When discussing the question of initiative, one can add the initiation coming from the model from other countries, which is very often in today's global world.[47]

---

[41] Kingdon (1995)
[42] This term is used by Kingdon(1995) he divides the variables in streams of: problem, policies and politics
[43] King (1973), Hofferbert (1974), Simeon (1976), Howlett/Ramesch (1999), Kingdon (1995)
[44] Hofferbert (1974), Simeon (1976)
[45] Prittwitz (1990)
[46] Baumgartner/Jones (1991)
[47] Jänicke et al. (2000)

There are four major phases in the agenda setting process[48]:
- issues are first initiated,
- their solutions specified,
- support for the issue expanded, and if successful
- issue enters the institutional agenda.

Important for the agenda setting is the relation among three different types of agenda. The first is the public agenda when the public shows interest in a certain problem it will push for this problem to get on the level of political agenda (second type), when the political institutions will look into the problem. At the same time some problems might be brought out by the media (media agenda, third type). What is important here is not only how the problem got on the political agenda, but also how this problem is perceived from the media and in the social discussions[49].

There are different approaches on how the problems move to the political agenda[50]:

a) Outside initiation model-issues arise in nongovernmental groups and are then expanded sufficiently to reach, first, the public (systemic agenda) and finally, the formal (institutional) agenda. Thus the outside initiative model applies to the situation in which a group outside the government structure 1.articulates a grievance, 2.tries to expand interests in the issue to enough other groups in the population to gain a place on the public agenda, in order to 3.create sufficient pressure on decision makers to force the issue onto the formal agenda for their serious consideration

b) The mobilization model-decision makers trying to expand an issue from a formal (institutional) to a public (systemic) agenda. "The mobilization model describes the process of agenda building in situations where political leaders initiate a policy but require the support of the mass public for its implementation…the crucial problem is to move the issue from the formal agenda to the public agenda"

c) Inside initiation model-influential groups with special access to the decision makers initiate a policy and do not want it to be expanded and contested in public

d) The consolidation occurs when the government initiates the process of solving a public problem for which there is already extensive popular support.

	Nature of public support	
Initiator or debate	**High**	**Low**
Societal actors	*Outside initiation*	*Inside initiation*
State	*Consolidation*	*Mobilization*

Table 3: Models of agenda setting by policy type[51]

[48] Cobb/Ross/Ross (1997)
[49] Jänicke/Kunig/Stitzel (2000)
[50] Cobb/Ross/Ross (1997)

Which model will be chosen is determined by the nature of the problem[52] and not by the type of the political regime[53]. The level of public policy support for the resolution of the problem is critical. The central question of agenda setting is the nature of the policy subsystem dealing with the problem. This determines whether the state or societal actors initiate the process, and the level of public support for its resolution, this goes for the innovation policy as much as for any other policy type.

2.6. Decision making

Gary Brewer and Peter DeLeon[54] describe the decision-making stage of the public policy process as: "the choice among policy alternatives that have been generated and their likely effects on the problem estimated…it is the most overtly political stage in so far as the many potential solutions to a given problem must somehow be winnowed down and but one or a selected few picked and readied for use. Obviously most possible choices will not be realized and deciding not to take particular courses of action is as much a part of selection as finally setting on the best course."

The public decision-making process has been studied by different theories. They all have common that: 1. the number of relevant policy actors decreases with the progress of the public policy process; 2. in modern governments the degree of freedom enjoyed by each decision-maker is circumscribed by a host of rules governing political and administrative offices and constraining the action of each office-holder. Such rules and operating procedures provide decision-makers with 'action channels', a regularized set of procedures for producing certain types of decisions[55].

In the following subsections I present the models of how the decisions are made or ought to be made in the political process.

2.6.1. Rational Model

The model consists of a rational individual taking the following sequential activities[56]:

1. A goal for solving a problem is established
2. All alternative strategies of achieving the goal are explored and listed

---

[51] Howlett/Ramesh (1999)
[52] Kingdon (1995)
[53] Cobb/Ross/Ross (1997)
[54] Brewer/DeLeon (1983)
[55] Allison/Halperin (1972)
[56] Elements for this model can be found in the early students of public administration such as Henry Fayol (1895), Luther Gulick and Lyndal Urwick (1973). The PODSCORB model that Gulick and Urwick developed suggests that organization can maximize their performance by systematically planning, organizing, deciding, selecting, coordinating, recruiting and budgeting.

3. All significant consequences of each alternative strategy are predicted and the probability of those consequences occurring is estimated

4. Finally, the strategy that most nearly solves the problem or solves it at least cost is selected.

This model prescribes procedures for decision-making that will lead to the choice of the most efficient means of achieving policy goals.

Opponents of this model[57] argue that several constrains prevent decision-makers from being rational in the process of decision-making. First, there are cognitive limits to the decision makers' ability to consider all possible options, forcing them to selectively consider alternatives. If this is true, than they are likely to choose from among options selected on ideological or political grounds, if not randomly, without reference to their implications for efficiency. Second, the model assumes that it is possible for decision-makers to know the consequences for each decision in advance, which is rarely the case in reality. Third, each policy option entails a bundle of favorable and adverse consequences which makes comparisons among them difficult indeed.

Simon's assessment of the rational model concluded that public decisions in practice does not maximize benefits over costs, but merely tends to satisfy whatever criteria decision-makers set for themselves in the instance in question

2.6.2. Incremental Model

The developer of this model is Charles Lindbloom[58], he summarizes the model as consisting of the following correlated elements:

1. Limitations of analysis to a few somewhat familiar policy alternatives, differing only marginally from the status quo
2. An intertwining of analysis of policy goals and other values with the empirical aspects of the problem (that is, no requirement that values must be specified first with means subsequently found to promote them)
3. A greater analytical preoccupation with ills to be remedied than positive goals to be sought
4. A sequence of trials, errors, and revised trials
5. Analysis that explores only some, not all, of the important possible consequences of a considered alternative
6. Fragmentation of analytical work to many (partisan) participants in policy-making (each attending to their piece of the overall problem domain)

There are two reasons why decisions do not usually vary substantially from the status quo, which this model assumes. First, since bargaining requires distribution of limited resources among various participants, it is easier to continue the existing pattern of distribution rather then try to impute values to

[57] Biggest opponent is Herbert Simon (in Earl 2001)
[58] Lindbloom (1984)

radically new proposals. Second, the standard operating procedures that are the hallmark of bureaucracy tend to promote the continuation of existing practices.

Lindblom also argues that the rational model's requirement of separation between ends and means was unworkable in practice not only for the time and information constrains identified by Simon, but also because it is assumed policy-makers could clearly separate means and ends in assessing policies, and could then agree upon both. He argued that in most policy areas, ends and means are not separable, and which goals are pursued often depends on whether or not there are viable means available to accomplish them.

The incremental model views decision-making as a practical exercise concerned with solving problems at hand rather than achieving lofty goals. The means chosen for solving problems are discovered through trial-and-error rather than through the comprehensive evaluation of all possible means. Decision-makers consider only few familiar alternatives for appropriateness and stop the search when they believe an acceptable alternative has been found.

In the earlier writings Lindblom[59], argued that four different types of decision-making could be discerned depending upon the amount of knowledge at the disposal of decision-makers, and the amount of change the decision involved from earlier decisions.

	Level of available knowledge	
Amount of change involved	**High**	**Low**
High	*Revolutionary*	*Analytic*
Low	*Rational*	*Disjointed Incremental*

Table 4: Types of decision making

Later in his career Lindbom argued that the spectrum of decision-making styles which existed are: synoptic (rational comprehensive decision making), strategic, disjointed Incremental, simple Incremental and blundering (following hunches or guesses without any real effort at systematic analysis of alternative strategies). He argued that any kind of synoptic analysis which attempted to arrive at decisions on the basis of maximizing criteria of any kind would end in failure, and that all decision-making was based on what he termed 'grossly incomplete' analysis. The essence of incremenatalism is to try to systemize decisions reached in this fashion by stressing the need for political agreement and learning by trial-and-error, rather than simply bumbling into random decisions.

Opponents of this model argue that[60]: first, it lacks any goal orientation; second, it is inherently conservative, given its suspicion of large-scale change and innovation; third, it is undemocratic, to the extent it confines decision-making to bargaining into select group of senior policy-makers; fourth, by discouraging

[59] Lindbloom (1984)
[60] Weiss/Woodhouse (1992), Forester (1984), Gawthrop (1971), Yehezkel (1964) Nice (1987)

systematic analysis and planning and undermining the need to search for promising new alternatives, it is said to promote short-sighted decisions which can have adverse consequences for the society in the long run

2.6.3. Subsystem Model

Forester[61] suggests that there are five possible styles of decision-making: optimization, satisficing, search, bargain, and organizational. Optimization happens when the conditions of the rational-comprehensive model are met. These conditions are: 1. limited number of agents-possible as few as one; 2. simple organizational setting and closed from influence from other policy actors; 3. well defined problem; 4. perfect information; 5. infinitely available time; the rest depend on the degree to which the conditions are met. When the limitations are cognitive, we are likely to find the Satisfycing style. A Search strategy is likely to occur when the problem is vague. A Bargaining when the multiple actors deal with the problem. The Organizational strategy involves multiple settings and actors.

Variables	**Dimensions**
1. agent	*Single-Multiple*
2. setting	*Single, Closed-Multiple, Open*
3. problem	*Well-defined-Multiple, Vague*
4. information	*Perfect-Contested*
5. time	*Infinite-Manipulated*

Table 5: Variable influencing the decision making style

An improvement of Forester's model can be made by re-casting his variables. A study of 'agent' and 'setting' can be accomplished by focusing on the policy subsystems, while the notions of the 'problem', 'information', and 'time' resources can all be seen as relating to the types of constrains which are placed upon decision-makers. Thus the two significant variables become: 1. the complexity of the policy subsystems dealing with the problem and 2. the severity of the constraints it faces. The complexity of the policy subsystem affects the likelihood of attaining a high level of agreement or opposition to an option within the subsystem members while others do not, thereby structuring decisions into hard and soft choices. Similarly the making of decisions is constrained to varying degrees by information and time limitation, as well as the intractability of the problem.

[61] Forester (1984)

	Complexity of the Policy Subsystem	
Severity of Constraints	**High**	**Low**
High	*Incremental Adjustment*	*Satisfying Search*
Low	*Optimizing Adjustment*	*Rational Search*

Table 6: Decision making styles depending on two most significant variables

2.6.4. Garbage Can Model

March and Olsen developed the garbage can model starting from the assumption that all other models presumed a level of intention, comprehension of the problems, and predictability of relationships among actors that simply does not occur in the reality. In their view, decision-making was a highly ambiguous and unpredictable process only distantly related to searching for means of achieving certain goals. Actors simply define goals and choose means as they go along in a process which is necessarily contingent and unpredictable. While in most occasions may well be a fairly accurate description of how at times organizations make decisions, in other instances it would be reasonable to expect more order.

The number of policy actors and the interactions among them and the institutional restrictions in which they operate are the factors that are going to influence the model that is going to prevail in the decision making process. In the innovation policy process there is a big number of actors with very different goals, and the institutional surrounding differs among countries and in the different periods. That is why the decision making process varies through the above models. In the following chapters the analysis will continue on the specific decision-making process in the given reference countries.

2.7. Policy instruments

2.7.1 Types of instruments

There is a wide range of attempts to classify the instruments available for the policy makers. Among them is the distinction among voluntary, mixed and compulsory instruments[62].

[62] Howlett/Ramesh (1999)

2.7.1.1. Voluntary instruments

Voluntary instruments have no, or very small involvement from the government. The governments let the problem be solved by the market, or some other institutions. They are very often used instruments because they do not ask for high governmental involvement, so they are cost efficient and they allow freedom.

The most important voluntary instrument is the market. It insures that resources are spent where they are most valued by the society. There is competition among the suppliers which provides efficiency and effectiveness in providing the private goods. The limits of the market come with the provision of certain products (public goods for example). There is a problem that on the market, only the needs of those able to pay are going to be satisfied. That is why the government often uses the market as instrument in relation with other instruments like consumers, investors and workers protection, or subsidies for promoting of certain activities.

Family and community can be considered to be a voluntary instrument. The government leaves it up to them to solve certain problems. The only role of the government would be to promote these as instruments. Family and community are widely accepted from the society, but they are not proficient for complex economic problems. They lack the capability of broad solution to problems or the economies of scale that the other instruments achieve.

Another voluntary instrument might be voluntary organizations. These are organizations that are free from state interventions, organized on a non-profit basis, and provide services. These organizations can be capable of providing many of the services being provided by the state. Because of the state provision of the services, these organizations are much more flexible, faster in their responses to the problems, and have the possibility of experimentation. The problem with them is that they are not capable of replacing the state in all its functions. If they are too big they might become bureaucratic and thus lose their efficiency and effectiveness.

2.7.1.2. Compulsory instruments

The compulsory instruments direct the actions of individuals and firms[63]. Among this instruments are the regulations, which are rules designed to control the conduct of those to whom they apply. Some regulations are laws (involve police and judicial system for enforcement), but most of them are administrative regulations. They can have different forms: rules, standards, permits, prohibitions, legal orders, and executive orders. Using regulations the government avoids uncertainties that exist when using less direct instruments, because of the non-existence of uncertainty it is easier to coordinate and plan further activates, they are more suitable in times of crisis when there is need of

[63] The government may instruct a citizen to perform a function it chooses, or directly provide goods and services, etc.

immediate response to the problems. It is easier to establish regulations prohibiting certain actions rather than create ways for discouraging their production and distribution (when the activities or products are undesirable). They might be more cost efficient than some other instruments and regulations may be politically more appealing if the public or policy subsystems want to see a quick action[64].

Another compulsory instrument is the public enterprise. Public enterprises are even more intrusive than the regulations, since the government can do whatever it wishes because of its ownership. They are efficient if used for production of goods and services which otherwise would not be produced. The information on the targeted activity or the preferences of the subject are not needed, since the government is the owner and can do whatever it wishes through the enterprise. It might be easier to establish a public enterprise than to create a complex system of regulations and the profits from these enterprises can be used for public expenditures. The disadvantage of public enterprises is in the problems that occur with their management (the principal-agent problem, the managers goals verses the public goals, and the shareholders are too spread). They can be inefficient, no matter how big the losses and their inefficiency will be transferred to the costumers.

The last compulsory instruments are public provisions. The government directly performs the task, producing goods and services directly instead of waiting for it to be done by the private sector or creating a public enterprise. The information requirements, as for all compulsory instruments, are low. They can create economies of scale and know-how inside the agencies supplying the good or service. They avoid the communication and coordination problems when the provision is indirect, and the transaction costs are lower. The disadvantages of direct provisions are the fact that bureaucracy is often inefficient and inflexible since they do not have competition hence no reason for them to be cost-efficient. Also the provision of goods and services can be used in the political voters' animation process and the delivery of programs may suffer because of inter- and intra-agency conflicts within the government.

2.7.1.3. Mixed instrument

Mixed instruments are a combination of voluntary and compulsory instruments. They permit governments different levels of involvement while leaving the final decision to the private sector.

The information and exhortation is the instrument with least involvement of the government. The goal is providing information for the public so that they are capable of making informed choices. Unlike the information, the exhortation is

[64] As additional advantages of the regulations as instruments the literature sees that there is less information needed to establish it because the government does not need to establish the preferences of the subject, it is enough to establish a standard and expect compliance; regulations may be politically more appealing if the policy subsystems want to see a quick action.

done with the specific purpose of changing the behavior of the public in a certain desired manner. These instruments allow the freedom of choice, in case they do not get the desired effect and there is more efficient instrument they can easily be replaced, because there is little commitment from the bureaucracy involved. The problems arise when there is need of fast action, than they can be used in combination with other instruments.

Subsidies, as another form of mixed instruments, involve financial transfers to the targeted actors from the government or from other actors but under the government direction. They can be done through grants, tax incentives, vouchers, and loans with preferable interest rates.

Another instrument closely related to the subsidies is regulations that restrict the quantity of a particular good or service produced or sold. These will artificially increase the prices. In this group are also regulations that fix prices and creates subsidy to the producers. The goal is to reward activities and create motivation for them. The advantages of the subsidies are that they are easier to establish especially when what the government wants the people to do and what they later desire is the same. They are easy and with low cost to administrate, they promote innovation on the side of the firms, and they are more politically accepted. But they have disadvantages as well, they need financing, so are hard to establish, there is the need of information on what should be the efficient level of subsidizing, they often do not bring fast results, and sometimes they continue existing though unnecessary (creating extra costs) because of the resistance from the ones that are getting it.

The next instrument is the auctioning of property rights, which is a way of creating markets where they do not exist. The market is being created by fixing a limited quantity of transferable rights for the specific resource to be consumed, that creates artificial scarcity and engages the price mechanism. With this, there is a limitation in use of the resources while still allowing it, and deciding on who the users will be through the market, so the government does not need extra information which they would need if they wanted to use regulations. The auctions are easy to establish and are flexible (the government can change the level of transferable rights and they make it certain that the undesirable effect will be in the limits set by the government). Possible problems with auctions is that they can be used for the creation of entry barriers (through speculations), and cheating. Since there will be also those that can not buy the rights, the resources are allocated according to the ability to pay and not the needs.

The last group of instruments are taxes and charges, which can be used as revenue for the state budget, but also as a policy instrument. They can be seen as negative incentives for some actions. They increase the costs of the firms and so dis-encourage the negative behavior and give incentives for innovative activities in order to substitute the undesirable activities with ones that are not subjected to taxes or charges. Other advantages of these instruments are that they are easy to establish, they provide incentive to decrease the undesirable activities, they are flexible, and easy to administrate. Their disadvantages are: the problem of setting the efficient level and costs acquired

during the process, there is no immediate response, so not effective in times of crises, they involve relatively high administration cost.

2.7.1.4. Financial and non-financial instruments

Another division of innovation policy instruments is the financial and non-financial instruments. Financial instruments are for example targeted and basic subsidies. They can have different goals, as for example: increase of the availability of the venture capital, reduction of the labor costs involved in research and development (e.g. through reduction of income tax), better supply of credits for risky technological development, better cooperation in joint research by SMEs (e.g. through subsidies specific for this porpoise), support for universities and other institutions of higher education, basic knowledge infrastructure, information and advice (through financial aid)[65].

The non-financial instruments support the innovation by supplying certain services and creating innovation friendlier environment. Examples of these instruments are government reports, information, and Patent Acts.

Innovation policy instruments can vary in this whole range of possible choices. Which will be the most suitable will depend on the specific actors, goals, and limitations involved in the policy creation process and the characteristics of the instruments. In the continuation of this work the specific instruments most suitable for technologically lagging countries will be considered.

2.7.2. Choice of instruments

How does a government choose a particular instrument from the vast array of instruments available? Can any distinct patterns or styles of instrument choice be discerned in the policy implementation process?

Economic models differ from each other depending on the theoretical base, having on one side the study of the neoclassical economist and on the other the welfare economists. While both prefer voluntary instruments, welfare economists permit greater scope for the use of compulsory and mixed instruments, while the neoclassic approve the use of those instruments only for providing public goods, their use for any other reason is seen as distorting the market process and leading to sub-optimal outcomes.

The welfare economists' greater acceptance of state intervention leads them to more systematic analysis of instrument choice. They treat the choice of instruments as strictly technical exercise that consists of evaluating the features of various instruments, matching them to different types of market failures, estimating their relative costs, and choosing that instrument which most efficiently overcomes the market failure in question. At the same time, the neo-classical economists generally rely on Public Choice theory to explain patterns of

[65] Schilder (2000)

instrument use. They argue that democratic politics leads states to choose instruments that provide concentrated benefits to marginal voters while spreading the costs to the entire population. This type of analysis does not explain the patterns of instrument choice.

The choice of instruments would be dependent on the political reason for its implementation, whether governments want to claim credit or avoid blame for the action to be undertaken. Most instruments can be used for both purposes.

Political models suggest that the choice of political instruments is influenced by the following factors: the characteristics of the instruments, the nature of the problems, the subjective preferences of the policy-makers, and the likely reaction to the choice by the affected social groups. The following models give explanation on the choice of instruments[66]:

a) In democratic societies governments prefer to use the least coercive instrument available and would 'move up the scale' as necessary to overcome societal resistance to effective regulation, assuming that all the instruments are technically substitutable (any instrument can achieve any chosen aim)[67]. The governments would choose a more coercive instrument only under pressure of the opposition groups for that specific instrument or under a social pressure. So the typical pattern of instruments used would be for the governments to begin with minimal activities such as exhortation and move slowly, if at all, toward direct provision. Problems with this model are the availability of all the instruments; the empirical evidence that shows that there is no slow movement up the coercion scale; and the changes under social pressure (there are areas where there is no resistance to government actions)

b) The choice is shaped by resource constraints, political pressure, legal constraints, and the lessons learned from past instruments failure. There are certain patterns of change given as: 1. a shift from information based instruments to those based on other resources, 2. a shift from reliance on coercion alone to the use of financial and organizational resources. Also new instruments might be needed because of technological changes and that the process is dependent on the past experiences with different instruments and their effects. Choice of instruments will depend on the characteristics and the size of the social groups targeted with the instrument. Thus, instrument choice is a function of the nature of the state's goals and resources and the organization and capacity of targeted societal actors. Governments prefer to use information and authority instruments since those instruments are 'non-depletable' and place minimum constraints on citizens. Coercive instruments are suitable for more closely targeted societal groups. Even then, authority is preferred to organization because the former is less resource-intensive. The problem with this model is that there is no reasoning on why the governments would want to use information and authority rather than organization, when it is not proven as more efficient or lasting measure.

c) The third model gives the following factors for instrument choice: features of the instruments (resource intensiveness, targeting, political risk, constrains on the state activity), political style and culture in the state,

[66] Howlet/Ramesh (1999)
[67] Doern (2001)

organizational culture (and links with other actors) of the institutions involved in the instrument choice, the context of the problem (timing, scope of actors). The instruments choice is a matter of decision-makers' subjective preferences, based on their professional back-ground, institutional affiliation, and cognitive make-up.

d) The synthetic model of policy instruments tries to link the specific choices of instruments to specific rationales. Factors for instrument choice are the extent of the state planning capacity (the organizational ability of states to affect social actors) and the subsystem complexity and especially the number and type of actors governments must face in implementing their programs and policies. Setting these variables allows the model of instrument preferences to be developed.

The HWWA Institute of Economic Research gives some guidelines for choosing instruments for innovation policies: Governments should concentrate on supporting R&D itself, not output or trade, because output subsidies and trade policies have desirable allocative side effects. If possible they should try to correct the market failure through 'government coordination' rather than subsidies (the government to serve just as coordinator, giving credibility, commitment and insuring mutual trust); the government should act in non-discriminatory fashion (this might be best to achieve through favorable tax treatment of R&D). It is not effective for the technology policy to concentrate only on subsidizing corporate decisions concerning research and development expenditures. Such subsidies tend disproportionately to benefit large firms because they formally account for the most measured R&D expenditures, whereas much activity which could accurately be described as R&D goes unrecorded in smaller organizations[68]. The state will end up supporting mainly the large firms and by that there is a threat of financing the second best projects, especially those seen to be of national prestige.

Certain governmental interventions on the market with the innovation and technology support policies can also create inefficiency and failures, so when choosing instruments there has to be consideration for this as well. Some examples are: monopolistic problems, when the pre-competitive circumstances, as R&D joint ventures, do not fall under ban on collusions or the decision to what extent foreign firms are allowed to participate in R&D project subsidized by the state (the goal of the national technology policy is to foster national agglomerations, but participation of foreign firms might be the only way to gain foreign knowledge necessary for success)[69].

2.8. Policy implementation

Policy implementation, although intuitively might be considered an "easy" part of the process when all the decisions are made and only have to be put in work, might in reality be a very hard phase, on which the whole process is

[68] Geroski (1990)
[69] Kiel Institute of World Economics (1996)

dependent and when the policy might actually become unsuccessful. Clearer distinction between policy and implementation can improve the effectiveness, efficiency and transparency of any policy (including innovation and technology development policies), making its implementation more professional, more assessable to the recipients and creating more clarity about responsibilities, costs and benefits[70].

Limitations that stay on the way of implementation process might be[71]:

a) nature of the problem[72]
b) social conditions
c) economic conditions
d) technological conditions
e) political conditions
f) organization of administrative apparatus
g) political and economic resources of the target groups
h) public support for the policy

In order to cope with these problems and foster the implementation process there are certain measures that the policy makers can take while creating the policy:

a) They must clearly state the goal of the policy and their relative ranking as clear as possible (it is clear instruction to the implementers)

b) The policy must be backed implicitly or explicitly by viable causal theory as to why the prescribed measure is expected to resolve the problem

c) The policy must have sufficient funds allocated to its implementation

d) The policy should set out clear procedures that implementing agencies must follow when carrying out the policy

e) The task of implementation must be allocated to an agency with relevant experience and commitment

In the theory there are two approaches to policy implementation that are suggested and seen as possible in using in the phase of implementation.

The 'Top-down' approach "assumes that one can view the policy process as a series of chains of command where political leaders articulate a clear policy preference which is then carried out at increasing levels of specificity as it goes through the administrative machinery that serves the government"[73]. This approach assumes the implementation process starts with the government decisions (assuming the existence of clear goals), which are than executed by the administration (concentrating only on high level officials and ignoring the lower level ones, who also have influences in the policy creation process). It

[70] Schilder (2000)
[71] Howlet/Ramesh (1999)
[72] The varying degrees of technical difficulties during implementation, the diversity of the problems targeted by the program, the size of the target group, the extent of the behavioral change the policy requires
[73] Clarke (1992), p.222

seeks to find the reason underlying the extent of the implementation and provides clear directions for implementation research.

The 'Bottom-up' approach starts with the actors involved in implementing programs and continues up the scale towards the actors who are doing the design, financing and the execution of the programs. It concentrates on the actors' goals, strategies and relationships in the networks. This approach shows that the success of the implementation depends a lot on the actors at the bottom which are directly involved in implementing the programs.

2.9. Policy Evaluation

Policy evaluation was not considered as part of the policy creation process for a long time. It was seen only as an approval that the voters give on the governmental policies on the day of election. However, evaluation can be a systematic scientific process, based on explicit criteria, related to accepted research[74]. In this case it can make a significant contribution to the whole policy creation process. The acknowledgements gained from the evaluation would be used for the improvement of the previous stages of the political process.

In this section different types of policy evaluation that the economic literature recognizes are presented[75]: Administrative, judicial, political evaluation, and policy learning

2.9.1. Administrative Evaluation-Managerial performance and budgeting systems

The evaluators in this type of evaluation are within the government (specialized financial, legal or political agencies, which are part of some governmental departments, as well as executive agencies, legislatures, and judiciaries, or private consultants hired by various branches and agencies of the government). Administrative evaluation is usually restricted to examining the efficient delivery of government services and attempts to determine whether or not 'value for money' is achieved while still respecting the principles of justice and democracy. It needs precise and standardized information on program delivery so that the comparison of costs and outcomes over time and with different actors is possible.

Administrative evaluation can have different forms and differ widely in levels of sophistication and formality by using different techniques[76]. Those undertaken by the government agencies are generally of five different types:

[74] Jänicke/Kunig/ Stitzel(2000)
[75] Howlett/Ramesch *(1999)*
[76] Some of the techniques for administrative evaluation are Program Planning and Budgeting System (PPBS), Zero Based Budgeting (ZBB), and Management by Objectives (MBO)-developed in US; Policy and Expenditure Management System (PEMS) established along with Office of the Controller General (OCG), Operational Performance Measurement System (OPMS)-Canada

a. Effort evaluation (inputs-monetary terms of personnel, office space, communication, transportation and so on)

b. Performance evaluation (outputs[77])

c. Adequacy of performance evaluation/Effectiveness evaluation (meeting the goals, needs for adjustment)

d. Efficiency evaluation (can the goals be meet with lower costs)

e. Process evaluation (can the process be streamlined and made more efficient)

The policies are not always clear and precise in stating their goals. This can present a problem for the administrative evaluation as to determining the level of achieving those goals. The same policy may be directed to achieving variety of objectives without indicating the priorities or very often without being able to isolate them from each other. Also each policy has effects on other areas other than those intended. An additional problem is the fact that the gathering of reliable and usable information is difficult. Administrative evaluations can not provide reliable information for the support on programs and policies, or their relevance, they give more information on the operational effectiveness.

2.9.2. Judicial evaluation

Judicial evaluation means judicial review and administrative discretion. Concerned with the legal issues relating to the manner in which government programs are implemented, possible conflicts between government actions and constitutional provisions or established standards of administrative conduct and individual rights; if an inferior court, tribunal, or government agency has acted within its powers or jurisdictions. It is carried out by the judiciary.

2.9.3. Political Evaluation-Consultations with Policy Subsystems and the Public

Unlike the administrative and the judicial evaluation, consultations are usually neither systematic nor necessarily technically sophisticated. Their goal is to support or challenge the policy, not to improve it. While they are on-going, it enters the policy process only in special occasions. One of the most important occasions in democracies is election time. The problem with these types of evaluation is that referendums or plebiscites are rear and elections do not give appropriate conclusions about voters' opinion on individual policies.

A more common type of political policy evaluation involves consolations with other members of the relevant policy subsystems (administrative forums, consultative comities and task forces). The political mechanisms for policy evaluation are usually capable of asserting the views of the members of the

[77] Politics outcomes are the different measures of the political-administrative systems, which result from the policy cycles, and are addressing specific actors

policy subsystems and affected public on specific policy issues. However it is not certain that simply because these views have been made known, they will be reflected in the revision of government policy. Effectiveness often depends on whether the views heard are congruent with those of the government, which in turn depends on the criteria utilized to assess success or failure of a particular policy or program.

2.9.4. Policy Evaluation-Policy Learning

From a learning perspective, public policy evaluation is a gradual process of active learning on the part of policy actors about the nature of policy problems and the solution to them, or as Peter Hall[78] sees it, policy learning is a "deliberate attempt to adjust the goals or techniques of the policy in the light of the consequences of past policies and new information so as to better attain the ultimate objects of governance".

There is a question as to whether the process of learning has been imposed upon policy makers from outside the policy process, or whether it originates within the process as policy-makers attempt to refine and adapt their policies in the light of their past actions. Endogenous learning happens when the policy networks are small, specialized and its objectives are learning about the policy setting and its instruments. The exogenous learning occurs when there are large policy communities and hence the object of the learning is the perception of the problem or the goals of the policy.

There are different types of learning (see table 7), according to the following two variables 1. the organizational capacity of the state, including especially its expertise in the subject area, and 2. the nature of the policy subsystem, especially whether and to what extent some links exist between its state and societal members. These variables affect the potential for evaluations that lead to learning and to initiate some form of policy change.

	Links Between State and Societal Actors in Policy Subsystems	
State Administrative Capacity	**High**	**Low**
High	*Societal Learning*	*Lesson-Drawing*
Low	*Formal Evaluations*	*Informal Evaluation*

Table 7: A model of Policy Evaluation and Learning Propensity[79]

[78] Hall (1993)
[79] Source: Cohen/Levinthal (1990)

When looking at the evaluation of a technology policy then all of the above given types of evaluation can be used, but the biggest impact come from the evaluations from specialized agencies, organizations or consultants, which can look at the policy as a whole, over a longer period of time, analyze the expenditures and the results achieved for those costs and take into consideration the international perspectives of the policy. On the other side, technology policy evaluation is the concern of the general public as well. The public organized in subsystems, creating policy communities and networks, can give the future directions of the policy, as well as get involved in the decision-making and implementation process[80].

[80] Schilder (2000)

3. Considerations for innovation policy in small countries

Changes in the global surrounding influence the approach to the creation of innovation policies. This chapter looks at certain elements that need to be considered. The state of the societies and the importance of knowledge in today's economy, the creation of knowledge based economies, the importance of the nations, and the globalisation processes force advances in the policies as well. Besides these general conditions, there are certain specificities for small countries, as well as for transition countries, which change the whole political, social and economic environment, and need to transfer from totally planning system to certain level of decentralization and competition.

Furthermore for development of innovation policy of great importance is the present state of the innovation. The future innovative activities are dependant on the past actions, thus influencing the types and approaches to innovation. Factors that further influence the policy are technology adoption capacity, level of human capital, the state of protection of property rights and the investment in R&D. These elements have to be considered for any innovation policy, but for small countries in transitions their significance and impact will differ from other countries. When creating an innovation policy, the actors have to regard the limits that these policies have and the compatible policies that have to be included in pursue of the set goals.

3.1. Knowledge based economies

Knowledge is produced (development and acquisition of new knowledge), spread (education and development through training of human resources), transferred (dissemination of knowledge, which is diffused through numerous actors, structures and institutions, from which network the capacity and the social level of technological development depend), has value and price.[1] Thus, the basic activities that characterise the knowledge-based economies are knowledge creation (knowledge investment) and knowledge diffusion (distribution). The OECD[2] defines knowledge-based economies as 'those that are directly based on the production and use of knowledge and information'.

The increasing role of knowledge within the production process and the recent transformation of industrial economies into knowledge-based economies are focusing the attention on innovation.

Competition between firms now increasingly involves "competition to innovate first"[3]. In global market places where "firms with more knowledge are winners", the importance of the ones that create the knowledge and work on innovations is highly recognised. The importance of knowledge and innovation is much bigger in the competitive global markets compared to the smaller and closed markets. The returns from successful innovations are higher in the big markets, but at the same time the risks for not being innovative enough are bigger. Being competitive in the global market and surviving depends on the ability to innovate. Without innovation, there is a risk of not being able to gain higher market shares and losing ones that the firm already has, so the pressure on the firms for producing new products and services and implementing new production processes and forms is increasing. The capacity to innovate is the basic competition factor in the knowledge-based economies[4].

[1] Popovska (2000)
[2] www.oecd.prg/document/14/0,2340, en_2649_201185_1894478_1_1_1_1,00.html
[3] Morck/Yeung (2000)
[4] Hirshhorn et al. (2002)

Innovation is not only created by intra-firm activities but also through interaction among firms. One can make the distinction between first-, second- and third-order economic learning. First order learning happens within the firm, second-order learning happens between firms (through different arrangements like joint venture, licensing, sub-contracting, partnerships or consortia). Third-order learning happens both in and outside the firm, it is learning how to learn and it takes place at the level of economic system as a whole. Its efficiency depends on the design and functioning of the economy's institutional framework. For transition countries it is important to analyse all three levels of changes. The transition means that besides the change in the institutional system, there are changes inside the firms and the way they organise and function. At the same time there are changes in the previous established networks or cooperation among different firms, inside the economy as well as connections with foreign firms.

3.1.1. The development of the society under the influence of knowledge

As stated before, modern economies are based on knowledge. There have been big changes in the societies and the economy in the past centuries. In the past, the development of the economy was dependant on resources and industrial development; today this crucial role in the economical development has been replaced by knowledge.

Feature	**Definition**
Digital revolution	*Prevalence of information and communication technologies, especially computers*
Human Capital	*Rapid growth of education and training*
Innovation	*R&D, know-how, brands and other forms of intangible capital more important than fixed capital*
Mobility/globalisation	*Capital (financial, fixed and highly skilled) very mobile across national borders*
Entrepreneurial capacity	*Start-ups and new entrants key drivers of growth*
Clusters	*Geographical concentration of high-tech firms (e.g. Silicon Valley)*
Inequality	*Increasing wage dispersion and volatility of income, 'winner takes all' in labour and product market*
Public/private	*A blurring of the division between the public and private sector*

Table 8: Features of new economy[5]

[5] Van Reenen (2001)

Bell[6] predicted in the 70s after the modernization and industrialization that the most developed societies would move to the next stage of development, to the post industrial stage. The main empirical indicator for the transition from one stage to another, according to Bell, is the employment structure, when the employment in the service sector outnumbers the employment in the industrial sector. In the new economic system knowledge replaces capital, innovation replaces tradition, and ideas replace manual work as the main sources of power and economic growth. Globally today we already reached this stage and we live in that system, the knowledge-based economies. It is an economy in which knowledge is the dominant resource. The change in the resource importance can be compared with the transfer from pre-industrialized to industrial phase, when the capital replaced land as dominant resource. Now with the transition from industrial to post industrial phase, knowledge is replacing the capital. Today the term information society is used instead of post-industrial one, because of the importance of the information technology in all the sectors of the economy. The knowledge-based economy is changing the predominant content of work[7], with knowledge being the key resource and information being the main source of competition.

In Table 8 are the key features of the new economy and one can notice that many of them are based on the importance of information. Some of the features from the table are not driven by the new technology. Mobility of capital was made possible as much by political agreements and liberalisation of the financial and other markets as by anything else. Some of the features have been around for long time, such as the effects of innovation in gaining competitive advantage[8].

3.1.2. The role of the nation state

The knowledge-based economy is transforming the meaning of the nation-state. The role of the state is changing from controller of the economic events within its borders to building conditions for attracting the global economic activities within its borders. This means that the state has to concentrate on creating an educated workforce, infrastructure, stability and suitable market frameworks, especially in developing countries. Governments also need to finance the basic research and development that pushes technology forward.

At the same time there has been a change in the balance of power between governments (countries) and corporations. In the knowledge-based economies countries need the corporations more than the corporations need the countries. Where in the past the corporations had to pay taxes for their economic activities in a country, today the countries often have to pay so that the corporations come to or stay in their country. The electronic commerce creates an additional problem, making it difficult to collect sales or value-added taxes on products and services that can be directly delivered electronically.

Additionally loss of the governmental power and the decreasing role of the national governments can be seen with the modern transportation and the immigration. The economic interdependence opens the possibilities for migration of the workforce. This problem is especially visible for the developing countries, whose citizens leave their home countries in search of better living standards. The

[6] Bell (1973)
[7] Won-Ki (2001)
[8] Schumpeter and the Austrian economists have based the whole paradigm in economics on the importance of the innovation.

dependence of the workforce on one nation and national system is decreasing, the political power of the nation-state is declining.

The role of the national governments in the developing countries is further marginalized by the role of the International Monetary Fond and other international financial institutions which indirectly or directly influence the economic decision of the local governments.

In the past different nations were building one country in order to create economies of scale and provide better life for the citizens. In these countries there were stronger and weaker regions. The stronger regions had to suffer extra costs because of their need to coexist with other, less economically developed regions. They were willing to carry over these costs for the advantages they could gain from bigger markets. Today there is no need of this, positive externalities that were created by the economies of scale are much weaker or do not exist any more. Therefore the strong ones do not want to carry the weaker any more, since they can be strong even alone. This can be seen as an explanation for why a lot of states have divided in the last decade.

While in the past there was a transition towards higher equality among individuals, firms and countries[9], now with the knowledge-based economies this inequality is increasing. Workers are leaving manufacturing jobs and going to the services sector, with a wide dispersion of wages[10].[11] The life cycle of jobs is shortening and the demand for permanent learning is becoming a requirement. Higher-level skills (problem-solving capabilities, communication, social skills, and computer skills) are increasingly required[12]. The demand for more education increases as well. The educational institutions increase the number of programmes offered on all levels and the number of students is increasing. Additionally to this, the permanent learning and training is being offered from the business organisations and educational institution together. Educational institutions promote knowledge-based society, and the business organisations rely on that knowledge and advance the creation of the knowledge-based society[13]. With the role of the education increasing, the state support for it should adjust to the new environment and pay attention to the market demands.

3.1.3. Systems of innovation

With the changes in the society and the economy and as the traditional role of the nation state is decreasing, states have to be prepared to slip into their new role where they will support the knowledge creation ad dispersion. In that situation the development of the national systems of innovation, as an institutional framework for support and promotion of innovation, is increasing.

There are a lot of possible definitions to explain the term “national systems of innovation”. In Table 9 some of them are given. Following these definitions one can see that the base of the national systems of innovation are the different institutions and their interaction (technical, commercial, legal, social, and financial), which influence the innovation process and give direction of the technological changes in the

[9] Transfer of the workers from agriculture to manufacturing and mining (higher wages and more skill requirements, social welfare state using the tax and expenditure system to further increase post-tax, post-transfer income equality).

[10] Sector in which the workers cannot organise themselves in Unions (Unions cannot work even in manufacturing any more because of the globalisation)

[11] Thurow (2000)

[12] Green at al. (1998)

[13] Sporer (2004)

society. Institutions (formal or not) provide incentives, information, resources, reduce uncertainty, and attenuate conflicts[14]. This description allows the possibility that some institutions might provide wrong incentives, incorrect information or inefficient resource allocation, hence are not capable of reducing uncertainty and stimulate conflicts. The above characteristics of the institutions and the different interactions between them determine the efficiency of the National systems of innovation. The institutional efficiencies will be further discussed at the end of this chapter.

". . . The network of institutions in the public- and private-sectors whose activities and interactions initiate, import, modify and diffuse new technologies" (Freeman, 1987)
". . . The elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge . . . and are either located within or rooted inside the borders of a nation state" (Lundvall, 1992)
". . . The set of institutions whose interactions determine the innovative performance of national firms" (Nelson and Rosenberg, 1993)
". . . The national system of innovation is constituted by the institutions and economic structures affecting the rate and direction of technological change in the society" (Edquist and Lundvall, 1993)
". . .A national system of innovation is the system of interacting private and public firms (either large or small), universities, and government agencies aiming at the production of science and technology within national borders. Interaction among these units may be technical, commercial, legal, social, and financial, in as much as the goal of the interaction is the development, protection, financing or regulation of new science and technology" (Niosi et al., 1993)
". . . The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country" (Patel and Pavitt, 1994)
". . . That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies" (Metcalfe, 1995)

Table 9: Definitions of National systems of innovation [15]

Niosi perceives that the concept of a national system of innovation expands towards a "system of Innovations", differing among industrial, local, regional, national, and may be international systems of innovation[16].

The importance of local and regional systems of innovation is increasing with the diminishing role of the national and increasing role of the global economy. Knowledge is a dominant development factor influencing the transition of the society into post-industrial stage, and at the same time the transfers into the global economy have an opposite impact on the development and adoption of new knowledge and new technologies. It is a two-way track. With the market openness, supply of educated workers is increasing, and that helps the development of new technologies and spread of knowledge outside state borders. These technologies (communication technologies especially) make the communication cheaper and more efficient. This brings the advantage of making the cooperation among researchers easier and with that it facilitates faster creation of new knowledge. The growth of the global trade brings the expansion of global communication networks, the most important probably

[14] Edquist,/Johnson (1997) p. 55
[15] Niosi (2002)
[16] "Capital easily crosses national or regional boundaries. Knowledge flows less easily, because of the tacit character of much of it, which is embodied in human brains. Human capital means tacit knowledge, which is difficult to transfer without moving people. The less mobile factors of production and the most crucial for innovation are human capital, governmental regulations, public and semi-public institutions, and natural resources. For all these factors borders and location matter." Niosi (2002)

being the internet usage[17], and the increase in the foreign direct investments, which have always been seen as an important factor in transfer of technology. Flows of information have also increased as a result of increased international collaboration. International agreements have grown as firms attempt to share the costs and risks of innovation in technology-intensive sectors such as information technology, biotechnology and new materials[18].

Thus, the driving forces for the knowledge-based societies are globalisation and the new information and communication technologies. The potential for countries in transition is the following: While adopting their systems to the new economical and political situation they should consider their importance and consciously drive the changes into creation of a knowledge-based society.

3.2. Globalisation and innovation process

Globalisation is an ongoing process, which was happening all through history with periods of expansion and setbacks. The spread of global religions, colonisation, trade, transoceanic migrations, and faster means of transport and communication, are all contributors to the globalisation[19]. After the World War II the globalisation process was in part slowed down because of the global rivalry and the cold war. The last wave is result of the information and communication technologies and the removal of obstacles based on capitalist-communist division. This process allowed higher competition among businesses on local, national and global levels. It opened borders for all types of interactions, and this openness stimulates more creativity and innovation. Global competition restricts monopolies. The modern information and communication technologies allowed all this economical and social changes. It allows companies to produce and trade globally. There is a flow of information, with a speed that allows transfer of information, knowledge and innovation globally. The use of information technology changed the way that firms do business as well as the way governments, science and technology, research and development (R&D), innovation, higher education institutions and the general public function.[20]

All these factors have changed the way of working and increased cooperation. But, although there have been increased possibilities for development and adoption of technological advances, there is, as yet, no significant evidence of an increasing globalisation of technology. Despite the considerable liberalization that has occurred in other sectors, the evidence indicates that patterns of technological specialization of firms and countries have tended to remain relatively stable. This can be explained with the difficulties for technology adoption. There is certain tacit knowledge that cannot be codified, that cannot be transferred and is acquired only through practice. The lack of this knowledge makes the adoption capacities of some firms, regions, and even states lower, and brings down their technological competence and decreases their capability of participating in the global knowledge production and distribution. Without this basic tacit knowledge they are limited in implementing new technologies. At the same time, the ones that have strong innovative capabilities will further develop their knowledge and build on it. This self-reinforcing process of knowledge accumulation helps explain the persistent leadership of particular firms and countries in given areas of technological development. It also underlines the problems with which some countries that are lagging behind in their technological development are

[17] Over the past decade, Internet use has increased at a rate exceeding 100 percent per year
[18] Hirshhorn/Nadeau/Rao (2002)
[19] Therborn (2000).
[20] Sporer (2004)

facing and the area of improvement that they have to work on in order to become competitive on the global market as strong knowledge-based economies.[21]

Archibugi and Iammariono[22] have created a taxonomy of globalisation of innovation (see table 10), by identifying three main categories, in order to classify individual innovations and areas of technological competence according to their main forms of generation, transfer, and exploitation. Both at single enterprise and national level, the categories are complementary and not alternative. Enterprises, especially large ones, generate innovation following all three procedures.

1) Generation of innovations includes innovations generated on a global scale: only innovations produced by multinational enterprises fit into this category. Except for few examples (such as Shell and Unilever), it is easy to identify the country of origin of these enterprises so that the term of national enterprises with multinational operations is used[23]. The branches of multinational enterprises may generate innovation in the host countries. The global generation of innovation by multinational enterprises may thus facilitate the advancement of the innovative capabilities of the host location just as, in unfavourable circumstances, it may weaken them.

Categories	**Actors**	**Forms**
Global generation of innovations	*Multinational firms*	*R&D and innovative activities in both the home and the host countries* *Acquisition of existing R&D laboratories or Greenfield R&D investments in host countries*
Global techno-scientific collaborations/transfer	*Universities and public research centres*	*Joint scientific projects* *Scientific exchanges, sabbatical years* *International flows of students*
	National and multinational firms	*Joint ventures for scientific innovative projects* *Production agreements with exchange of technical information and/or equipment*
International exploitation of national produced innovations	*Profit-seeking firms and individuals*	*Exports of innovative goods* *Transfer of licences and patents* *Foreign production of internationally generated innovative goods*

Table 10: Taxonomy of globalisation of technology[24]

2) Lately there is a new form of innovative activities that is getting developed which is between the generation and exploitation and it comes from different types of agreements between enterprises, which agreements concern joint technological innovations, and where enterprises are from different countries. The enterprises developed new forms of industrial organisation in search for more efficient technological development[25]. The academic world has always been cooperative in the international transfer of knowledge, where there has been high cooperation and the knowledge has been shared without any economic compensation. The enterprises are taking the examples of the academics and are finding new cooperative channels for knowledge creation and transfer.

[21] Hirshhorn/Nadeau/Rao (2002)
[22] Archibugi/Iammariono (2001)
[23] Hu (1992)
[24] Source: Archibugi/Iammarino (2001)
[25] Mytelka (1991); Dodgstone (1993)

3) Exploitation includes the attempts of innovators to obtain economic advantages by exploiting their technological competences on other markets other than the domestic ones (the category is called 'international' as opposed to 'global', since the players that introduce innovations preserve their own national identity, even when such innovations are diffused and marketed in more than one country). This category includes also activities in foreign host countries (through direct investment abroad), but not when it means creation of additional technological development capacity on the spot. The increase in the volume of international trade has made it more important for each country to select its own strengths and weaknesses (international specialization).

The level of influence that the growing globalisation will have on the national economies is dependent on a number of factors. Globalisation brings advantages as well as disadvantages for individual national economies. The significance of these depends on the characteristics of the participating actors and the relations among them. Enterprises performing in the global market face stronger competition than those that are active only on smaller, local markets. Globalisation brings competition also for the local and national systems, as well as governments. At the same time globalisation gives opportunities for better cooperation and joint contribution in the domestic market (it motivates higher cooperation among domestic organisations in order to strengthen the possibilities for higher competitiveness on the global markets), and in the international markets. These changes brought by the globalisation of the economies may have both positive and negative effect on the innovative capacity of the national and regional systems.

The free-market system puts the power of strategic decisions in the hands of the elite. This is most dramatic when it comes to the trans-national corporations, which play a dominant role in the free-market system[26]. Trans-nationals can use their flexibility to 'play-off' both people and countries (divide and rule). They may as a consequence of their strategic decisions promote a world of uneven development[27].

Development of new technologies is often associated with economies of scale, thus on the international market large countries can have comparative advantage in fostering activities which benefit from economies of scale and scope, while small countries should rather specialize in production based on constant returns of scale[28].

Krugman[29] suggests that liberalization benefits knowledge creation in relatively large countries, because the competitive advantage inherent to market size would ensure them a greater share of integrated markets. Thus, firms from the smaller national economies can improve their competitiveness on the technology development market if they establish operations abroad. From the home country they can coordinate the global network of operations. Expansion of their headquarter services at home may then be expected to lead to a concentration of knowledge creation. Casella[30] on the other hand, argues that improved access to other markets reduces the comparative disadvantage of a location in a small country, increasing its ability to compete in production based on economies of scale. The international trade and internationalisation of firms operations influences the level of knowledge creation and production in small economies. While R&D is usually viewed as headquarters service, firms are increasingly undertaking foreign direct investments in R&D[31], and it appears that R&D is being systematically internationalised, at a particular high pace in

[26] United Nations (1993)
[27] Hymer (1972), Cowling/Sugden (1998)
[28] Krugman (1980), Venables (1987)
[29] Krugman (1991)
[30] Casella (1996)
[31] Mowery/Teece (1993), Dunning/Narula (1995)

multinational companies based in small economies[32]. As the domestic market cannot supply the demand for R&D personnel, it is more efficient for these companies to transfer these operations in foreign markets. The consequence from these transfers of the research operations for the industrial development will depend whether R&D is internationalised in order to e.g. overcome transfer costs, adapt processes or products to foreign markets, strengthen the knowledge-creating activity itself, acquire foreign firms or foreign technology, etc.[33]

R&D in small countries is not just the result of internationalisation. The very existence of multinational companies is presumed to be based on firm's specific assets which cannot easily be traded at arm's length including R&D. High R&D expenditures favour the development of multinational companies which in turn supports R&D. Why have some small countries established high level of internationalisation and others not? Internationalisation is dependent among other things on the educational system, infrastructure and industrial innovations (which provide base for technical and entrepreneurial capabilities), antitrust regulation, openness for foreign direct investments, and taxes and labour market institutions (favouring small or large enterprises). In order to achieve R&D internationalisation, there is a need to overcome transfer costs, increase intra-firm trade, technical progress, concentration in large host countries, shifting mode of establishing foreign affiliates, and technology sourcing.[34]

3.3. Innovation in small economies

Despite many attempts in economic literature throughout the 20th century to define the size of a nation-state, there has been no general agreement on one numerical measure of country size. In the first half of the 20th century, a geographical measure (area, arable area) was preferred[35]. During and after the Lisbon conference on the economic consequences of the size of countries, most economists[36] used the demographic measures (population).

But neither of the two criteria is fully appropriate measure of size, because they do not represent all the aspects of the problem. Geographical size is taken as a proxy for the richness with natural resources. The problems with this measure are: first, it assumes random distribution of resources across the earth's surface, and second, it excludes the significance of the labour force (or human capital) for the development process. At the same time, the demographic measure presents only the labour supply of a country (though it does not consider qualification of the labour force) and the size of the market (again not perfect presentation cause it does not consider the different tastes and demand functions at different levels of development).

As noted by Chenery[37] and Lloyd[38] only if the development level is held constant may demographic criteria be taken as an appropriate indicator of market size. Since the geographical and the demographical measures are not representative some economists[39] suggested national income, GNP or GDP as the most suitable measure of the size of a country. GDP or GNP is undoubtedly the best indicator of

[32] Äkerblom (1993), Andersson/ Fredriksson (1996)
[33] Andersson (1998)
[34] ibid
[35] Marschall (1919), Ohlin (1933)
[36] Kutznets (1960), Marcy (1960), Chenery (1960), Michaely (1962), Deans/Bernstein (1978), Hughes (1984), Dommen/Hein (1985)
[37] Chenery (1960)
[38] Lloyd (1968)
[39] Fabricant (1960), Kuznets (1964), Lloyd (1968)

size of the market. Although the GDP and GNP seem to be representative measures, there are also problems with accepting them as absolute measures. It is an ex-post indicator of the economic activities, but it does not present the factors of production of the countries. There may be a problem of indexation of individual measures and the ranking of countries by each of the three criteria may be conflicting. For example, the market size of Sweden is up to three times bigger than Indonesia's, although Indonesia is geographically 5 times larger and demographically 22 times larger than Sweden. Jalan[40] presented a simple non-weight size index for 111 countries, but he assigns each of the three size-components the same weight, which makes the index not representative.

Hence, there was need of a combined measure of size, measure that contains all the three dimensions of size mentioned before (geographic, demographic and economic) [41]. Demijan[42] developed single numerical, combined weight measure of country size[43], ASC (Aggregated size of a country). 193 countries were classified according to ASC criteria into four major groups: 4 large (ASC>5%), 26 medium (5%>ASC>0.5%), 97 small (0.5%>ASC>0.03%) and 66 micro states (ASC<0.03%) According to this classification, one can consider that small countries are those whose absolute value of GDP is (on average) between 10 and 20 billion USD, whose population is (on average) between 8 and 13 million, and whose area (on average) does not exceed 500.000 sq. km. Similarly, micro states have on average a population of less than 1 million, an area of less than 30,000 sq. km and GDP not exceeding 1.3 billion USD.

These specifications are very similar to those reported by some other researchers. Lloyd[44] defined small countries as those with GDP of less than 20 billion USD and a population of less than 15 million. Senju[45] also suggested a distinction between small and micro countries (mostly small islands); as a dividing line he chose a population of 1 million. The aggregated size of a country (ASC) is a methodology and substantively appropriate measure of size. Furthermore as a single numerical size indicator, ASC is a very suitable for regression analysis purposes.[46]

3.3.1. Characteristics of small countries

The size of the country influences the social, political and economic situation in it. Following are some of the characteristics of small countries, important for the creation of the innovation policy.

The economic structure of small countries is less diversified than that of a large country at the same level of development. This happens because most small countries have small geographical areas and therefore less diversification in raw

[40] Jalan (1982)
[41] Leduc/Weiller (1960), Jalan (1982)
[42] Damijan (1993, 1996)
[43] $ASC_i = (sA_i*w_1+sP_i*w_2+sG_i*w_3)/w_1+w_2+w_3$, where: ASC_i is the aggregated (adjusted) size of country i, sA_i is the ratio of the area of country i to the total world area; sP_i is the ratio of the population of country i to the total world population; sG_i is the ration of the GDP (GNP) of the country i to the total world GDP(GNP) and $w_1 = 0.108$, $w_2 = 0.205$, w_3 are the weights calculated using principal components analysis (each of them expressing a proportion of the explained variances for GDP per capita through individual size components
[44] Lloyd (1968)
[45] Senju (1992)
[46] Damijan (2001)

materials and natural resources (at the same time whatever natural resources they have they will be used for domestic demand)[47].

The small size of domestic markets hinders the use of economies of scale (this can be substituted with production for foreign markets, but increases the risk). Because of the limitations in resources and the limits in usage of economies of scale, small countries concentrate on products in which they have a comparative advantage. International trade is much more important for the small than for the large countries, because it is the only chance to use the benefits of economies of scale, have increasing returns, and creates an additional source of capital accumulation for economic development. Concentration on certain products (that allow them comparative advantage) brings risks that are connected with the fluctuations in production and exports, but these do not have to reflect the level of expenditure. Stable expenditures, when working in unstable surrounding (coming from the risks of being more dependent on the international market movements), can be achieved through inventories and foreign exchange. Foreign trade consisted about 10% of the national income of a large country, while for small countries it is 50%[48].

Another characteristic of the small economies is transportation cost. In small countries the domestic transportation costs are much lower than in large countries, this is disadvantage for small countries. For large countries transportation costs can be used even as a form of natural barrier, thus protection from imports. Small countries do not have this protection, they are much more open to imports. Transportation costs increase the openness to imports in small countries, but also reduce the costs of the exports. But here one has to consider another problem that some small countries face, which is many of them are landlocked and are dependent on their neighbouring countries for sea transportation (keeping in mind that sea transportation is still the cheapest way of transporting goods). Thus, small countries tend to concentrate more on foreign sources of supply and foreign markets. Exports tend to be more concentrated on markets of a few countries (in extreme cases small countries become satellite of a large one), since smaller volume of goods for foreign trade is harder to diversify geographically than a large volume[49].

In economic theory, the thesis can be found that the relative costs of government administration are much higher and the role of the public sector much greater in small countries than in large ones[50]. Logical argumentation seems to support this thesis. First, the costs of government administration may be lower in large countries because of the economies in the large scale of government activities. In medium and small countries, these costs must be somewhat higher because they must have the same government institutions as large countries, but the extent of their operations is less than optimal, so they are not able to make use of economies of scale. Micro countries do not usually have all the government institutions because of their dependence and reliance on large countries, so the costs of government administration should be lower. Second, because of the greater cohesion and homogeneity of the population resulting in a greeter sense of solidarity in small and micro countries, there should also be a strong tendency towards larger direct government intervention in the economy because of social reasons. In other words, the greater interdependency of economic and social policies might raise the role of the government and consequently the size of the public sector in small and micro countries. Large and medium size countries should be less affected by these

[47] primary products account for 75% of the exports of small countries, but only 15% of the export for the 15 largest countries

[48] Streeten (1993)

[49] Some successfully developed small countries have managed to exploit niches in which they could be efficient exporters (high-tech industries and financial services for Switzerland)

[50] Robinson, E.A.G. (1960), Senjur (1992)

characteristics, so the size of the public sector should be lower than in smaller countries.[51]

The size does influence the policy creation though. Small countries have less independence in setting their macroeconomic policies and are more dependent on outside events, because of their relatively greater openness. Another set back is the limited access to external capital markets (with exceptions made for countries that serve as offshore banking as tax and regulation havens)[52].

Economies of scale can be an additional limitation for small countries. They can be found and make difference even for non-tradable goods and services (construction, retailing, financial institutions, power generation, local transport, education) and may influence the income in small countries (reduce income because the economies of scale can not be achieved). But there are situations when even these non tradable commodities can become tradable such as sharing with neighbours, which depends on the barriers, natural and man-made, for such sharing. There is also the defence burden, that is larger for small countries, and it is a function of the size of the potential enemy.

Besides all the disadvantages that small countries have because of their size, as mentioned earlier, they are also much more dependant on the international markets and have higher costs of supplying certain products and services because of incapability to reach economies of scale, there are also advantages that come with the small size of the country. By concentrating on labour intensive economies, which is possible since the ratio of foreign trade to national income in small countries is large, they can create jobs. For a large country to achieve high employment they need to spend resources on R&D for appropriate technologies.

Other explanations for the success of some small countries can be the sociological and psychological factors. Development always involves change, and there are always some groups that would be harmed from changes and these groups tend to resist it. In small countries resistance should theoretically be smaller, because of stronger national solidarity[53]. International trade brings greater uncertainty and external shocks and these are easier to be accepted if solidarity prevails. Groups will refrain from actions that harm others because the harm is more visible. The feasibility of the actions brings solidarity into the society. On the other side the disagreements between parties, fractions, or leaders can be paralysing in small countries perhaps even more than in a large one, where they can be easily replaced.

Small countries benefit from greater flexibility of administration (although there are diseconomies of scale when it comes to the administration of small countries). In a larger organisation there is always greater risk that information gets lost or distorted as it is passed, and the organisation has the risk for becoming too bureaucratic.

Small countries gain more than proportionally by migration of workers to industrial countries. Remittances constitute a large share of income and can provide a steady source of foreign exchange. When workers return they have acquired both financial and human capital that enables them to become agents of progress in their country.

Small countries tend to receive more foreign aid per capita[54]. They tend to get more private capital from abroad as a ratio of total capital formation. From international organisation's membership aspect, the small counties very often have

[51] Despite these theories certain empirical analysis showed that the country size by itself does not seem to essentially affect administration costs and the size of the public sector (Damijan 2001).
[52] Streeten (1993)
[53] Olson's (1965) theory on collective choice shows that free-rider problem is less disruptive of collective action in small groups.
[54] Aid per capita increases and the terms of aid improve as the size of the country declines; Isenman (1976)

disproportionate votes in some of them[55]. On the other side foreign aid might hinder self-sufficiency and create dependence on the donor.

The challenge is to overcome the disadvantages of small countries by building a stronger sense of community, closer unity of population and the encouragement of greater adaptability of attitudes and institutions. For the purpose of policy making in small countries there is the need of greater flexibility, so that a full advantage is made out of favourable changes and quicker adjustment is made to unfavourable changes.

One important aspect for small countries is the acknowledgement of the difference between self-sufficiency and self-reliance. An attempt to be self-sufficient in food supply, might lead to greater dependence on foreign suppliers if the domestic harvest fails. Self-sufficiency can replace self-reliance. So it is quiet consistent for small country to be self-reliant. One way to insure against the risks of foreign trade is to hold sufficient amount of foreign exchange reserves. Small countries need larger reserves in relation to their trade than large ones. This means that because of large reserves they have to sacrifice the alternative use of the funds, but the benefits are that they can avoid under-utilization of capacity and other losses that would have to be suffered from cut in imports if reserves are not available. Good credit standing in international capital markets permits access to credits that can be used in order to cover temporary balance of payment difficulties. Inventories of goods, especially non-perishable ones, provide a backing against fluctuations in trade (large stocks can be expensive and foreign exchange reserves might be favourable). Industrial space capacity in import substitutes presents another source of reserves (this can be cheaper way of protecting against unexpected shock in international trade than high-cost permanent protection of domestic industries). Insurance against some uncertain hazards can be bought. In selecting industries, to reduce the risks, they can avoid those that require large-scale production for unit cost reduction, unless an adequate and stable export market is assured. R&D expenditure should be concentrated on methods of adopting and adapting foreign technologies, since there are economies of scale even there[56].

Thus, the diminishing capacity of the state to govern economic activities, the expansion of international regimes, the growing size and power of the multinational companies and the increasing volatility of global commodity, and technology and financial flows, impose especially heavy costs on small countries for several reasons. One is that small countries have less diversified production, making them more vulnerable to productivity shocks and to changes in prices or technology[57]. They are also seen as less able to resist pressures to engage on ecological or social dumping. Finally, they may be unable to develop industries that depend on large outlays for R&D or those that depend on economies of scale and scope[58].

The empirical evidence in the economic performance of small and large countries, such as the study by Ehrlich[59], suggest that there are no significant differences in long term growth when appropriate exogenous variables are held constant. One exogenous variable, not included in the study but of great potential impact, is location. The economic characteristics of a small country's neighbours are

[55] Streeten (1993)
[56] Streeten (1993)
[57] Brada (2000) argues that because of the smaller diversification of the production the small countries are subject to fewer shocks. A large country that engages in the production in all sectors of industry must be affected by every shocks that affects any industry, while small countries are affected only by the shocks that affect the industries that they have
[58] Brada (2000) also argues that in the rationalisation of production by multinational firms, it is countries capacities and their location and not the size of their market that is key because, by internalising the role of the market, the MNC is able to source parts and components from many locations and to sell the globally.
[59] Ehrlich (1998, 69-75),

likely to be of much greater importance to its economic performance than are the characteristics of a large country's neighbours[60].

3.3.2. Innovation in small developing countries

The post industrial era is spreading from the developed to the developing countries, and also from the large to the small countries. In order to participate in the global economy, developing countries must be seen as attractive off-shore production bases for multinational corporations. For that they have to provide well-educated workforce, good infrastructure, political stability, and willingness to play by market rules. If these things are there, then the multinational corporations are going to transfer specific production technologies and market linkages necessary to participate in the global economy[61]. [62]

Large firms which subcontract with smaller ones for part of their production make strategic decisions for the small ones (for the entire production process), so it is like one company together, seen according to the strategic decision makers. Strategic decisions are made only from the elite of the companies. The small companies that are subcontractors for the big ones are only employing the decision made by the big ones. Thought for the trans-national companies, the strategic decision making is not only taken away from some smaller companies (contractors) in a frame of a national economy, but also the smaller and developing countries are forced into following the strategies of the bigger ones (the leaders), the base of the strategy-makers of these companies. One can say that through the trans-national companies the elite is making the decisions for all.

Size limitations of the small countries come from the modest size of the national economies, and the small size of the knowledge and the capital base. „All small nations are faced with the same dilemma of openness: they need access to foreign resources and can pay their way only by exporting commodities or services at an internationally competitive price. This in turn forces the domestic producers to match or surpass foreign firms in competitiveness and the only feasible way to ensure that the domestic firms keep pace with the rest is by eliminating all barriers to trade. Protectionism is simply not a viable option for small nations. Small nations need to become regions in a broader economic entity, with as little loss of political independence as possible"[63].

On the other hand, the producers from small nations have to adapt much faster to the changes in the global surrounding (they are more dependent on the outside situations), so there might be a need for the state to provide protection from the state for those (companies and sectors) who are especially affected by sudden change in the international economic environment. Small countries can specialize in industries with stable demands and low price-elasticity, medium or low-tech ones. "The small European states, while letting the international markets force economic adjustments, choose a variety of economic and social policies that prevent the costs of change from causing political eruptions. They live with change by compensating for it"[64]. The problem with protectionism is that it may prevent firms from adjusting efficiently, believing that they will be compensated.

[60] Brada (2000)
[61] By themselves the developing countries can not produce at the quality level demanded in high-value –added industries and cannot market the products from the low-value added industries.
[62] Thurow (2000)
[63] Braczyk (1998), p.193
[64] Katzenstein (1985), p.24

The same goes for innovation as well. Recent studies have highlighted the particular importance of technology diffusion to the process of technology[65]. An OECD study that looks at the contribution of technology imports in the form of machinery, equipment and components, finds that this 'good-embodied diffusion' is particularly important for smaller economies. Technology imports make a much smaller contribution to the technology intensity of large economies, which have a greater R&D capacity and are much more technologically self-reliant. One study of OECD economies found that for smaller economies, total productivity growth was, in fact, more responsive to changes in the R&D of its main trading partners than to changes in domestic R&D[66]. This happens because of the dependence and the spill-over effects that occur between small countries and their main trading partners[67].

3.4. Innovation in centralized and decentralized systems

When discussing the level of innovation in transition countries, one must consider the system changes that they have went through. What I am concerned with here is the transfer from a centralized (hierarchical) system into a less centralized system. In different environments different policies get the optimal result. With a change in the centralisation level, there is a need to adopt the policies that are going to be more suitable for the new environment. At the same time the policies changes, brought through because of system changes, influence the centralisation level. The question arising for the policy makers is the level of decentralisation that should be pursued.

In process of providing public services the regulators face certain transaction costs. With each additional transaction, the costs increase. Having the services provided decentralised, on different hierarchical or competing levels, there will be multiplication of some of these transaction and increase of the costs with it. Thus, the system centralisation decreases the costs.

Preferences of the citizens also influence the efficiency of the more or less centralized systems. When the preferences are more homogeneous than they can be supplied with fewer costs by one central regulator, but the more heterogeneous they get, it becomes more difficult for the central regulator to acknowledge all the specific preferences and find efficient way of supplying them. When evolution economists[68] argue on the problem of knowledge and learning, they state that the centralised level has more knowledge which public goods are most suitable for the citizens' preferences and in which quantities they should be provided, respectively which regulations are most suitable for solving the problems of market failures. There are economies of scale for supply of public services. In order to utilize the economies of scale there need to be sufficient amount of the service 'produced'. The performance and the level of centralisation are constrained by the number of citizens that would use the service. The smaller the geographical range of the public services, the area for which the services are supplied, the more efficient it is to have centralized provision of services. Hence, some static criteria lead to the conclusion that centralized systems can be more suitable for determining the preferences of the

[65] Example of Canada; see Doern/Reed (2001), Bernstein (2002)
[66] Hirshhorn/Nadeau/Rao (2002)
[67] The substantial spill over benefits Canada has received from US R&D have been documented in a number of studies. One recent study, which examined eleven Canadian manufacturing industries over the period 1991 to 1996, found that R&D spill-overs from the US (primarily intra-industry spill-over) contributed to improved performance in all cases and were the major factor behind productivity growth in eight industries.
[68] Hayek (1945)

citizens for the public services needed to be supplied, and are capable of doing it more efficiently than decentralized institutions.

There is a trade-off between the static criteria that give stronger argumentation for the centralisation and the evolutionary-dynamic criteria, which suggest decentralisation. Centralized institutions hinder innovation. They are further from the direct users of the services, can not see the results of their work being applied, and there is less motivation for competition and improvement. In the hierarchical systems a principal-agent problem is strongly felt. When the policy actors are separated from each other and there is no cooperation in the policy making process, there will be conflict in their interests and goals, as well as in the way the policies are being conceptualised and implemented. The principal-agent problem leads the policy makers to design the policies in the way that the control over the results is easier to observe and measure, which on the other hand influences the choice of instruments. The level of centralization of the system dictates the type of policy that is going to be chosen. In decentralized systems the principal-agent problem is not as big. The decisions are made on a lower level joint by with the executors or the actors that are concerned with the specific parts of the policy. When there is acceptance about it, then the implementation is easier and the costs are lower. Centralized systems are more bureaucratic, the changes are harder to be presented, it takes longer until they are accepted, and there is fear of experimentation. "The marginal cost of adopting innovation in decentralized system is simply the technical cost of innovation, incentive costs externalities are eliminated, there for private and social costs and benefits coincide and efficient levels of adoption prevail. Within hierarchical systems, the technical cost of adaptation is augmented by increasingly large incentive costs, therefore the rate of adaptation is lower that in decentralized economies and inefficiently low rates of adaptation prevail"[69].

Dearden et al. suggest that 'mere adjustment of incentives schemes within the hierarchical system are unlikely to counter the problem'[70] The neoclassical economists analyse this from two perspectives: 1) the problem of spread, local knowledge in a federal system and 2) the problem of general uncertainty, how certain problems are best solved through provision of public goods or regulations. The traditional theory of federalism and the neoclassical analysis are discussing the problem of tax competition and the question of efficient amount of public services, but they forget the problem of production of those services, the role of innovation, acknowledged by the evolutionary economics.

At the end of 1980s discussions began on "competitive federalism", "competition among governments" and "inter-jurisdictional competition" in America. At the same time in Europe the discussion on "Systemwettbewerb", "institutioneller Wettbewerb" und "Standortwettbewerb" (as part of the EU processes)[71], which are concerned with a competition among different level or governments from same level (decentralized decision making, on the production and financing of public goods and taxes, the level of citizen's mobility among different regions[72]). Competition supporters argue that competition will drive governments to use the tax money in more efficient way and supply the citizens the services that meet their needs. The opponents say that in their competition the governments will just lower the tax level, and because of

[69] Cowling/Sugden (1998) p. 243
[70] Dearden/Ickes/Samuelson (1990), p.120
[71] Kerber (2004)
[72] Competition can exist even when there is now mobility of individuals among different jurisdictions that is so cold Yard stick competition, the voters in one jurisdiction are comparing the achievements of their government with the one of other jurisdictions and their decision for re-election depends on the result of this comparison. For more information see Salmon (1987), Breton (1996), Besley/Case (1995), Bodenstein/Ursprung (2005)

shortage of funds they will reduce the services that they offer, “race to the bottom”. Institution economics criticises the neoclassical argumentations of regulation competition, from a point that the “race to the bottom” will bring allocation inefficiency, and it can exist only under appropriate institutional frameworks. The empirical results show that the positive effects are stronger than the negative ones.

Hence, there are advantages and disadvantages in both centralization and decentralization. Considering the choice of services provided, the reduction of costs for their supply, the knowledge needed for decision making, the innovation support, application and experimentation bust, and creating competition among different levels of governance will bring the best results (as a way of moving away from the hierarchical system), having in mind that certain institutions have to stay centralized for efficiency reasons. The choice of level of centralisation depends on the areas of interference and the goals of the innovation policy as well. Creating completion among different regional systems might bring efficiency and innovativeness in the innovation policy, but there are always institutions that are more efficient if they stay more centralised (because of the information they posses and the economies of scale they achieve).

3.5. State of innovation in a country

As seen above, the innovative and knowledge adoption capacity of one nation depend among other things on the present state of innovation. There are different methodologies to analyse the state of innovation.

Research shows that it is not right to classify a firm into innovation type simply on the basis of the industry in which it operates, because its innovation activity can be different from others in the same industry. Best approach is analysing the inputs and outputs from innovation separately. The problem in measurement of the innovativeness comes when looking at the inputs and outputs of the innovation activity. They are not clearly divided from the rest of the activities, and this unclear division may bring confusion to the analysis. The variables for innovation output are used to create groups of distinctive innovator types, whereas the variables for innovation inputs are used to relate a smaller number of uncorrelated variables summarizing the key features of innovation input.

Empirical studies on innovation most often use one or more of the following three measures of innovative activity: 1. the number of patents; 2. innovation counts; and 3. research and development expenditures. Bernstein[73] acknowledged the following problems in using these indicators.

1. Patents[74] are output indicators of innovative activity. The patent documentations incorporate all the relevant information concerning the specific innovations that they handle and can be considered to be an adequate presentation of the state of innovation for the activities that are protected by patents. The problems in using the patents number as an indicator arise from the fact that the number of patent innovation is just part of the number of total innovations, some of the innovations are not patentable and for some the innovators do not want to patent them, since applying for patent is a strategic decision[75]. The patent system might be abused by some firms in order to close the market for potential competitors. Firms that have developed a

[73] Bernstein (2002)

[74] Patent is a temporary monopole awarded to an inventor for the commercial use of a newly invented device. For a patent to be granted the innovation must be non-trivial, meaning that it would not appear obvious to a skilled practitioner of the relevant technology; it must also be useful, meaning that it has potential commercial value.

[75] Griliches (1990)

new process and fear that other firms may attempt to steal their innovation by finding a different process (meeting the patent office requirements) that circumvents the innovator's patent could engage in patent ticketing. They can do this by filing patents for variants of the original patent, not because there are substantial innovations, but because they could block competitors attempt to circumvent the original patent. These actions create an additional problem for using the patent numbers as indicators. A further limitation of this indicator is that simple patent counts, even within a narrowly defined class, are a very imperfect measure of innovative activity, because patents vary a great deal in their importance or value.

As attempt to overcome these difficulties patent citations have been introduced as a proxy for the importance of patents[76]. Citations are the references to previous patents that appear in each patent. Patent citations serve an important function, since they delimit the scope of the property rights awarded by the patent. It should be emphasized that patent citations, as patent counts, are dependent on the innovators actually applying for and being granted a patent. Consequently, patent citations relate to the worth of a patent, but not to non-patented innovation outcomes. Moreover, citation ticketing serves to complement patent ticketing in attempting to foreclose competition by increasing entry costs facing potential rival, through the requirements to cite all relevant patents.

2. Innovation counts are lists made by various firms and entrepreneurs. They should present all the innovation outcomes; those that are not patented as well as those patented. Just like patents, they are output indicators. Innovation counts should be the best output data because they measure all innovation. But in practice, innovation counting is difficult since there is little guidance from the economics literature on what is an innovation. Simple innovation counts are an imperfect measure of innovation activity because innovations vary in their economic value. With respect to innovation there are no indicators comparable to patent citations currently available to help discern value.

3. R&D spending is an input-based measure in contrast to the patents and innovation counts which are output based measures of innovation. The main criticism for use of R&D spending is that it measures inputs to innovation, not innovation outcomes[77]. But output based indicators are not superior to the input based ones[78], and the innovation process is so complex that there it is not possible to be presented by only output or only input indicators. The choice between the output based or input based indicators should be done according to data availability, and not because of conceptual correctness. The knowledge gained from current R&D spending does not disappear, and in conjunction with knowledge gleaned from past R&D spending it leads to innovation outcome in the future. Consequently, accumulated R&D spending generates new processes and products[79].

[76] Trajtenberg (2002)

[77] Morck/Yeung (2000)

[78] It is well known (Varian, 1992) that the production process can be summarized by either a production function, which is output-based, or a requirements function, which is input-based. Both functions depict the same process. In practical terms, the choice between an output-based and input-based representation rests on data availability, not on conceptual correctness.

[79] R&D spending leads to a durable input (i.e. one that lasts form more than a single period), which in turn generates innovation outcomes. Hence, as for other forms of investment, in order to construct capital stock measures, R&D spending must be converted from current-value terms to real time. This calculation leads to the construction of R&D capital, a more appropriate input-based indicator of innovative activity than R&D spending. As for other forms of capital, two significant challenges complicate the construction of R&D capital stock measure: I) determining the appropriate price index for R&D spending and II) determining the appropriate depreciation rate for historical R&D expenditures.

Two broad categories of indicators were developed by OECD[80] to measure the production, distribution and use of knowledge[81]: indicators of structural change and indicators of investment in intangibles. Indicators of structural change in OECD international trade are all based on R&D intensive manufacturing industries. Also, indicators of production and technology-knowledge inputs and outputs are all standard R&D related measures such as: expenditures on R&D, employment of engineers and technical personnel, patents, and international balances of payment for technology. All of this misses innovation in the service sector that has taken off in the new economy and is mainly based on other sources apart from R&D[82]. Innovation in services does not arise from the traditional R&D activities. They are based on adaptation of new ICT platforms and the ability to produce new products and services, to approach new markets, or improve business processes. A lot of these innovations have been created in the cooperation between more firms. The impact of the service innovations can be understood if one looks at the credit cards, the World Wide Web, email, e-commerce; all examples of a service sector innovations and their significance for the modern economy. The concentration on the product market and R&D limits the policy makers in paying the required attention to the service sector, as well as the creative industries and social and cultural innovation[83].

Rooney et al.[84] suggest that some of the 'by the way' OECD indicators of diffusion and investment in information and communication technologies could be upgraded in quality and elevated in status as proxies for service sector innovation. They also suggest the use of assessments of education, literacy and numeracy, social network morphology, social knowledge and skills, social innovation, social and cultural function and dysfunction, quality of knowledge mediators, and identity issues. New experimentation and relationship indicators, and indicators for measuring institutional performance need to be considered. One type of business measures that could be promising in this regard, if it can be suitably applied to the policy context, as it reflects a more flexible and long term measure, is the balanced scorecard[85]. This is a tool for plotting and implementing long term strategy that contains a balance of hard and soft measures over four aspects of business: financial, internal business processes, learning and growth, and customers. Qualitative approaches are useful, because they tend to capture peoples meanings, description of events and aspects that are hard to measure such as satisfaction[86]. Qualitative approaches are not as limited by the indivisibility problem of knowledge as quantitative methods are. These qualitative methods may draw upon ethnographic, socio-political, historical, linguistic, and future approaches to research[87].

Since there is no one representative indicator for the analysis of the state of the innovation in a country all of the above should be used.

Additional points that need to be taken in consideration are:

- Research efforts
- Proportion of engineers and scientists in the active population

[80] OECD (1999)
[81] Much of their work addressing the issue of whether economies are becoming more knowledge-based relies on R&D data to classify industries as high, medium or low tech industries (most of the indicators remains rooted in the manufacturing sector and R&D)
[82] Miles et al. (2002)
[83] Rooney/Hearn/Mandeville/Joseph (2003)
[84] ibid
[85] Kaplan/Norton (2000)
[86] Neuman (1997)
[87] Rooney/Hearn/Mandeville/Joseph (2003)

- Coordination of the research efforts, (with regard to civilian and defence research)
- University-industry relationship
- Capital risk industry which invests in high technological firms
- Cultural tradition favourable for risk taking and to enterprise spirit
- Costs of filling for licenses, a single legal protection system favourable to the commercial exploitation of innovation
- Time for firms creation
- Ability to adopt technological information
- Mobility of employees between companies and inside the company

3.6. Technological trajectories

Dosi[88] developed the notion of Kuhn's scientific paradigms and translated it into technological paradigm. He defines it as "An outlook, a set of procedures, a definition of the relevant problems, and of the specific knowledge related to their solution". Related to the technological paradigms is the concept of technological trajectories: the direction of the advances that exists in a technological paradigm. For assessment of future technological developments, the technology trajectories have to be considered. The state of the innovation in a country as well as on global level is dependent on and constrained by the technological trajectories followed.

Path-dependence processes can be characterized as circumstances that happen only after other events. Knowledge is built on already existing knowledge and does not start from the beginning every time around. The problems and knowledge from the past are influencing present actions and developments. That means that people continue developing the already existing knowledge and new developments are going to be strongly influenced from the base that they are developing on. Not only is past knowledge a base for development of present and future, but it also gives directions to that development. It creates guidelines, frameworks in which the future actions are going to be taken.

Some of the reasons for the existence of path-dependence are the following[89]:

1. Network externalities: early market entrants may spread their standards due to their networks and exclude future competitors, even though sometimes those are not the best solutions. (ex. Software development or video-cassette recorders)

2. Increasing returns to scale: the first firms to enter a market, where there are high returns of scale, dominate the market, and are able to impose their technology. New firms on the market will have lower returns to scale, face higher production costs, and find it harder to introduce their technology.

3. Sunk costs: past investments in one technology may get firms stuck to that specific technology, even if it is not the most optimal one.

4. Human learning: the investments in human capabilities, communication skills and technologies and similar investments can be considered sunk costs as well, although they are mostly intangible. But since the costs have been created it might be difficult to transfer to another technology or organisational trajectories.

5. Uncertainty: when nobody knows the most efficient way of solving certain problem, there will be no maximization of utilities. When there is no information on the

[88] Dosi (1982)
[89] Arthur (1989); David, (1985, 1988, 1994); Hodgson (1996); North (1990)

best way to solve the problem (existence of bounded rationality) people tend to stick to what they already know.

6. Contracts: contracts exist to make the expectation and performance requirements explicit. They tend to reduce uncertainty, but at the same time they block the flexibility of the organisation. The cost of changing the contracts are high, so it encourages pursuing of the old "ways".

7. Economic environment: different institutions can bring similar outcomes. The efficiency of the results is often dependent on the economic environment in which they function. So even if different systems of institution serve well in different environments they may not be equally efficient. It might also be that certain institutions change their efficiencies in the same environment through a longer period of time. When the surrounding changes and the institutions do not adapt to those changes, they might become less efficient.

Changing of a trajectory often considers high costs. There is the question of the choice of new path. Williamson[90] states that the maximizing behaviour of agents under appropriate inducement (such as changing prices or demand patterns) may be enough to break the path dependence process. "That history matters does not, however, imply that only history matters. Intentionality and economizing explain a lot of what is going on out there"[91]. The new paths can be influenced by the government as well. Innovation policies introduced by governments can set a technology's direction. Williamson accepts that there exist large and irremediable inefficiencies, and that they "do raise serious issues for modelling economic organization"[92]. Gunnar Myrdall[93] has shown that there are often lock-in conditions in developing countries, based on feed-back effects. These are situations where institutional inefficiency is severe and difficult to correct: vicious circles of poverty, deficient educational systems, political corruption, low savings and investment, all reinforcing each other.

Thus, distinction can be made between policies concerned with the emergence of new technological paradigms and policies which are created in order to sustain technological activities along relative established paths. In the former case, "policies should provide a satisfactory flow of scientific advances, establish 'bridging institutions' between scientific developments and their economic exploitation, develop conductive financial structures to support the real trial-and-error procedures generally involved in the search for new technological break-troughs, and act as 'focusing device' in the selection process of the direction of technological development"[94]. At the same time for sustaining of technological activities along the existing technological trajectories, the role of the policy changes and the tasks gets limited on encouragement and maintenance of a supply of techno-scientific advances, as well as creation of better conditions of private appropriability of the benefits of innovating (e.g. through patent policies, etc.). Countries well below the technological frontier may also find it necessary to act directly on both the technological capabilities of domestic companies, and on the appropriability features of the related technologies, in so far as they function as an entry barrier for catching-up companies and countries. In the developing countries it can be expected that the institutions are not strong enough to be capable of influencing origination of new paradigms. The goal of the policy should be the support of the economic actors in strengthening their capability of accepting already existing paradigms and developing along the line of the present trajectories.

[90] Williamson (1998), p. 50
[91] ibid
[92] ibid, p. 51
[93] Myrdall (1956)
[94] Rosenberg (1976)

Public policies influence the fundamental 'rationales' of the agents (including the ways their expectations and objectives are formed).

3.7. Innovation types

Another topic important for innovation policy is the type of innovation. Typologies of innovation are necessary because different types of innovation relate differently to different subsystems of organisations. The policy makers need to be aware of the different characteristics and requirements that are related to the specific innovation types, and consider them when making the decisions on a target of a specific policy and ways of reaching the most optimal results. Different innovation types need different approaches. The policy creators have to also take into consideration the different demands that the innovation in different industries present as well as the type of innovation that is concerned.

Literature marks the difference between administrative and technical innovation. Technical innovations are connected to products, services and production process technology (ideas for new products, introduction of new element of an organisation's production process or service operation). They are related to the work activity of the organisation, and can be either product or process innovations[95]. Administrative innovations involve administrative processes or organisational structures: new ways to recruit personnel, allocate resources, and give rewards. They are indirectly related to the primarily work activity of the organisation and more directly related to its management[96] and are mostly process innovations.[97] Particularly important for this work are the technical innovations.

A basic distinction is made among product and process innovations. Product innovation is defined as the introduction of a new product or service to meet an external user or market need[98]. The result of the innovative process is a new or improved product. Process innovation is defined as a new element introduced into an organisation's production or service operations to produce a product or render a service[99]. What is in one industry a product innovation might be for another process. With the improvement of the process one might expect improvement of the product. It goes the other way around when the new product is process somewhere else. Product innovations are market focused and are primarily customer driven, while process innovations have an internal focus and are mainly efficiency driven[100]. The distinction is important because their adoption requires different organisational skills: product innovations require that firms assimilate customer needs, patterns, design, and manufacture the product; process innovations require firms to apply technology to improve the efficiency of product development and commercialisation[101].

The differentiation among basic and applied research is also important. Basic research is one that is concerned with the research whose goal is knowledge for its own sake[102] and it is mostly done by universities and public research institutions. Applied research is the one that is concerned with knowledge whose use would be for commercial purposes and thus done in enterprises, concerned with brining new products on the market. The line between these types of research is very vague.

[95] Daft (1978), Damanpour/Evan (1984), Knight (1967)
[96] Daft (1978), Damanpour/Evan (1984), Kimberly/Evanisko (1981)
[97] Damanpour/Gopalakrishnan (1999), p.59
[98] Etitilie/Reza (1992); Utterback/Abernathy (1975)
[99] ibid
[100] Utterback/Abernathy (1975)
[101] Ettlie et al. (1984)
[102] Waldman/Jensen (2001) , p.399

While the basic and applied researches are concerned with the creation of new knowledge, there is also an application and diffusion of innovation that can be considered as innovation type on its own.

Swann[103] differentiates between three different types of innovation, based on analysis of the effect that the innovation in consumption has on the economic growth. First innovation is pure producer innovation, for which there is a ready market. The producer improves an already existing product or finds a new way to produce the product cheaper, without sacrificing the quality. The second is pure consumer innovation. This happens when consumers take already existing products and create (find) new use for them, not envisaged by the producer. The consumer does not simply read the instruction before using the product, but is being innovative. The third innovation type is an intermediate one, where both consumer and producer need to be innovative. The producers come up with new product for which there is not existent market. Consumers need to be innovative to allow the market for this product to be created; they need to accept the new product. In this case the consumer is being innovative by being a consumer of innovation and not the creator[104].

Normann[105] differentiated between 'variation' and reorientation'; variation implying refinements and modifications to existing products and processes, and reorientation implies fundamental changes of the products or processes. Nord and Tucker[106] distinguish between 'routine' and 'non-routine' innovations depending upon whether the innovation produces minor or major changes in products, services or production process in the organisation. Another distinction can be made between 'ultimate' innovations (those that are ends in themselves) and 'instrumental' (those that facilitate the adoption of ultimate innovations at a later point in time). All these categories have been generalised in the terms of radical and incremental innovations. Radical innovations are the ones that produce fundamental changes in the activities of the organisation and represent a clear departure from existing practices. Incremental innovations result in a lesser degree of departure[107].

When it comes to the question of motivation for innovation there are those who think that the market should dictate the course of action and those who believe that the technology will develop a following. According to this, one can differentiate among technology push or demand pull approaches to innovation. The technology push approach is based on the belief that innovation and technological progress can be achieved by pushing the results of scientific research into industry. Technology push is a technology development that is driven by ideas or capabilities created by the innovative organizations in the absence of any specific need that customers may have. Innovations are created and then appropriate applications or user populations are sought that fit the innovation. According to technology push, economic development can be achieved by directly funding scientific research only. The policy can influence this type of innovation by[108]: defining the new problem solution (e.g. state of the art) and thereby accelerating especially its diffusion; making existing solutions more expensive (e.g. through taxes on fossil fuels) or even prohibiting them (e.g. toxic, persistent chemicals); acting as a pioneering buyer (leading customer), who is prepared to pay a high price initially (although the product quality may still be patchy), thus creating the conditions for mass production and learning effects.

[103] Swann (1998)
[104] There is analogy between the consumers innovativeness in this case and the technology transfer in production. In that context the producer accepts technology that is new for the firm, but it has been produced/created somewhere else.
[105] Normann (1971)
[106] Nord/Tucker (1987)
[107] Dewar/Dutton (1986); Ettlie et al. (1984)
[108] Nutzinger et al. (2005), p.38

The demand pull approach assumes that technology development can be driven by user needs and requirements (demand), rather than by ideas or capabilities created by the development organization. In contrast to the technology push approach, demand pull can achieve innovation progress by relying on strong market need alone. The market need would in turn demand manufacture, development, and ultimately fundamental research. This implies the existence of a market for this technology. However there are some reasons that make pure demand pull impractical, there are products for which demand is created after they appear on the market (the need of that innovation is not recognized before the product is available) and it might also happen that because of the long development times that the product appears on the market long after the demand was first recognized.

One can also see the process of learning by doing as an innovation type. Thanks to the knowledge gained in the previous periods of time, there can be cost advantages achieved for the future. The existence of a learning curve shows that the costs for a repeated procedure will decrease in time, because of the past experience. This can influence the market developments by creating "first movers advantage", closing the market for new competitors and monopolization of the market. Government can support learning curve effects by support of the demand for private pioneer (subsidies, regulations) or acting as buyer. One has to be careful not to support monopolization, but at the same time to help newcomers as well.

Lately we can also speak about institutional and socio-cultural innovations. The first one concerning: "changes in the framework conditions (autonomous central bank, regulation regime national plans for sustainability etc.), prevailing especially in the international competition of economic and social systems". The later concerns: "changes in values, lifestyles, consuming patterns, (working) time patterns, needs, preferences etc. in a society"[109].

All these different types of innovation need different approaches from the policy makers and require different instruments for their promotion.

3.8. Technology adoption capacity

Transfer of the knowledge can be achieved through foreign cooperation. The exchange and joint work in creation of knowledge brings learning effects, which in turn enhances the capability of adopting knowledge and innovating[110].

In the developing countries there is relative technological backwardness. The relative backwardness hypothesis states that the greater the relative backwardness, the faster the rate will be at which countries can catch up with the technology level of the leading country through the adoption of advanced technologies invented in advanced countries. Since adopting advanced technologies is easier and less costly than innovation, backward countries attain a high productivity growth rate at the same time that advanced countries have fewer opportunities for high productivity growth[111]. This creates potential for rapid growth, the degree to which this potential is realized depends on its adoption capacity which is the capacity to absorb advanced technologies and adapt them to their own needs.

In order for technology adoption to be operational, however, a laggard country must have a well-developed adoption capacity. The capability of adopting and implementing advanced technologies is described by many studies using different

[109] Nutzinger et al. (2005), p.37
[110] ibid
[111] Kang (2002)

terminologies, like: "social capability"[112], "monopoly barriers"[113], "imitation costs"[114], and "social infrastructure"[115]. Here I use the term "adoption capacity", coming from the policy determinants contributing to technology adoption[116].

The catching up theory states that the realized effect of technology adoption depends on relative backwardness as well as on adoption capacity. The rate of technology progress in the laggard country is positively related to the level of adoption capacity as well as to the degree of relative backwardness. In other words, the higher the adoption capacity of the laggard country the faster the technology gap will decrease. Thus technology catching up is strongest in countries that are not only technologically backward but also in those countries that have policy determinants conducive to technology adoption[117]. If a country caught in underdeveloped position can increase its adoption capacity through economic policies, then this country might move from underdeveloped to the catching up position. Conversely, if a country in the catching up process has a decrease in the level of adoption capacity due to policy failure, then this country might move from the catching up to the underdeveloped position.

The micro foundation for technology adoption function is technology transfer and externalities arising from duplications made in the R&D process. An increase in the investment of human capital in the technology adoption sector increases the ability for adoption and thus leads to higher technology growth. Human capital[118] as factor for technology adoption capabilities approximates the countries technical competence. In addition, endogenous growth models differentiate among two different roles for human capital: it can be used in final good production and in knowledge creation[119]. The openness for foreign competition is additional factor, since the technology transfer is achieved through contacts with the international markets[120]. The investment on capital in the form of embodied technology, if available, might be a good proxy variable to technology transfer as another possible independent variable[121].

Income inequality may be harmful to the technology adoption process because the concerns about social and political conflicts are more likely to lead to government policies that hinder technology adoption. Furthermore, the poor group might be subject to market imperfection and borrowing constraints. Thus, the more skewed the income distribution, the larger would be the share of population unable to finance investments, for example, the investment in human capital as an input in technology adoption process[122].

In addition to the human capital and market openness, important for the adoption capacity are the financial systems. They facilitate the exchange of goods and

[112] Abramovitz (1986)
[113] Parente/Prescott (1994)
[114] Barro/Sala-i-Martin (1997)
[115] Hall/Jones (1999)
[116] Kang (2002)
[117] ibid
[118] Human capital is the average years of secondary schooling from Barro/Lee (1993)
[119] Romer (1991), Dinopoulos/Thompson (2000)
[120] There are two openness indexes used to consider the countries' openness to foreign competition. The first index, Openness is defined as the average value of the ratio of the sum of exports and imports to GDP in current international prices and is from 1960 to 1969. The second index, developed in 1970, Openness (SW) is defined as a dummy variable: 1 for open economies and 0 for closed economies. Since the Sachs-Warner openness includes BMP in calculation, it is excluded from the regressions that consider BMP as a variable15. Fourth, Gini coefficient is included as an approximation of income inequality; Deininger/Squire (1996)
[121] Kang (2002)
[122] Benhabib/Spiegel (2000) investigate the joint effect of financial development and income distribution on growth and investments. Lastly, in order to test scale effects on the technology adoption process, the population size from the Penn World Tables 5.6 is used.

services, monitor managers and exert corporate control and thus the costs of acquiring information and making transactions can be enhanced through developed financial system[123].

The importance of the adoption capacity and the factors that influence it are similar in all countries, regardless of their size or development level. The difference is that in developed countries, which are at the same time assumed to be the producers of technology, the level of adoption capability is high, while in developing countries the technological development lags behind, and thus one needs to adopt the technologies created elsewhere. For them, the policies for building adoption capacity are of great importance. These policies include strengthening human capital, financial development, exchange rate policy, and so on[124]. A higher level of adoption capacity can bring the country in a better position for technological development and competitiveness on the global market, especially important for developing countries in their struggle for moving away from underdeveloped positions, especially considering that if there are policy failures in improvement of the adoption capacity then the country can slide even into bigger underdevelopment.

3.9. Human capital

In order to increase the adoption capacity of a country, the most important factor is human capital. For the technological advances to be understood, accepted and applied there is the need to develop individuals capable of delivering these advances. So, another factor that generates innovation and learning and is important for policy considerations is investment in human capital[125]. This is especially the focus of the endogenous growth theory: empirical investigations have demonstrated the importance of the level of human capital in increasing the level of productivity[126].

R&D is a stimulus for innovation and pushing the technology frontier forwards, as well as helping firms learn where the current technological frontiers actually are; using R&D to innovate and to catch up. Promotion of R&D can be done through promotion of the R&D personnel. Bloom, Griffith and Van Reenen[127] showed that R&D tax credits are quite effective at raising the R&D over the long run[128]. Another solution is given the inelastic supply of R&D workers, may be to drive up the salaries of high skilled R&D workers[129]. In the long run this should have the desired effect of attracting more people to the R&D sector, but in the short run, it will tend to increase the degree of inequality.[130]

Coleman[131] argued that in addition to knowledge, an important part of human capital is people's ability to associate with each other. This ability is based on shared norms and values and willingness to subordinate individual interest to the interest of a large group. Thus, the social aspect[132] of the human capital (social life, norms and trusts, tradition of cooperation with others) is a complex dimension of culture that can influence in positive or negative way the economic cooperation and performance.

[123] Levine (1997)
[124] Kang (2002)
[125] Benhabib/Spiegel (1994)
[126] Sianesi/Van Reenen (2001)
[127] Bloom/Griffith/Van Reenen (2001)
[128] Hall/Van Reenen (1999)
[129] Goolsbee (1998)
[130] Van Reenen (2001)
[131] Coleman (1988)
[132] Putnam (1995), Putnam/Gross (2002), Lundvall (2001)

There are three dimensions through which social capital has been conceptualised and measured[133]. The first is the value system that regulates individual behaviour and it is measured on an individual level. The second is the system of networks and relationships that usually makes economic cooperation more successful. Measurement of group dynamics as a system of networks is complex and we don't have measure available as yet. The third system is norms and trust in institutions and this can be measured on the individual level.[134]

Thus, the policy should be concentrated on the development of human capital, both from the aspect of knowledge building as well as the social aspects of the human capital.

3.10. Intellectual property rights

Schumpeter argued that competition in innovative activity is the driving force of a capitalistic economy. He also asserted that some degree of market power in product markets may be necessary to achieve this[135]. Arghion and Howitt[136] expand on this and argue that competitions in product market as well as competition in R&D activities are likely to promote innovation and growth.

The problem arises in the moment when, under the pressure of competition and as a product of innovative activities, certain knowledge is created. This knowledge has the characteristics of public goods. It is easily transferable and it can be used by more users at the same time[137].

These characteristics create problems for the creator of the knowledge. The knowledge is costly to create, and because it is easy to transfer, it can be used without appropriate payment. Thus, the producers of knowledge are worse off. The protection of the intellectual property can influence the market conditions. An unregulated patent system can obstruct the competition, can create protectionism in the market, and facilitates the market take-overs. For this reason the intellectual property rights (patents, copyrights, trademarks, registered industrial design, integrated circuit topographies, etc.) have been created, to increase the ability of the inventors to appropriate the benefits of their intellectual labour. This on its own creates monopolies, 'winner takes it all' situations.

Intellectual property rights are the key factor in fostering innovation and growth in today's economy. By providing limited ability to exclude others from making, or enjoying benefits of, the protected ideas/materials, intellectual property rights provide vital incentives for research and development leading to new products and production processes, and facilitate the diffusion of new technology or creative works.

The use of intellectual property rights varies considerably across industries and firms. The role of intellectual property in fostering innovation is complemented by other incentives, such as first mover advantage, which exist independently from intellectual property legislation[138].

Recently there is debate about the scope and length of patents and other forms of intellectual property rights. The scope refers to the range of products that can

[133] Putnam (1995), Putnam/Gross (2002)
[134] Sporer (2004)
[135] Schumpeter (1950)
[136] Aghion/Howitt (1997)
[137] Besides the transferability and no-exclusiveness, other public good problems also apply for the knowledge, like: spill-over effects, economies of scale in the production of public goods, the level of geographical homo- heterogeneity of the preferences of the citizens, allocation of the public goods and their financing
[138] Cohen/Levin (1989), Acheson/ McFetridge (1996), McFetridge, (1998)

be considered as violating the property right if used by others but the owner of the rights. The broader the scope of intellectual property protection, the more difficult it will be for other firms to 'invent around' it, and therefore the greater will be the returns to the rights holder. Concerns about too large scope of intellectual property rights reinforce the need for effective competition policy. Creation of substantial market power based on intellectual property rights (strengthened with additional positive externalities) might be significant for network industries[139]. In majority of cases it is doubtful that only because of the existence of intellectual property rights that their owners will achieve significant market power. This reflects on the fact that the scope of the product covered by the intellectual property right is usually smaller than the 'relevant market' in an antitrust sense[140]. The length of protection granted by the patents or other intellectual property rights is also disputable. In the age of knowledge based economy and 'innovation competition" the life cycle of the products is becoming shorter and new innovations are taking over the market at a much faster rate.

The discussions often lead to the conclusion that the intellectual property rights protection was created for another world. In today's age of technology, the knowledge-based economies need new system of protection. The needed system of intellectual property rights is very different depending on the level of development. Developing countries need to copy in order to catch up with the developed, which on the other hand need to stop the copying to ensure adequate rates of return on investment in R&D. A global system needs to be developed which will support the different economic levels and needs[141].

3.11. R&D investment and technology

The level of R&D investments as a variable for innovation can be the innovation policy goal on itself. In order to develop a policy that is going to stimulate the optimal level of investment, the present and past investments have to be taken into consideration. The problem that arises is the assessment of the optimal level of investment. The innovation policies concerned with R&D investments assume that the market does not supply the optimal level of investments, but the state does not have the information to assess the efficiency nor the optimal distribution of the sources for R&D investment. When concerned with the level of R&D investments, some important aspects to be analysed are the productiveness of those investments and efficiency according to type of firms and organisations involved.

The number of patents in comparison to the investments made for acquiring a certain patent gives the efficiency of R&D. For that purpose the productiveness analysis should be done on the investments in R&D in different size firms and the innovation that they produce. "R&D expenditures have been concentrated in firms which are unproductive in its use (80% of the R&D is done in big firms, while only 47% of the innovation is there)"[142]. In addition to firm size, the structure of the firm is also important. The hierarchically organised firms are usually not productive enough. Another inefficiency that occurs besides the location of the resources in the unproductive firms is the general inefficiency in using the computer power. All of these

[139] Church/Ware (1998)
[140] McGrath (1985)
[141] For the developed world those that not obey the property rights system are thieves stealing property, for the developing world those who enforced the system are depriving them from the knowledge they need to develop (they do the same as the developed ones did when they were developing, USA copied the British textile mills in 19th century, Japan copied the American auto and consumer electronic industries in 20th century)
[142] Cowling/Sugden (1998)

have to be considered by the policy makers when making the decisions. Thus, the innovation policy supporting R&D investments should find instruments for general, overall increase in the investment level, without promoting any specific groups of firms, because with the limited information (assuming that the policy makers are bounded rationally), it will not only be incapable of correcting the market failures, it will even bring some regulatory inefficiencies.

3.12. Policy limitations

The endogenous growth theory says that international trade patterns in (free) high-tech markets are determined by comparative advantages, which may be affected by the resources that different countries devote to industrial research (knowledge creation). Whether the comparative advantages really influence the trade patterns would depend on the diffusion of knowledge (degree of localisation of technology spill-over). If the spill-over is global where competitors in all relevant countries have access to any addition to the knowledge pool wherever it comes from, there will be no lasting effect on the trade patterns, and in this sense a national technology policy makes little economic sense (the knowledge will be easily transferred/diffused outside the country, positive externality for the other countries). If the spill-over is national (geographically concentrated), and the knowledge can not be easily diffused, then the national knowledge will be spread inside the borders of the state and bring competitive advantages for that country. In this case national technology policy will make sense, if there are market failures and there is no optimal level achieved. The market is not going to be efficient if there are positive or negative externalities. In case of positive externalities, there will be private under investment, while if there are negative externalities there will be over investment. In both cases the role of the state will be to fix the market failures and provide efficiency. Empirical evidence based on analysis done on semiconductor industry and the aircraft industry on the trade patterns and the role of the national technologic polices show that knowledge spill-over does exist in the today's economy. Studies of the inter-regional diffusion process point to strong localisation of knowledge in terms of geographical localisation and not in terms of sectors of industry. At the same time the international diffusion shows the opposite tendencies. There is a great spill-over across the national borders: leading high-tech centres in different countries to be better linked than the high-tech centres and the periphery in one single country.

The strategic trade theory sees an additional role that the state can play in the technology development. It focuses on the international rivalry for monopoly rents. In the world market there is no perfect competition, and usually there are few producers from different countries that fight over the monopoly rents. Rivalry can bring accidental initial advantages of one firm to high monopoly profits because potential competitors are deterred from market entry by high start-up costs and narrowness of the perspective market. In this case the role of the state might be to support the start ups (newcomers) on the market (national subsidies), and create competition and break the monopolistic position of the dominant foreign producer and gaining some of the monopolistic rents for the domestic market. If the subsidies are lower than the gains in rents then this policy will pay off. Competition on the market will bring competition in innovativeness, and thus, when the state supports market competitiveness it supports innovation as well. In total it is hard to evaluate the results of the technology policy because there are no counterfactual scenarios, though it has been shown that a consortium might help to reduce parallel research.

When analysing the variables for technological development[143], there are two issues to concentrate on. The positive approach brings to the conclusion that all the market economies have policies that are affecting different groups of variables influencing the technological development. The normative approach is concerned with the policies' requirements and their performance. One reason for policy involvement can be found in the idea of market failure, connected with the innovative process, coming from the mixture of private appropriation and public good aspects[144], and the normative approach to this problem does not regard the question if, but how and to what degree policies should affect innovative activities. Another reason for policy can be found in the trade-offs between static and Schumpeterian efficiency. In the complex changing world there is no clear difference between the performance criteria and the link between the policies and the performance.

Whenever state intervention is discussed one has to come back to the question if the state is more efficient than the market. As mentioned earlier, the state should create policies in order to fix the market inefficiencies. At the same time, one has to consider that there are possible government inefficiencies as well. Both have already been shown in the economic theory. The Neoclassical economists explained the market inefficiencies with different types of market failures, giving the externalities as a most often seen type. The government failures have been shown by the equilibrium economics, stating that the economic policies maximise the welfare of small interest groups and reduce the welfare of the majority.

There might be two different reasons for the state not to be able to solve certain problems with its policies. One reason is that the problem cannot be solved by public intervention; in this case no matter what kind of policy the governments use they will not achieve results. The other reason is that the specific state is not capable of solving the problem, which would mean that it needs to develop this capability. This can be done through analysis of the problems and their causes, creation of new institutions and organisations, which will be able to apply new instruments, etc.[145]

3.13. Connected policies

Wide ranges of policies have significant impact on technology development, for example[146]:

- Education and training polices, which are strongly linked to technology policies through their influence on technology-related skills and the fact that research is an important medium for training scientist and engineers
- Policies affecting the investment climate, trading conditions and intellectual property, which have influence on the incentives for innovation and access to technology produced abroad
- Regulatory policies, such as those in the fields of environment and health, which constrain technology choices of regulated firms and the future development prospects of particular technologies.

As a result, policies that influence technology development can have different objectives, which may even be conflicting, and which are likely to change the way in which economic and social conditions evolve. Besides certain policies, other influences on technology development of one country can come from some cultural

[143] Dosi/Pavitt/Soete (1990), p.255
[144] Nelson (1981)
[145] Edquist (2001)
[146] Cannell/Dankbaar (1996), p.4

characteristics, industrial heritage, historical developments, national preoccupations and ideological preferences of the governments. Further difficulties derive from many uncertainties underlying technology policies, including a serious lack of relevant data about the ways in which the firms are responding to the challenges of technology and inadequate theoretical models of innovation[147]

When talking about technology and innovation policies and policies affecting the knowledge-based generation and distribution one has to distinguish between explicit and implicit policies[148]. For explicit policies one can consider the R&D policies and an example for implicit polices is privatisation, but also the impacts of investment policy, monopoly and competition policy, labour market policy, foreign direct investments policy, and regional policy. Tax policy has both implicit and explicit aspects.

The Innovation policy should present a bridge among all these different policies that might influence the innovative activity and the technological development of the country. This policy should try to equalise the conflicting results coming from the different influences and promote the necessary actions in the different relevant policies in order to use them as a support and enhancement of the desired results.

[147] ibid
[148] Dycker/Radosevic (2000), Smith (1994)

4. State of innovation in Macedonia

This chapter tries to explain the present situation in Macedonia. It presents the advantages and disadvantages of the macro economy in the country, with a more intense view on the state of the innovation and the level of technologic development, also looking at the already taken actions in solving the issues of importance for the innovation policy and areas that need further activities.

4.1. Issues connected to innovation policies, arising from the economic reforms and accession

The independence of a country with the change in the political and economical system created big turbulences in Macedonia. These led to the decline of the national economy and breaking apart of the industry, as will be shown in this section.

4.1.1. Basic indicators

The period since the independence of Macedonia (1991) is a period of reforms, both political and economical. The economy has been experiencing a lot of changes, and it still cannot be said that it is stable, with the economic indicators showing a constant changes in the direction of the level of the economic activities. The GDP has been showing increases since 1996 with the growth rate improving from 1,2 in 1996 to 4,6 in 2000[1]. This positive flow was interrupted in 2001 when there was a negative growth of –4,5%, which can be explained with the war going on in some parts of the country. Small improvements could be noticed in 2002 and 2003 (0,9% and 3,2% respectively), but in 2004 there was again negative growth rate. The results that the growth of the GDP shows are signified when looking to the gross fixed capital formation. The lack of investments and the structure of those investments have been representing a problem since the entering of the market economy.

1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
17,4	*17,3*	*17,4*	*16,6*	*22,3*	*19,1*	*20,7*

Table 11: Gross fixed capital formation as % of GDP

In the first five years after the independence there was a much bigger investment in constructions, compared to machinery and equipment. However, at the end of the nineties there was a positive change, and the investment in machinery and equipment increased. This trend changed as in the last years the investments in constructions increased on the cost of the investments in machinery and equipment[2]. That can also be proved with the production indicators, the index of production grew from 49 in 1996 to 53 in 2000(1990=100)[3]. At the same time, although the production

[1] Drzaven Zavod za Statistika (2005)

[2] 2002 the investment in constructions were 51,4% and in machinery and equipment 44,3%, consequently the following years they have been 55,5% and 39,3% in 2003, and 58,3% and 36,7% in 2004

[3] Drzaven Zavod za Statistika (2005)

is increasing, there is growing negative trade balance (from -0,5 in 1998 to -0,9 in 2003). From this, one can conclude that although there is an increase in production, it is still on a very low level, far lower than at the beginning of the transition process and that although there are improvements in the economy they happen with very slow pace and their characteristics are not favorable (no sufficient investments and no export production).

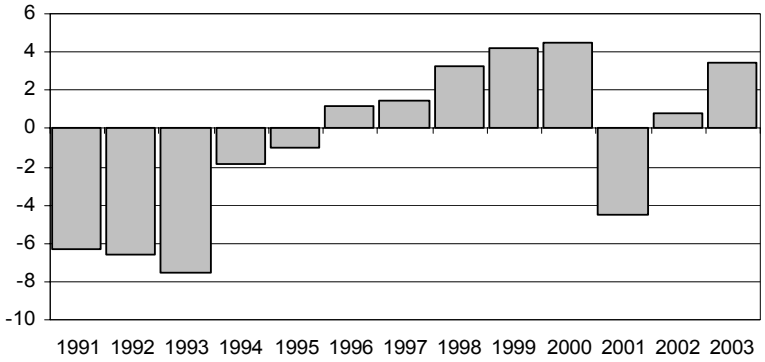

Figure 2: GDP real growth rates in %

The transfer from one to another political and economical system asks for big changes in all fields of life. Structural reforms have been introduced, but there are still those that remain to be enforced so that the legal and institutional framework can be completely functional. Having some remains from the old system stops the functioning of the already “reformed” areas. So, although it is said that the transition process is already deep in the society, that is not sufficient, because there is the need of much faster institutional adaptation and that goes for all the institutions of the society, so that it can all function together. The slow changes in some areas (judicial systems, banking system), do not allow the ones that have been already adapted to the new ways to function efficiently.

There were some steps taken that presented the start up of the process of transition and helped at the same time the economical stabilization of the country during that process. The anti-inflation program introduced in 1993 gave an astonishing outcome. The inflation was 200% when the new national currency was introduced. After the anti-inflation program, followed with a strict monetary policy, the inflation decreased to an average of 7 %, as well as a monetary independence of the National Bank and liberalization of the interest rates. At the same time the budgetary control helped supervise the state expenditures and it was supported with the salary control of the governmental employees. However this does not mean that there was no budget deficit or no need for foreign credits. There are much stronger measures which need to be implemented and bigger reconstruction of the budget so it can be used more efficiently. There were a lot of changes made in the taxation policy as well, including decrease of the tax-base, introduction of Value-Added tax, simplification of the tax system, and encouragement of the foreign investments through decrease of the income tax. The foreign investments have been supported also with the equalization of the foreign with the domestic investors. In the financial sector there are possibilities of greater competition on the market with stronger supervision over the financial institutions. There have been substantial reforms going on in the payment system, which used to be organized through a Central Payment Office and today it is done through the commercial banks. The privatization and the

ownership of the public companies were one of the basic stapes taken, and although this is still in progress, the main part of it is finished.

What is planned for the future is[4]:

- Additional reforms in the monetary instruments
- Development of the capital market
- Support of free competition
- Liberalization of the trade regime
- Change of the custom tariffs and their harmonization with WTO
- In the financial and payment system:
  - Re-regulation of foreign payments
  - Regulation of the creditor-debtor relations in and outside the country
  - Decrease of the banking provisions
  - Issue of bank guarantees
  - Unification of the foreign currencies market
  - Creation of a database with financial data for the small companies.
- The reconstruction of the courts is seen also as a non-delaying task

In total the economy in Macedonia is in depression and it needs a lot of support from the state for its faster recovery. There are some bright points that have to be considered when creating the economic policy and build upon them. It has been more than ten years since the market economy has been introduced in the country, although it cannot be said that it does not have problems, it has to be kept in mind that earlier the economy was driven on completely different postulations, and that the business actors accepted the change to the market rules. That can be seen also through the increase of the number of enterprises in the private sector, which was drastic in the first years of the transition, and now is already stabilized. All those entrepreneurs were willing to work under the new, open market conditions and learn the new ways, and there has been noticeable growth of the small and medium sized enterprises which actually shows their capability for adaptation to the market. Hardest for the business was and still is to connect with the foreign markets, especially for exporting of products, but the situation is improving even in that domain. There is openness and interest for the world market, and acceptance of the international market rules. The individual business connections are getting better and there have been also free trade agreements concluded from the state with different countries, which support further development of cooperation between them.

When it comes to the technology and its level, it must be said that it is not really satisfactory, but there are industries, which do follow the world trends and try to adopt the newest technologies. That can be noticed in the light industry more, because the investments there are considerably smaller than in the other. At the same time the education of the people is on a high level, and there is significant number of researchers in the total structure, which gives hope for the future technological development. There is also high mobility of the population, which can be of great meaning for the further development and transfer of knowledge.

The slow structural changes and inefficiencies of the institutional and legal system, especially in some areas that are closely connected with innovation, do not support its development. But there are features inherited from the previous, socialist system that are supportive for the innovation and can be used in the future in the development of the innovation capabilities. There used to be a functioning system of research institutions, none organizationally linked, with governmental bodies. These

[4] Zarezankova-Potevska (2000)

institutions were mostly part of the universities and were organized as special research centers with big autonomy in their work, as well as some research units in the big industrial enterprises. From this system, there are a lot of elements that do not function anymore (the industry situated research is almost completely vanished) and some institutes lost part of their functions, since the industry was in a crisis and the investment in research was set on minimum, not only did the businesses close their own research units but also the research centers cooperating with them felt the loss by being left without customers. There is traditionally a close relationship of the research in the country with foreign academic institutions (this goes mostly for the university researchers), from which they get a lot of support, especially technical one.

On the other hand, there are much more disadvantages inherited from the old system that still exist in today's innovation and technological development system and make it inefficient. The already mentioned institutions are very rigid, and though there is sufficient number of them, the way they are organized and function does not give too much opportunity for creative work. Often they are overstuffed and with not competent personnel. Although there are connections with the industry, they are not based on some institutional linkages or mechanisms, so at the end that cooperation is not sufficient and the research done is not compatible with the needs of the economy. There is much more basic research done in comparison to applied and even more in comparison with experimental development, which is the one needed from the industry. The innovation culture is on a very low level in the enterprises as well as in the public sector institutions and in the administration, and even when there is innovation, the additional problem is its market application. But although the research and the development have being going through a difficult period there is certain existing base, and there is need for it to be further expanded.

A supplementary problem is the non-existence of major orientation of the administration for taking the innovation as an important factor, if not priority, in the development of the country. As a result of that there is still no developed innovation policy, also the goals to be achieved or the measures for innovation support have not been yet defined.

The total economic policy of the country is based on some mistakes like the constant need and taking of credits from the international financial institutions and favoring the cheap labor as a competitive advantage, and the possibility of development through innovation and increased export production of sophisticated products has never been taken seriously in consideration. Though it has often been mentioned as a way of development, the measures taken did not show support for it, there are only few cases when there are attempts for innovation support, but that is all based on individual ideas and it is far from a development strategy.

4.1.2. Enterprise sector

The biggest change happening in the enterprise sector is the privatization of the public companies. In the previous economical system most of the enterprises were public with small exceptions in the craftsmanship and agriculture. The real start up of the process of privatization was with the enactment of the new "Law on Transformation of Enterprises with Social Capital" in June 1993. The results of the previous privatization with internal shares that was going on for few years before this law was adopted were generally being recognized, but only after a prior audit of official supervisory institutions, authorized by the law to control the privatization transactions made by the previous law. That the privatization is close to its end can

be proved from the facts that from 1216 companies that were to be privatized there are only 85 left, all the others have already finished the process. At the present moment 95,35% of the enterprises are from the private sector, 1,223% public, 1,223% mixed ownership, 0,052% state ownership, and 2,152% cooperative. The small-scale privatizations can be considered completed. The big-scale privatizations are still going on and being supported with the *Action Plan* for privatization and restructuring of the loss-makers, which are mostly large enterprises.

In general the privatized enterprises are still adapting to the new ownership and most of them are doing defensive restructuring, disinvestments and lay-offs, and divisions in smaller units. What exists in the economy is domination of the classical industry, with not enough attention being paid to the modern industries. The industry is characterized with energy intensity, raw materials intensity, lack of research, lack of information, technological import dependency, low accumulation, and high labor intensity.

The technological level of the industry has not improved much since the start of the privatization process. The companies which had R&D departments in their organization or that were investing in any way in innovation, during the privatization process took away the attention from those activities. Although the privatization is over in most of them, new management and organization in most of the privatized companies has still not been established or stabilized. Though the economy is functioning on market principles, it will take more time till the economical culture adapts to the new ways of working. The innovation and technological development will be important for the enterprises when this time passes and they start working on pure market bases. It can be expected that then the old innovation sectors will start emerging again and new ones will be created.

There are cases of companies that are trying to improve their technological position and are investing in new processes and products, or spreading in new markets, but that is mostly without precise development strategy or plan. The development investments are mostly in sales promotion and commercials focused on broadening the market share. But even in that area there are only few cases that show attempts for penetrating new foreign markets, mostly they are concentrating on keeping the already existing market or increasing the share on the domestic one.

The adaptation of new technologies is not one of the priorities of the companies. Mostly it is done on individual basis from the people that are working on the already existing ones and in a process of searching for solutions of the oncoming problems. It is rare that the employees of a company get on-the-job training and that is usually done through the associations of people from specific professions, through seldom organization of some seminars and congresses. The transfer of employees from one job to another is not a usual practice, so the knowledge and know how does not get transferred in that manner. At the same time there is a close cooperation among the companies that work in the same industry. Since the market is small they must cooperate in order to survive, which can be seen as a positive thing, and this cooperation can be stimulated and further developed by the creation of joint projects in the future.

The government in the past years and in the present moment is oriented more towards the restructuring of the economy and preventing the breakdown of the large enterprises and keeping social stability in the country while putting aside the support of the development of enterprises.

4.1.3. Industrial policy

Development of the industry is one of the most important things on the agenda of the state. The analysis of the situation of the industry will show a lot of factors keeping the low level of development, but the role of the state should be the support of the positive ones and interference for minimization of the negative influences. For that purpose the advantages and disadvantages for the industry should be acknowledged and that has been done from a group of scientist, people from the industry and from the administration who in the year 2000 were working on the creation of the National development strategy for the following 20 years.

Level of education	**Labor Force**			
	2004		**2005**	
Total	*842817*	*100%*	*883522*	*100%*
Without education	*9623*	*1,142%*	*7439*	*0,842%*
Incomplete primary education	*42706*	*5,067%*	*48524*	*5,492%*
Primary education	*219184*	*26,006%*	*229419*	*25,966%*
3 years of secondary education	*103591*	*12,291%*	*117693*	*13,321%*
4 years of secondary education	*336447*	*39,919%*	*350776*	*39,702%*
Higher education	*34022*	*4,037%*	*39093*	*4,425%*
University level education	*97243*	*11,538%*	*90578*	*10,252%*

Table 12: Labor force by level of education

According to them, one of the biggest advantages and something to be supported and further encouraged is the level of qualified work force. The education of the population is on high level and there is sufficient number of experts in different fields. The on the job education and training presents a problem hence that should be more encouraged, because the already existing experts are losing their expertise not following the world trends and developments.

The present industry is much more diversified and provides a lot of opportunities. Another positive characteristic is the natural resources that give a foundation for development of certain industries. Some of the natural resources that can be considered in Macedonia might include: the climate and hydrological conditions, agricultural land, and the mineral resources. There is a broad network of traffic and telecommunication infrastructure inherited from the past that is necessary for the industry, which can also be considered as a resource.

Doctors			Masters			Specialists		
2001	**2002**	**2003**	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**
68	*51*	*59*	*144*	*87*	*61*	*12*	*9*	-

Table 13: Number of graduated students in postgraduate studies

Apart from these advantages of the country on one side, on the other side are the disadvantages that exist. Macedonia is a small country without sea exit, that makes the contact with foreign markets much harder, adding expenses to the work and that closes the enterprises in their business activities on a very small market, limiting the use of economies of scale and which present a big disadvantage for growth and development. The capital supply is also a problem, because the domestic capital accumulation is very low and that keeps the investment and innovations down and creates constant need of foreign capital. An important disadvantage of the economy that the experts see is the technological non-development. The general situation in the industry is the use of very old technology with a use of a lot of raw materials and a lot of energy, and the stagnation in the reality can be traced back more than 20 years, which presents a big period for the development of the technology, the only positive light can be seen in the general computerization but the equipment used is mostly from foreign producers. There is almost no production of machines in the country and the only exception in this field is the production of apertures for domestic use or production of process equipment produced with given specifications, which proves the need of innovation in the enterprises. Besides the import of production equipment, there is a dependency on import of energy: oil and gas. The huge unemployment has been addressed as the biggest problem of the industry very often. Macedonia has very high unemployment rate and it has been increasing (2003 it was 36,7%, 2004-37,2% and for 2005 it is expected to be 37,4%). A substantial amount of the national income goes on to the support of the unemployed.

Looking in the situation of the capital in the country, the picture is also not positive. The capital funds are on a very low level of development, the fixed capital is aged in the sense of technology. Since it is very old, most of the fixed capital has already been amortized and should have been replaced long time ago. The way the fixed capital is structured in total is also not favorable in view of technology, since it consists of very old technology not adjustable to new and modern processes in use and its distribution is not efficient among different industries. All this gives a very low economical value to the fixed capital. The investment is also very low hence the above situation is not improving. The biggest reason for the low investment is seen in the low capital accumulation, although there is existing “hidden” capital from the individual savings, but since there is general disbelieve in the banking system, this capital can not be accumulated so that it is further invested in the economy. The investments made are most of the time additional support of the already existing projects, and there is no sufficient investment in new projects or in new companies. On the other hand even the investments made show low efficiency rates and even the existing capacities are not used enough. Till now there were no institutions built that will support and help in the investment process.

Achieving the following goals has been stated, from the countries experts, to be of a strategic importance[5]:

[5] MANU (1997)

- higher level of total savings
- activation of the "hidden" savings from the population
- financing the investments with a modern instruments of the capital market
- encouragement of foreign investments, mainly through direct investments and joint ventures

4.1.4. Small and Medium-Size Enterprises policy

Small companies present an important production factor in Macedonia. They are 99,2% of the all the companies and employ no less than 49% of the totally employed population. Based on the structure of the Macedonian market for goods, the main share of output (more than 45%) derives from small and medium enterprises[6].

	% of SMEs from the total number of enterprises	% of SMEs from the total number of employee	% of SMEs from the total turnover
EU (2000)	*99,8*	*66,3*	*54,5*
Macedonia (2003)	*99,2*	*No less than 49%*	*45%*
Slovenia (2000)	*99,7*	*64,2*	*n.a.*

Table 14: Participation of SMEs in the economy[7]

In the beginning of the transition process the SMEs were completely left on their own. Although in the first years there were a lot of new companies established, from those most were SMEs, but there was not much support or consideration for them. For the first time with the Macroeconomic policy of 1996 and 1997 the role of the Small and Medium-Sized Enterprises in the development of the country has been taken into consideration, with the priorities set for[8]:

- Creating conditions for more efficient work and faster development of the SMEs
- Adaptation of the acts which regulate the functioning of the SMEs and make the procedure for their work simpler
- Opening of agencies and consulting centers for SMEs
- Decrease of the profit-tax rate for SMEs in the industrial and agriculture sector and in the craftsmanship
- Decrease of the tax-base in case of reinvestment
- Regress in credit interests from the budget sources in the private sector, in the industry, craftsmanship, agriculture, reconstruction, modernization and for reinvestment in new objects,
- Use of credit lines from foreign financial institutions
- Adaptation of the enterprises' classification according to the classification of the EU
- Grounding of incubators

[6] European Reconstractuon Agency (2004)
[7] ibid
[8] Zarezankova-Potevska(2000)

- Encouragement for the grounding of consulting centers for SMEs
- Organizing industrial zones
- Governmental guarantees for use of foreign credits

As it is in any country, one of the biggest problems for the SMEs is the financing, and furthermore in Macedonia there are some specificities which make the financing even harder. It starts with the general disbelieve in the banking systems, so the capital accumulation is not done through the banks. On the other side the banks show rigidity in their working so it is hard for the SMEs to use them as a source of financing. There is no cooperation between the banks and the SMEs and that comes from the fear of the banks to invest in them. There are no credit guarantees and the interest rates are too high, normally the banks ask for a mortgage as a guarantee for the credit and a big participation, they ask for sophisticated investment programs which for the SMEs is hard to prepare on their own, so it is too expensive for a SME to take a credit under the general rules. At the same time there are no institutions, which are specialized for financing small enterprises.

	2000	**2003**
Number of SMEs	*32759*	*32700*
Number of SMEs on 1000 people	*16,4*	*16,4*
Percentage of SME in the total number of enterprises	*99%*	*99%*
Percentage of micro enterprises in the total number of enterprises	*92,3%*	*95%*
Percentage of small enterprises in the total number of enterprises	*5,9%*	*3,9%*
Percentage of medium enterprises in the total number of enterprises	*n.a.*	*1,1%*
Average size of enterprises – number of employees	*n.a.*	*4,9*
Percentage of SMEs in the GDP	*n.a*	*45%*

Table 15: Information on enterprises in R. Macedonia[9]

The organization of the work in the companies is also a big problem. Inexperienced managerial personnel with not enough sources of information and knowledge do not have the power to organize efficiently. There is no constant quality and production. Not standardized products and procedures represent a big setback in the development of the companies. A lot of them are adapting to the present market situation, without having some medium- or long-term plans.

Additional problems concerning the innovation process in the SMEs are the sources of information or innovation. A small company does not have the ability to invest and work alone on new products or processes like the big ones. They need support from outside the company (organizational, financial and technical support). Public institutions and private consulting companies may give this support, but both are missing, with the exception of few areas in which there is SMEs support at the present moment in Macedonia and that is in the development of business plans and information about financing possibilities.

[9] European Reconstractuon Agency (2004)

There is no specific form of organization of the SMEs in Macedonia, mainly because of the lack of public support for them. The companies do not cooperate too much with the Chamber of Commerce; which is mostly seen as a non-functioning institution and as an institution that exists only for the "big" ones. There are few association of industries, mostly industries in which most of the subjects are SMEs and where they feel the need of cooperation, but that is all still in the starting phase.

The most successful sectoral cooperation is the association of the milk and diary products producers and retailers of the products in the supermarkets. The success of this association is based on the big financial and technical support they got from the USAID program. They even created their own sign of quality, which represents quality standardization for their products. They also are active in other areas such as opening a joint laboratory, developed a draft instruction for purchase of milk by quality grades, encouraged higher quality, lobbied for all current problems in the industry, visit of foreign producers, getting information about new technologies, promote the increased sale of Macedonian made meat and dairy products, and introduction/presentation of their association and the companies that are part of it to new markets[10].

There are different institutions being created in order to help SMEs. *NEPA* (the Macedonian Agency for SMEs) organizes trainings, gives information on different sources of financing and has itself a small credit line specialized for small enterprises which can be used for development projects. NEPA helps in the establishment of business contacts with companies from different European and other countries, gives consulting on the possibilities for infrastructure for the working facilities and helps in the creation of the company's profile (marketing definition, strategy, promotion, presentation) and business plan. They are spread all over the country, through their regional centers and have the closest relations with the SMEs, so most of the other support programs for SMEs is executed with their help. They have been limited in their work mainly because of the limited financing and lack of security for the duration of their project.

In 2003 NEPA has been made part of an *Agency for promotion of entrepreneurship in Macedonia* (APPRM). The goal of this agency is to create a favorable economic environment and legislation; create and develop an institutional infrastructure for the support and development of entrepreneurship and competitiveness in small business; implementation and coordination of SMEs support, promotion of entrepreneurship; implementation of the Program on measurements and activities for support of entrepreneurship and creating competitiveness in small business. It offers non-financial (business networking collecting, processing and delivering information; organizing specific training and consulting; organizing panel discussions, conferences and business forums; implementing cooperation programs with particular countries; and implementing other national development projects) and financial services (co-financing arranged projects for the needs of the Agency; co-financing of development projects; co-financing of postgraduate studies in the field of entrepreneurship)

The further creation of some institutions for support and help of the SMEs can be noticed, like the *Business-information Centre* organised by the Chamber of Commerce (with a data base of the interested SMEs, connected with the same sort of centre in Bradford, U.K. and with the Dutch government). The Chamber of Commerce has also Informative systems in the framework of the Central-European initiative, but the use of these services from the SMEs is too small or even almost

[10]http://eni.interliant.com/ENI/jssuccess.nsf/413a058054decf3b8525664e00696631/7f92273765aac0ad862569bd0068c7b7?OpenDocument

non-existent, mainly because of the rigid structure of the Chamber of Commerce which is still working by the old-fashioned methods and waiting for the reconstruction and institutional changes, and not trying to get SMEs' attention.

Another form of an institution for the support of the SMEs are the *Enterprise Support Agencies* (ESA). The ESAs were originally set up by the UK government's Department for International Development (DFID) with the goal of operating without the benefit of any subsidy or direct financial support in the future. There are three of them in Macedonia, located in Ohrid, Tetovo and Gostivar; and there mission is to assist the establishment and development of SMEs, to increase the economic prosperity of the regions themselves and the country as a whole. They are focused on meeting the needs of local businesses, and the creation of best practices in customer service, ethical standards and equal opportunities for all. They offer services such as business counseling and advice, business planning and review, business management training, business information service, investor services; work with other agencies on projects to influence the state policy and practice; they also support the creation of networks through business clubs, newsletters, business issues seminars, local trade fairs, trade missions.[11]

There is also *The Macedonian Business Center,* organized by the USAID as a project for support of the SMEs, which gives all kind of services, accepts financing. They organize seminars on management, financial support, marketing researches, quality standards, production and financial management, international accounting standards, helping in the creation of business plan, marketing plan, organization of the working… etc.

USAID also created a savings house *Moznosti* that is working only with small loans for SMEs and for startups and is the only institution of this type in the country.

Other ways of organisation for help and of the SMEs have been incubators. There were few attempts for their organisation, there are 7 of them existing in the country, organised and supported by different institutions ("British Know-How Fond" and "The Macedonian Agency For SMEs"), but their success still has to be proven. But besides this there is almost no regional connection among the SMEs, no organising in clusters and the cooperation with the bigger enterprises is just starting to build up.

The existence of all this institutions shows that there has been a lot of work done for the SMEs, but they need constant support from the state and it will take time untill they learn and adjust to the market economy. There is a need of additional changes in the system, which will allow them to go through this process of adaptation faster and easier.

The state is supporting start-ups also through the reduction of the profit tax from 30 to 15%, through the exempted from profit tax for the new companies in the first year of working and faster amortization of the fixed capital being accepted, which makes the taxed base lower[12].

Next planed step towards the help of SMEs are[13]:

- Help in the entrance to the market
- Services and information on export-import activities
- Finding business partners for production cooperation and investment
- Knowledge transfer
- Fears

[11] www.esa.com.mk
[12] http://www.finance.gov.mk
[13] Zarezankova-Potevska (2000)

- Education of personnel on working in international markets
- Special financial assistance
- Help with achieving of quality of the products
- Management and marketing research
- Research and development support.

What the SMEs are getting from all the different organizations for their support is mainly training in the preparation of a business plan, basic management training and information or help in the financing. There is almost no support in areas that can be connected with the innovation process in those enterprises. In the last period the first attempts for some sort of technological support are starting although still with no results. The SMEs have no contact with the new technology and as everywhere they are the last ones to get the most modern technology. The problem in Macedonia is that there are no institutions which would help them, even at least with the basic information on where and how they can find possible sources of information that they need and there is even less of institutions which would offer the information on products and processes that exist in the other more modern and technologically developed countries. That is why the technology transfer in the country among the SMEs is based on personal knowledge, which is most of the time knowledge about already outdated technology.

A seminar was organized by NEPA on the problem that the SMEs face. The result was a clear acknowledgment of the barriers they face in their daily work, as given:

- *Administrative problems, like:*
  - *Procedures for registration of a company*
  - *Getting licenses*
  - *The bureaucracy is too big, and too slow with unnecessary procedures, losing time by waiting on counters*
  - *Unclear and long procedures*
  - *Unclear responsibilities*
  - *One has to go from one place to another several times*
  - *The local offices of different ministries are not coordinated with their central office*
- *Legal problems, and among them:*
  - *Unclear laws with double meaning*
  - *Not functioning of the Courts (too slow)*
  - *Problem for administration, banking and financial discipline*
  - *Bankruptcy procedures*
  - *Not strong enough laws for insuring financial discipline*
- *Financial problems, like:*
  - *Not enough offered capital on the market, especially for credits for variable capital*
  - *Too high interest rates*
  - *Bad policy of the banks towards the SMEs*
  - *No efficient and non-transparent banking procedures*
  - *No credits for start-ups*
  - *Non existence of a public guarantee fond*
  - *Too high and expensive guarantees for credits*
- *The problem of gray economy, taxes and duties are:*
  - *High duties*
  - *Unequal duty policy for all participants in the commerce*
  - *High taxes (VAT, income tax)*
  - *Too high personal income expenditures*
  - *Unequal treatment of the participants from the inspections*
- *Other problems are also:*
  - *No clear national strategy for development of SMEs*
  - *No law for SMEs*
  - *No guaranteed buy-out prices for certain products*
  - *No public intervention in the agriculture*
  - *Not enough activity from the companies in their organizing in business associations*
  - *Non-existence of a Chamber of commerce for the SMEs and the existing Chamber doesn't take care of the SMEs.*

Figure 3: Problems faced by SMEs

4.1.5. Industrial R&D

Traditionally through the years there have not been big investments in scientific and research activities as part of the GDP. The highest it reached was 1.5% and that was in 1975. In the period 1985-86 it was 0.3 %. In the period of transition this trend has not changed and it did not increase more than 0.5 % of the GDP. The number of researchers has been increasing with the notice that it has been mostly concentrated in the universities and other educational institutions, which takes the research away from the market needs[14].

Sector	Total	Business sector	Government sector	Higher education sector
Ph.D	*979*	*6*	*197*	*776*
M.Sc.	*404*	*6*	*135*	*263*
Specialization	*232*	*15*	*16*	*201*
University degree	*460*	*30*	*179*	*251*
Non-university degree	*40*	*-*	*20*	*20*
Secondary degree	*341*	*10*	*182*	*149*
Other	*133*	*-*	*100*	*33*
Total	*2589*	*67*	*829*	*1693*

Table 16: Number of persons in R&D in 2003

The proportion of 8 researchers per 10 000 inhabitants is favorable in relative terms compared with other more developed countries[15]. Although there have been relatively satisfying number of research institutions and personnel, what can be noticed is that they have not been working on significant projects. Another striking notice is that the part that the technical sciences take in these projects is very small.

Most of the costs of the research institutions are for current expenditures and the investments are mostly done by the government and the sector of higher education. It is observable that the business sector investments are far behind the ones done by the government, which shows that the business has still not been showing too much interest and capability for research. On the other hand though the governmental and higher education sector invest in research, the investments in instruments and equipment is not sufficient. The research equipment is not always on satisfactory level; there are only few institutions that are well equipped. The investment in new equipment is not high enough; only 4 % of the research and development resources are for the procurement of high-tech research equipment[16]. This shows that these institutions are only surviving the period, and not trying to go forward. It is understandable that they cannot do research and follow the modern trends of the technology when the equipment that they use and work with is old and outdated.

[14] Popovska (2000)
[15] Atanasovska (1994)
[16] ibid

Sector	Type of costs							
		Current expenditure			Capital expenditure			
	Total	Total	Labor costs	Other current expenditures	Total	Buildings and land	Instruments and equipment	Other
Total	*565984*	*513711*	*299449*	*214262*	*52273*	*31237*	*20152*	*884*
Business sector	*7294*	*7294*	*6197*	*1097*	*-*	*-*	*-*	*-*
Govern-ment sector	*352518*	*337621*	*187981*	*149640*	*14897*	*8939*	*5086*	*872*
Higher education sector	*206172*	*168796*	*105271*	*63525*	*37376*	*22298*	*15066*	*12*

Table 17: Expenditure on research and development by sector of performance and type of costs, 2003

The state is supporting R&D particularly in the fields of basic research, mostly through education of young researchers, research and development infrastructure, and international scientific cooperation. The government invests mostly in basic and applied research; and at the same time the business sector invests in experimental development, specifically in the engineering. The good sign is that the higher education institutions, which are at the same time the biggest public research institutions, have done a lot of project where the subscriber is a business enterprise, which shows the interest and openness for cooperation. This cooperation might be also seen as a lack of other institutions compatible for that work.

Most of the researchers are at the universities, whereas small numbers are in the institutes, and almost non-in the industry. The old regulations were motivating for the companies to have research sectors or units, with tax benefits, scientific titles, etc. With the privatization process and changes of the legal environment, the motivation was destroyed; most of the big research units were degraded and the best researchers left the companies and opened their own companies to use their knowledge, but rarely participated in any further research activities, becoming managers rather than research workers. In a situation where the research and technology development or introduction of new technology is left to the universities, there is no motivation even for the university scientists to continue their work. Their regular funding is being cut for the amount of funds they receive additional for their scientific work, so at the end they end up with the same level of financing, no matter if they have or not any scientific activity as part of their work. The above setup brought the innovation system to a locked situation.

Sector Field of science	By type of activity				By subscriber				
	Total	Basic research	Applied research	Experimental development	Business enterprises	Ministry of science	Ministry of education	Other ministries	Other
Total	***301***	***83***	***147***	***71***	***55***	***174***	***4***	***17***	***51***
Natural science	-	-	-	-	-	-	-	-	-
Engineering	*92*	*23*	*35*	*34*	*18*	*62*	-	*2*	*10*
Medical science	*66*	*8*	*48*	*10*	*35*	*18*	-	*4*	*9*
Agricultural science	*42*	*2*	*36*	*4*	*2*	*34*	*4*	*2*	-
Social science	*47*	*14*	*22*	*11*	-	*17*	-	*2*	*28*
Humanities sciences	*64*	*36*	*6*	*12*	-	*43*	-	*7*	*4*
Business sector	***43***	***-***	***43***	***-***	***43***	***-***	***-***	***-***	***-***
Government sector	***124***	***43***	***44***	***37***	***-***	***58***	***4***	***15***	***47***
Higher education sector	***134***	***40***	***60***	***34***	***12***	***116***	***-***	***2***	***4***

Table 18: Finished projects by sectors, field of science, type of activity and subscriber, 2003

Without research and development, the industry in Macedonia is not being substituted with technology transfer. Without policy on transfer of the knowledge and technology, it is not done systematically but rather sporadically on individual present need bases. The problem is that this does not create self knowledge and accumulation, but it continues with the import of random technology, mainly financed from credits. The main form of transfer of technology was buying of licenses, but without any selection. There have been cases of buying licenses for products that haven't been protected at all on the territory of Macedonia. Most of the license agreements have restriction clauses (about 94 % of them). It is usual for the companies to regulate the license buying with contracts for long-term production cooperation, business-technical cooperation, technical support and similar ones. Most of these contracts are characterized with the following negativities[17]:

- Use of wrong terminology as a result of a lack of professionals in the negotiations
- Having contracts that are not understandable and too big, with clauses that are not of benefit to the domestic contractor
- Losing of the specificity of certain kinds of contracts to the point that they become a type of technology transfer contract
- Mostly buying a non-patented technology which can be treated as old technology
- High risk for the buyer of the non-patented technology, since 60 % of the contracts for technology transfer are on know-how or licenses on trademark, on which the duration is not limited. Know-how is protected as a production business secret, but it can be threatened if a third party gives patent application which is similar with the know-how of that technology
- Orientation for certain technology is done without the use of patent and scientific information, mostly on the basis of commercial materials, and there are also a lot of cases where the data is received even after the contract has been concluded
- The number of restrictions has been decreasing, but probably the restrictive business practices continued through buying of raw materials and repro-materials and through the payment practice. Those are regulated with annex contracts
- The most usual restriction practice has been the limitations on export, secrecy, change of the technology purpose, obligation for raw materials supply etc.

The level of technological development is strongly influencing the competitiveness on the foreign markets. Many of the Macedonian products do not satisfy the criteria for the international product quality standards (ISO 9000), they are based on the old technology used for the production, as well on the non-existence of the institutional solutions for regulation of the product standardization. There is dual quality of the products developed for domestic and foreign markets. The goal is to avoid this dual quality and orient towards the development of products with high and standardized quality. Thus, the economic program suggests the following measures to support the export oriented economy, which on the other hand might be seen as an additional stimulus for innovation and further technological development[18]:.

- Creation of a bank which will give credits for export activities and give guarantees

[17] Popovska (2000)
[18] MANU (1997)

- Completing the institutional framework necessary for the support of the export activities (creation of an institution for measurements and precious materials, for protection of the intellectual and industrial property, attests of quality, etc.)
- Improvement of the techniques of the market competition by creation of the information centers
- Taking part of international development programs and projects
- Organized strategy for export promotion and for entering foreign markets
- Development of the telecommunications and infrastructure, etc…

In the economical strategy for the next 20 years made in 1997, it is acknowledged that the scientific research is not on a satisfactory level. There was:

- Backwardness of the development of the inventive personnel
- Relatively small number of researchers, specially small number of young researchers
- Not compatible distribution of these personnel according to different scientific areas and institutions
- Reduced financial input in the scientific research, in building of the research infrastructure for faster transfer of the scientific knowledge from the more developed scientific research centers
- Low level of participation in the international scientific community and approach to additional financing
- Low level of communication between the scientific research institutions and the industry
- Small number of researchers in the industry, there is not enough motivation among the management for investment in the research and development

The number of research personal was expected to grow from 4 to 4.5 % and that in 2020 the number of researchers will be 18 per 10.000 citizens. It was said that there is the need of inter-institutional and inter-sectored cooperation, and that it is expected that the biggest increase of the number of researchers should be expected in the research units organized by the industry. Financing of the scientific research is set in the period till 2020 to get to 2.5 % of the GDP. Scientific research from public interest will be financed from the state budget. There should be also more investments coming from other sources, mostly form the industry, especially for the financing of applicative and development projects.

The striking characteristic of the economy is the legacy of fixed capital and equipment. In some industries it is years behind the world technology. That makes competing on the world market impossible. The biggest companies, which are supposed to be the carriers of the technologic progress, are in the worst technologic situation. The existing equipment is in general imported. The researchers have been neglected, and the number of researchers is on non-satisfactory level, with the fact that more than half of the research is not in the technical fields.

4.1.6. Financial markets reform

Privatization and restructuring of the banking system is still on its way and this delay does not help the development of modern forms of banking. The capital market being undeveloped does not give the possibility for long-term financing and in that situation the banks are left as the only source of long-term capital.

The banking system does not always support the changes in the business sector and the enterprises' development and introduction of innovation, such as investment banking or venture capital funds. It relies on the traditional banking services. SMEs financing as mentioned earlier is also not in a better situation, starting from the rigidity towards the SMEs, high interest rates and strong guarantees required.

Banks have more weaknesses as:

- low quality of credit portfolios
- under capitalization
- high operational costs

Obstacles that make the capital market harder to develop are:

- No liquidity and competition in the banking sector
- Not satisfying the necessary institutional, legal and regulatory conditions for the effective functioning
- The companies are controlled from insiders (management, employees) and it is natural that they avoid sell of their stocks and do not take too much care of the interests of the outside stockholders

There was no suitable legal framework for forming of investment funds and other financial intermediary institutions on the financial market. Thus, there are almost no investment funds. The only big form is the Public Pension Fund that is itself in financial crisis. Other investment funds are supposed to have the conventional purpose of activating the savings of the small investors and diversification of their portfolios, but they are still not activated.

4.1.7. Fiscal/tax policy

All the allowances that count for all the companies go also for the innovative ones, but there are no special ones developed for them, which shows that the importance of these sectors has not been noticed yet.

There is a fiscal support for creative companies in the sense that the accepted "norm" costs are between 25% and 60% depending on the activity.

Attracting foreign investors is done via tax reduction for the companies that have foreign investments, but this is in no way related with their investment in the technology transfer or development. Macedonian investment legislation allows equal rights to enter and exit businesses and they provide adequate investment protection to both domestic and foreign investors. Macedonia has liberalized foreign exchange regime, which allows free transfer of profits and repatriation capital.

Tax incentives are given as decrease of the tax from 50 % for the new entities, entities that for the first time do commercial activity, and the calculated tax will be decreased for 50 % in the first year in which they will show profit, under the condition that they continue the activities minimum 3 more years after the year they used the tax benefits, which should stimulate the starting of new economic entities.

There have also been increases in the accepted norm costs for the income from copyrights and industrial property rights with the purpose of supporting the development of the creative activities and innovation. It has been suggested that the costs of realization of the incomes of the copyrights to be from 25 % to 60 % from the total income depending on the type of property rights, for industries forming with the

creation of models and designs, small plastic, scientific, professional and publishing works, etc. the costs are increased from 40 to 50 % from the total income.

4.1.8. Foreign direct investments

The biggest foreign investors are EU countries, with more than 30% of the FDI in 2003, but in the same year big investments have been done from the CEEC (Central and Eastern European Countries) with 27,2% of the total FDI and from the countries from Former Yugoslavia with 12,3%.

The number of foreign direct investments has been fluctuating during the years. The biggest level of FDI can be noticed in 2001. Considering the fact that the political situation in the country was least stable than (during that year parts of the country were under war actions), the level of FDI is not good representative for the attractiveness of the country for foreign investments. The total level of investments is very low so that one single transaction influences the total result. That is what happened in 2001 when the states telecom was bought by foreign investors.

1997	1998	1999	2000	2001	2002	2003
30902	*112308*	*38079*	*121812*	*449104*	*77812*	*80643*

Table 19: Foreign investments in thousand $

Although there are legally favorable conditions for FDI there are still not satisfying number of them. The main reason is the unstable environment in the country and in the area in the past years, as well as the insecure legal system. For attracting foreign investments it is given that in the entities in which there has been foreign investment there will be decrease in the tax proportional with the percentage

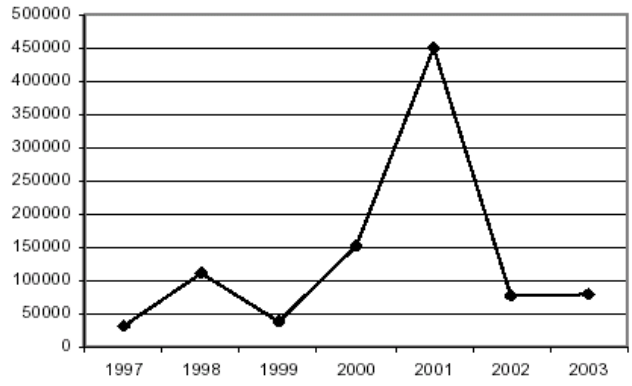

Figure 4: FDI developments

of the foreign capital, under the condition that the foreign capital is minimum 20 % from the total invested joint fix capital. This benefit is for the first three years, under the condition that the user of the benefit works at least three more years after the use of this benefit.

4.2. The innovation policy community

The Ministry of Science and Education, as a responsible body in the government for the development of science and technology, helps in the financing of research projects and in financial support for further education and cooperation projects. The public universities are under the responsibility of this Ministry, so by supporting the universities it helps also the development of the science, and currently works on the creation of a strategy for technological development

The Ministry of Economy is concerned with the development of the industry. Technological, economical and other questions are in the range of its competences, such as: use of the capacities, development, modernization, and application of technological and other achievements. This Ministry also suggests measures in the area of industrial production for the macroeconomic policy of Macedonia, and takes part in the creation of the technological development policy. It follows and analyses the influence of the measures of the economic, fiscal, customs, and export-import policy. Their duty is to help in technology transfer, support in the introduction of quality systems and certificates, support in project preparation, use of consultant services for modernization of the production, adaptation of new products and technologies for technologically clean production and saving of energy, they organize educational seminars on the development of the production and services.

Under the authority of the ministry of Economy is the *Patent office* (IPPO). Their main duties are protection of industrial property and giving services to the interested parties. It gives the following services:

- Researches in the domestic and foreign patent, trademark, industrial design and appellations of origin data
- Gives advices and expert opinions to the companies
- Organizes seminars, courses and workshops of industrial property
- Registers the license agreements
- Keeps the list of registered industrial property representatives
- Organizes presentation of Macedonian inventors to the World exhibitions of inventions
- Issues its own official gazette "GLASNIK".

Part of the patent office used to be the *Technology watch center*, which is giving efficient watch system to the economic entities. This Center gives its services on the base of privileged access to the comprehensive patent documentation of the European patent Organization and the World Intellectual Property Organization, it has access to numerous scientific, technical, economic and commercial on-line data bases, modern electronic library with the complete world patent documentation, offers internet specific services, including collection and treatment of the contained data and preparation of reports related to products, technologies, services, competitors, etc. At the present time this center is closed because of lack of interest for their services.

The main Centers of research in Macedonia are the two state *Universities* which besides their educational objectives, do at the same time scientific activities at their faculties as well at the institutes which are part of the universities. These *institutes* are three in agricultural science, one in technical sciences, two in social sciences and four in humanities: seismological observatory, hydro biological institute, institute of agriculture, tobacco institute, rice institute, veterinary institute, institute of animal breeding, institute of earthquake engineering and engineering seismology, institute of economics, institute of national history, institute of the Macedonian

language, institute of ancient Slavic culture, institute of folklore, institute of sociological, political and juridical research.

As already mentioned the creation of *Technology Centers* at the universities is on its way, with the goal of supporting the research activities. They should offer services on technological consultations, information, transfer of technology, connecting with international institutions and enterprises, financing…etc. At the beginning, these centers are going to be supported from the state, but on long run they should get independent based on the incomes from their services.

Research and development units in the *industry* are much less than what is expected or what exists in the more developed countries. There are only few enterprises that have units devoted to the technology development and research as well as few associations of researchers: Institute of mining and metallurgy at the Skopje mining and steel works, Center for application of radioisotopes in science and industry, mining institute, development institute of the metal processing industry-MZT, EMO-Ohrid energy institute, research and development sector at the Skopje organic and chemical industry (OHIS), research and development unit at the Alkaloid pharmaceutical, chemical and cosmetic industry, Research and development unit within Euroinvest-11 Oktomvri, water management institute, research and development unit at the Skopje oil refinery, research and development office at Zastava-Heroj Toza Dragovic, research and development unit "Ruen"-Kocani, Society of arts and sciences-Prilep, Society of arts and sciences-Bitola, Society of arts and sciences-Kratovo, Society of arts and sciences "Braka Miladinovci"-Struga. These institutions used to do be active in the R&D sector, especially in the applied R&D, but with the changes in the system and with the privatization process they suffered great changes in resources and personnel devoted to their work, so that most of them are hardly surviving.

The Macedonian Academy of Sciences and Arts has also a *Research Center* for new technologies which was founded 1986 with the goal of promoting key areas of science and technology in Macedonia, especially in the fields of energy, informatics, and genetic engineering and biotechnology through research, education and training.

Besides the already mentioned research institutions and governmental institutions concerned with the knowledge development and transfer, there are other actors that are involved in the innovation policy.

Among the other duties and activates of the Macedonian *Chamber of Commerce* are: giving expert assistance to the members of the Chamber in the development of some activities; introduction of new technologies and methods in managing the enterprises; encouraging and coordination of researching and development of technical-technological achievements; ensuring the needed data through an own information system; business information about the important data of the domestic and the world economy, about the development projects, special current information about the credit-monetary policy, taxation policy, customs policy and the market, the technology and the export and import possibilities; and organizing and encouraging of relevant forms for permanent functional training and innovation of the knowledge of the managing and creative personnel of the enterprises.

There are all together 7 business incubators functioning, with 86 companies taking part in them, and 47 of which have already left the incubators[19]. But there is no innovative or technological support for the companies in the incubators, rather they

[19] The number of companies participating in the incubators is based only on 6 of them, there is no info for the seventh incubator

offer specific support in areas such as: international trade and industrial cooperation and promotion, payment and finance of international transactions, project preparation and management, information technology promotion, cooperation of culture; marketing, business communication, business plans, implementation of quality standards; and preparation of promotion material

Different associations (association of Innovators, association of technicians and other engineers) exist. From those, the most active is the *Union of the inventors and authors of technical improvements of Macedonia* (UATIM), which is a member of the International Federation of innovators (IFIA), since April 1996. The Goals and activities of this association are:

- Inducing, targeting and stimulating of inventor innovations and technology development
- Involving in legislation for inventors, rationalizations and innovators
- Giving facilities for innovation work and rationalization activities of youth
- Popularization of invention work
- Cooperation with international institutions in the field of inventors.

Its Goals and activities concentrated on the young researchers are:

- Spreading of science and technical culture among youth
- Discovering and stimulating of talented pupils that have interest for science and technical work
- Developing and care for the processes of professional orientation of young generation
- Supporting of young people to work in the field of technology, science and innovations
- Getting new knowledge and skills
- Stimulating and giving prizes for good results on festivals for young technicians.

UATIM of Macedonia has realized their work through activities in clubs and societies of the union on organization of technical culture, in many factories and Universities in Skopje and Bitola. In Stip it has established a regional centre for inventions, innovations, and rationalization that is in the region of Eastern Macedonia. It organizes traditional annual exhibition of innovations and rationalizations MAKINOVA[20] and is a traditional participant of exhibitions for innovations in Geneva, Brussels, Paris, Rijeka, Zagreb, etc.

Association of young technicians of Macedonia has realized their activity through clubs in primary schools, organization for technical culture clubs and other institutions that are working with children and youth. In clubs for young technicians there are sections for technical sciences: Astronomy, Astronautics, biology, ecology, geography, geology, mathematics, physics, chemistry, meteorology, agro-techniques, ship modelling, aircraft modelling, engineering and architecture, electronics and energetic, electronics and automatics, machine techniques – robotics, cinema and video techniques, radio techniques, rocket modelling, traffic modelling, photography, construction – innovators and computer informatics. In the Republic of Macedonia there are 800 clubs for young technicians. Working with youth

[20] MAKINOVA is a traditional exhibition held in the frame of fair exhibition TEHNOMA, where traditionally are presented the innovations, rationalizations and technical improvements. Every year MAKINOVA has promoted over one hundred examples.

with basic principles of research is done trough free science and technical activities, workshops and courses, science lecture projections, and technical films, exhibitions and other forms.

The most important festival of Association for young technicians of Macedonia is the Competition for young technicians, which is held at the end of the year. Competitions are maintained in several levels, from school and organizations for technical culture trough local government's competitions and the best competitors take the right to participate on nation-wide competition for young technicians. The festival is a competition in which young technicians are defending and competing with their works and models.

4.3. Assessing innovation potential: data collection, surveys and indicators

The main government agency collecting innovation statistics in Macedonia is the Statistic office, a professionally independent government organization. The statistic office collects the following statistics:

- Technical equipment
- Investment in the basic funds in the private sector with technical purpose
- Percent of GDP given for R&D
- Number of persons in R&D
- Finished projects by sectors
- Unfinished research projects by sectors
- Field of science
- Type of activity and subscriber
- Total income from the research and development organization by sector of performance
- Income from research and development activities in organization by sector of performance
- Expenditure on research and development by sector of performance and type of costs
- Technology balance.

The Macedonian Industrial Property Protection Office (IPPO), an agency of Ministry of Economy, regularly gathers patent information. IPPO prepares the patent, trademarks and industrial design records according to the methodology of WIPO. Collected data is published in annual IPPO reports.

New source of information is established by the Macedonian Chamber of Commerce, which through its databases and connections with foreign Chambers of Commerce issues, upon request, information on domestic and foreign companies and on the supply and demand in the country and outside.

4.4. Main developments in innovation policy

The innovation policy did not represent a concern for the government in the past. Besides it being mentioned as one of the areas in which the state should give support in the Economic vision for the next 20 years created in 1995, till now there was not much of a progress achieved. Though some activities can be seen, the technology development policy is in preparation procedure, but there is a constant discussion on which institution should be the responsible authority. There is no

governmental body that will organize and coordinate the efforts in innovation, where a mixture of responsibilities and competences without cooperation gives no result.

The goal of the Ministry of science, which is responsible for science, technology and innovation, is the creation of new institutes, in particular for research in fundamental sciences, the protection of the environment, the development of new technologies and to provide improved library services. The policy of the Ministry is to increase the amount of GDP spent on research and development to the target of 1% and to provide the necessary stimulus for an increased investment by private, corporate and foreign sources. Its aim is to promote further increase in international cooperation, to stimulate international and multinational projects and to invite foreign scientists to spend their sabbatical leave in Macedonia.

For the support of the technology transfer, the following measures have been suggested:

- Defining an evaluation system for verification of the priorities in the import of technology, and stopping the import which is not according to the development goals
- Intangible technology transfer needs to be connected with the tangible, because different consulting, training, foreign experts in different fields can not give the wanted results if that is not connected with specific project of adopting the imported technology, innovation-product or innovation-process
- Special support for the modern forms of technological cooperation. Especially the policy of cooperation with the multinational companies for production of compatible products and technologies
- Efficient license politics, which would have results in the development of own capabilities for the enhancements of the acquired technologies.

It was concluded that one must start from the following criteria:

- Level of techniques of the world scientific knowledge in the specific areas
- Level of development of the specific scientific areas and capacities (organizational, personnel, financial, infrastructure, etc…) for realization of the scientific research
- Expected results from the research and their fragmented and global meaning for the development
- Possibility of application of the results from their research
- Possibility of creation and improvement of the research personnel through the scientific research
- Interdisciplinary and complex research
- Participation of the scientific institutions domestic and foreign and the possibility for knowledge transfer

Priorities are set on:

- Supplying of necessary research equipment in the institutions, especially on hardware and software
- Supplying modern equipment for basic research, specially in the medical, natural-mathematical, bio-technical sciences
- Creating experimental bases (experimental objects, industry, collections of animals, plants, etc…)
- Participating in domestic and international informational systems for on-time gathering of scientific-technological and other information
- Supply of recharge-library information and enrichment of the library funds

As a strategy for technological development it has been said that:

- Adaptation and development of technologies, which will allow Macedonian companies to adapt much faster to the world flows and allow competitiveness and higher productivity and standard. Those are technologies from the modern type which joint with innovative management will be able to revitalize and improve the technological and export possibility of the industry
- Following of improved (modern) technologies in certain areas, which because of their characteristics become crucial for the infrastructure, and not avoidable for taking part in the globalization and the international market. Those are high technologies, which have been developed in the developed countries, and in Macedonia they would be followed and brought in through specific projects.

This would present a mixed strategy, a technological follower with elements of developing of technologies. As part of the strategy of adaptation and development of modern technologies as support for the industry it is supposed that:

- Regulating of the market conditions with legal projects against not loyal competition
- Promotion of the interests of the domestic industry on the new markets through bilateral and multilateral arrangements and cooperation in the banking, financial and economical information
- Organized encouragement of the foreign companies for cooperation with domestic ones, opening of foreign companies, regional offices, representative offices, centers, mechanisms for technology and knowledge transfer
- Creating conditions for different types of partnerships for the cooperation among the buyers and suppliers, in service and production, for small and big size companies, with the purpose of technology diffusion
- Support of interregional and inter-sector diffusion of innovation
- Creating conditions for diversification as possibility for creation and acceptance of the technological improvements in the different areas
- Stimulating production cooperation with foreign companies, for supplying certain parts to the foreign producers, or for buying different prototypes for further development
- Supporting the niche strategies of different domestic companies as a way for faster contacting with the multinational companies
- Support of SMEs in adaptation of modern technologies in the area of computer technology, biotechnology, etc…
- Support of the educational consulting and training, marketing, management, with the purpose of stimulating the innovative activities of personnel from different professions

As part of the strategy for technological follower the following is supposed:

- Participation in the R&D projects of the European Union, for the countries which are not member states
- Participation in transnational and bilateral cooperation's (business, R&D centers, universities, services, etc…), supported with commercial or non commercial contracts for knowledge transfer and its implementation in the practice
- Connecting of successful domestic companies with multinational ones in production programs as "small product of high technology", covered with contracts for long-term production cooperation, joint ventures, direct investments, etc…

Innovation policy, according to the 20 year plan, is supposed to be both supply and demand oriented. This means that it should be influenced by the connection between the R&D institutions and universities on one side and the industry and the market on the other side. The policy for stimulation of the supply of innovation should stimulate the conditions, sources, owners and creators of the innovations, and these should be more and more part of the business and industry, and there should be bigger support for the applicable research, with support for the transfer of the results in the industry. The policy devoted to the development of the demand for innovations can use the public demand and orders for innovation as measure in the areas where the public demand has bigger part in the total demand.

This Plan predicts creation of *National technological (innovation) fund*. The Fund should be used for supply of modern technology, commercial and noncommercial technology transfer for creation of own innovations in the priority productions, employment of young innovative personnel. Also creation of a *Fund for investment in personnel of the industrial companies***,** which would help creation of: knowledge and skills for new production, knowledge of the market and competition, knowledge for technology transfers, as well as opening of services and centers for innovative support and technological parks.

4.4.1. Legal environment

The Ministry of Science and Education prepared a Law for promotion and support of technological development. With this law for the first time the technology development was taken in consideration as an area of interest. It predicts preparation of a program in which the priorities would be set on:

- New technology of products and services, compatible on the foreign markets
- Improvement of the existing products, processes, services and technologies
- Program for technological development according to the European standards

These programs were supposed to be realized from the actors of the technological development: enterprises, research and development organizations, public scientific institutions, innovation centers and technological centers, different organizations whose activities are based on innovation and technological development and other legal and physical entities which do activities in function of the technological development. With the same Law a creation of a data bank is prescribed, where this data bank should contain data on the activities of the technology development, as well as the continuous technological boost of the knowledge.

This same ministry created a working group that is supposed to work on the development of a strategy for technology development. The working group is formed from scientists; mostly professors from the technical universities.

4.4.2. Financial help

What the Ministry of Science and Education does as part of innovation support at the present time, is help in the financing of R&D projects, up to 30 % of the value of the project, as long as these projects are cooperation between the industry and the research institutes (universities), or as long as the leader of the project is a person

that has a PhD. This ministry finances also the building or creation of prototypes, as help for the innovators in realization of their ideas. The financing is done up to 30 % of the total expenses, and the innovator has to have already started the procedure for patent protection in the Patent Office. They help also by the financing of the scientific research of the research institutes that are part of the university, through support of the travel costs, taking part on seminars and other ongoing costs.

4.4.3. Technology transfer support

At the beginning of 2000 the *Technology Watch Center* was established under the Patent Office, which is organized from the Ministry of Economy. This Center is supposed to help the clients in acquiring different kinds of information:

- Getting to know new products
- Recognition and prediction of the changes in the industry
- Identification of the competitors
- Prediction of the possible steps of the competitors
- Getting to know the successes of the ideas of others.

The goals were focused on the change of information habits of the enterprises in order to increase their competitiveness on the world market, assistance in the establishment of a technology watch system within the enterprises by providing advice and education and logistic support regarding the information and its treatment. Unfortunately it never started functioning, because of insufficient support from the responsible authorities and actors involved. It was not given time to promote its services and get closer to the potential market, so as reason for its failure was given that the prices of the services were too high.

The German GTZ (Gesellschaft für Technische Zusammenarbeit) organized a project on technology transfer. The goal is to support the Macedonian government in the creation of conditions for efficient technology transfer. As part of this project GTZ helps in the creation of a National Policy for Technology Development, establishment of Technology Transfer Centres and offers a wide range of services, as well as information in technology transfer. The Ministry of Economy of the Republic of Macedonia is the main political partner of the GTZ TT and it cooperates also with universities, research institutes, chambers of commerce, associations of SMEs, SMEs, consultancies, municipalities, non-governmental organizations, international projects etc. It gives information on: priorities in technology, demands of the enterprises, interests of the Universities, interests of foreign investors, financing possibilities, possible partners; consulting in: assistance in business plan preparation, assistance in strategy development, consulting in qualification and vocational training, providing technical consulting services; financing: national support programs, international financial resources, assistance in access to credits, engineering support in application, assistance in identification of Macedonian companies for external investors; helps in qualifications through: trainings, exchange of experts; networking by sstrengthening of international cooperation between Macedonian companies/universities and international companies/universities.

Currently the University in Skopje with the support from the German GTZ creates *technology centers* as part of some of its faculties. In the present moment centers like these are in process of being created at the faculty for mechanical engineering and at the faculty for agriculture. The idea of these centers is to provide services (Information, education, training and additional qualification, mostly for the

employees in the SMEs), support the scientific research done at the university, attracting the students to do research, easier ways to get introduced to information on new technologies and technologic solutions; giving help to the university researchers in cooperation with the industry, connecting the owner of the technology with the potential user; it helps in building partnerships: forming networks of partners with the goal of information exchange, idea exchange, know-how, know-what, know-why, in the realization of their projects, in marketing and in financing of the projects (information on the financing possibilities, conditions, criteria). In the future, it should have also mediation function and may be functioning as incubator for small innovative companies. These centers should support start-up companies and provide supporting environment in which they can successfully build technologically developed and innovative companies. The goal of the centers is effective application of the results from the scientific research.

4.5. Summary of the state of innovation policy in Macedonia

In the course of transition, the economy in Macedonia has sustained a big damage on the level of technological development and knowledge creation. In the process of privatization, the industrial conglomerates were divided in smaller units. The old, transformed and the newly started enterprises had to fight for survival on the market and for conquering of new markets, since the existing ones were partially lost due to the independence of the country. During this period very little, if any, attention was paid on the technological development, of creation of new products and of innovation in general, so the technological level of the industry decreased rapidly, and the demand for scientific and technical development was reduced. The existing research institutions and innovative procedures in the old enterprises were ruined and new institutions were not built.

Individual mangers of firms have been able to make autonomous market-oriented decision and create strategies for survival. Due to the lack of resources and high uncertainty regarding markets, these strategies were based on improvisation skills and lead to relatively simple, not technology oriented production. As a testament from the old system there is still a lack of demand-oriented production and product development. The SMEs, which were started in high numbers, especially in the early years of transition, did not manage to develop into innovation-oriented enterprises or enterprises that are capable of taking over an important role in the knowledge-centered economic development.

Since the importance of the scientific and research institutions has decreased during the transition, the prestige of the scientific work has also decreased. New ‘elites’ were developed, which did not necessarily include the intellectual elite. The high rate of unemployment and the low resources devoted for knowledge adoption and creation, both in the industry and in the research institutions, pushed a lot of the young educated people to leave the country. The problem of brain-drain visible in most of the transition countries, is of extreme proportions for Macedonia, since with the little population that it has small number of emigrants (and this number has been increasing all through the transition period) have a big impact on the population structure in the country. Assuming that the education system is adapted to the needs of the market (although there is need of changes in the education policy as well), an additional problem for the innovation is the lack of on-the-job and life-long education, for technical as well as managerial skills. This furthermore influences the labor

market structure in the country, and thus the possibilities for knowledge and technology oriented economical development.

The state support for the technology and innovation in the country for too long period was left to the already existing system of direct support for research projects (without demand orientation) and financing of the public research institutions, those that were part of the state universities as well as the 'independent' ones. Since the budget for science and technology development was reduced during the years, the resources devoted for these institutions narrowed down to covering of the operating costs (utilities, wages of the personnel).

As presented before, the policy in the first period of transition was concerned with the adoption of the legal system and privatization and not on the development strategies. Thus the innovation policy was neglected for almost a decade, leaving the state measures in the state they were before transition, concentrating on scientific development and neglecting the technology and innovations. A substantial problem in the policy creation process is the cooperation of the different parties, and this is in various aspects: cooperation between sections of one ministry working on the same problem but not knowing about each others efforts, or between two ministries concerned about the same problem from different perspectives; cooperation between the state authorities and the industry and research organizations concerned with the policy; cooperation between research institutions (universities) and the industry as knowledge transfer sources; as well as cooperation among enterprises and sharing of information for improvement of the mutual situation. The lack of cooperation in the country can be followed back to the top-down approach to the creation of policy that was exercised in the past. The policy is still centralistic, not flexible and not very demand oriented.

After the initial shock, mostly due to the support and consulting from international cooperators, slow advancements have been made in the development of a national innovation system and creation of instruments for its aid. Although belated and still too slow to present a real support for the economy, the creation of certain institutions and organizations for the support of the technological development and innovativeness (in first hand taking over a strategy for technological catching-up) are being created as given before, though the lack of consensus and joint efforts does not allow the creation of long term perspectives and the building and evolution of a national innovation system.

5. State of innovation in Slovenia[1]

For the purpose of analyses of the state of the innovation and the policy measures in Macedonia, this dissertation turns to the same in Slovenia, as a reference country with certain similar characteristics. Thus, this chapter presents the situation in Slovenia.

5.1. Issues for innovation policy arising from the process of economic reform and accession

Slovenia, as most of the other transition countries, went through a period of economic downfall at the beginning of its transition. Specific for this country was the short time it took for it to go over these problems and start showing positive economic results.

5.1.1. Basic indicators

The Republic of Slovenia declared its independence from SFR Yugoslavia in 1991. It has an area of 20.256 km^2 and 2 million inhabitants. The starting point for the transformation was relatively good. Slovenia was the economically most developed republic in the Yugoslavian Federation.[2]
The transition process has brought economical decline. The inflation rate in 1991 went up to 117,7 %, and the GDP declined about -9,3%[3], unemployment rose from 4,7% in 1990 to 14,4% in 1993 and 1994[4]. The loss of linkages among the former Yugoslavian states meant losing the main markets and trade partners which presented additional economical set-back for the new created independent states; this was true also for Slovenia.[5] The trade balance for the first seven months of 1995 shows a deficit of USD 678 million, due to a bigger growth of imports compared to the growth in exports. The balance of payments was slightly negative. The budget deficit in 1995 was with 0.6 % of GDP which is low by all standards.[6]

After the initial economical problems at the early transition phase, the economy of Slovenia had the highest GDP per capita among the Central European economies in 2004 with 19.600 $, compared to Poland (12.000 $), Hungary (14.900 $) and the Czech Republic (16.800 $), while at the same time the GDP per capita in Macedonia was 7.100 $[7]. Other economic indicators did not show the situation as very positive. The GDP growth was 4,2 % (2004) and

[1] The analysis in this section are in large part based on: Bucar/Stare (2001) and Biegelbauer (1996)
[2] Bross/Zenker (1998)
[3] The World Bank (1996)
[4] EBRD (1997)
[5] Bross/Zenker (1998)
[6] The World Bank (1996)
[7] http://www.cia.gov/cia/publications/factbook/rankorder/2004rank.html

2,7% in 2003, 3,5% in 2002, 2,7% in 2001 [8], the unemployment level went down and is was 6,6% (2003), respectively 5,9 in 2002 and 2001[9]. The inflation rate is also lower now compared to 1997 when it was 9,1% while in the year 2003 it was 5,6%. The Gross fixed capital formation was very dynamic and increased from 23,4 % of GDP in 1996 to 28,4 % of GDP in 2000.

The structural reforms (regulatory and institutional frameworks) are widely implemented, however there are still additional steps that need to be made. As legacy from the socialist system, Slovenia has some positive but also negative features concerning the innovation system and capacity. As advantages, one may consider[10]: a decentralized system of research institutions not being organizationally linked to the academy of sciences and governmental bodies; openness of institutes for contractual cooperation with the business enterprise sector; autonomous management decision making; traditionally good linkages with Western academic institutions etc. The disadvantages that that system carried are[11]: rigid research and higher education institutions; overstaffed R&D personnel in some research institutes of previously federal importance; over-emphasized basic research in comparison with the applied research and experimental development; a slow and ineffective innovation system; insufficient linkages and mechanisms between the university based R&D and the socioeconomic needs of the society; as well as deficient innovation culture in the enterprises, in the public sector institutions and the administration further hampered innovation orientation.

The technological development has been addressed as a major priority area for the first time in the year 2000[12]. But even though it was considered as an important area of concern there have not been significant changes in its financing.

5.1.2. Enterprise sector

The basic scheme of the privatization combined different methods of privatization. It foresaw the distribution of the shares of the firms among the state owned funds (Pension fund, Reimbursement/Restitution fund) and the special investment funds for future free distribution to all Slovenian citizens through ownership certificates and to the insiders of the firms[13]. The privatization process[14] was finished in 1998, with certain segments staying non-privatized,

[8] http://www.stat.gov.mk/
[9] ibid
[10] Bucar/Stare (2001)
[11] ibid
[12] EIU (2000)
[13] Stanovnik/Lapornik (1994), p.3
[14] The privatization model in Slovenia was a mixture of free distribution, internal buy-outs with discount and commercial privatization. The majority of enterprises favored internal buy-outs resulting in dispersed internal ownership, which is only recently being consolidated. Heavy loss making enterprises which could not be privatized were transferred to the Slovenian

those being the enterprises of the portfolio of the Slovenian Development Corporation and to state-owned enterprises like the public utilities. In 2001 the government set measures for speeding the privatization process for whatever was left out initially, including plans to restructure Slovenian Development Corporation and prepare the required legal framework for privatization of state-owned enterprises (banking, telecommunications, etc.).[15]

At the beginning of the transformation period, like in other transition countries, there was defensive restructuring of the industry, demonstrated through disinvestment and lay-offs. By the mid-nineties, the enterprises with "concentrated ownership structure"[16] moved on to offensive restructuring, via the introduction of new investments and programs which increased capacities and employment. This led to an increase in the R&D activities. Though this shows positive results in the enterprise sector, the privatized enterprises still stayed behind these developments.[17]

At the beginning of the transition process the government concentrated on preventing the breakdown of the large enterprises (as in Macedonia) and did not pay much attention to the development of the enterprises. This changed to some extent with the State Aid Control Act brought in 1999, according to which it is obliged to follow relevant EU rules. Since the beginning of 2001, the state aid policy changed from redistribution to development orientation, focusing on: promotion of know-how from the research sphere to enterprise sector, on basic and applied research, on industrial R&D, pre-competitive activities, etc.[18]

5.1.3. Industrial sector

The employment level in Slovenia has been decreasing in the first years of its independence, but after the original adaptation period it began to increase. The industrial sector in Slovenia has been changing since its independence and the market changes that the states have undergone. This has been best demonstrated through the transfer of the labor force from the first and secondary sector to the services sector. The most striking change is the reduction of employment in the mining, electric power supply, and the manufacturing sectors and a positive increase of the employment in the education and culture sectors. The change in the employment in the public administration is the result of the Slovenian public administration taking over the functions previously performed by the federal government that was placed in Belgrade.[19]

The economic situation in Slovenia is also characterized by the fact that among all the transition countries, Slovenia has lost the smallest part of its GDP and it has had the fastest "rebound" with stronger growth. This might be a result

Development Corporation (SDC). The objective of the SDC is to restructure enterprises in their portfolio, privatize them afterwards or liquidate in case of unsuccessful rehabilitation.

[15] Innovation policy in six candidate countries: The challenges

[16] Bucar/Stare (2001)

[17] ibid

[18] IMAD (2001)

[19] Biegelbauer (1996)

of the Slovenian industrial capability to enter the western markets[20]. This was easier for Slovenia than for other transition countries, because of the previous long-term business relationships that the country had with Western companies. These relationships were based on a number of licenses and cooperation agreements and it made possible to market the Slovenian products in Western Europe under original brand names (Gorenje, Iskra, Lek etc.)[21].

The most important foreign trade partners for Slovenia are the EU countries (led by Germany and Italy). The Slovenian industry is characterized with products that are from low or medium level of technological sophistication, this goes for the products for the domestic and as well as the foreign markets.[22]

In order to support the industry, the Slovenian government adopted in 1996 a "Strategy for increasing the competitiveness of the Slovenian industry" (it was updated in 1998). On the base of this strategy in 1997, financial instruments were introduced in nine horizontal programs in order to support the enterprises in the international competition. The programs were:

1. Technological modernization and increased role of R&D.
2. Stimulation of the development of small and medium-sized enterprises.
3. Stimulation of companies' integration.
4. Management education and industrial training.
5. Export promotion.
6. Promotion and stimulation of investments.
7. Stimulation of the use of information technology in enterprises.
8. Promotion of environmental approach to business.
9. Harmonization of technical regulations.

Instruments and measures were being introduced on an annual basis. The annual update of 2000 concentrated on R&D, export development and promotion of foreign direct investment. The benchmarking analysis comparing the Slovenian industry with that of the EU and the OECD Member States was done in year 2000 by the Ministry of Economic Affairs and with this analysis, potentials in "promising" industries were identified (e.g. biotechnology)[23].

For the period of 2001-2005 the following elements were seen as the most important ones for the strengthening of the enterprise development and competitiveness by the Ministry of Economy[24]:

1. Increase of competitiveness of Slovenian industry by improving competitive and innovative capabilities of enterprises for successful export activities and promotion of foreign and domestic new investments

2. Increase in the enterprise's investment in technology development and innovation, promotion of development of own know-how and transfer of know-how to Slovenian industry

[20] Biegelbauer (1996)
[21] ibid
[22] ibid
[23] Ministry of Economy (2000a)
[24] Ministry of Economy (2000b)

3. Promotion of entrepreneurship and development of SMEs via establishment of supportive environment

4. Promotion of tourism development and parallel service activities.

For the future, the focus is on the industrial policy to be formulated at the central governmental level rather than by individual ministries, so that there is more coordination among the various programs[25]. The Strategy for Economic Development of Slovenia was prepared in 2001 to supplement the National Development Plan (2001-2006). It contains strategic orientation of Slovenia and key investment priorities.

5.1.4. SMEs policy

Since the beginning of the transition period, for a lot of the large state-owned enterprises, it was hard to adapt to the new market system and instead a lot of SMEs grew. As a result of the restructuring of the large companies, 130.000 people lost their jobs, they found new ones in the SMEs. The employment in this sector was growing and SMEs now account for 63 % of total employment and at least 83% of the total turn- over[26].

The comparison of innovating firms according to size shows that for the period of 1994 and 1996, in the lowest size firms (up to 19 employees) 20% of the firms did not innovate, while 16% realised innovations. In the group of 20 to 49 employees, 34% did not innovate and 18% realised innovations. The share of innovators is bigger for the firms with more than 100 employees[27]. Thus large firms tend to be more innovative, while the small firms, despite their flexibility, lack resources for innovation. However in 2004, 28,4% of the investments in R&D were made from SMEs.

Slovenia created its first strategy for development of SMEs in 1996 and has since updated it[28]. One of the main objectives of these strategies is the promotion of the quality of innovation and of technological renovation of SMEs. The promotion of development of SMEs was a priority in Accession Partnership of Slovenia with the EU and for this purpose an important factor is considered to be the establishment of administrative environment for enterprises. Thus, in 1999 the Ministry of Small Business and Ministry of Labor developed an anti-bureaucracy program in the framework of the National Action Plan for Employment (2000-2001)[29]. Main objectives of this Program were[30]: the significant decrease of the costs of setting up new enterprises; shortening the time required and simplify procedures for setting up enterprises (14 days); elimination of all barriers which prevent faster growth of SMEs; elimination of

[25] IMAD (2000)
[26] http://www.stat.si/eng/index.asp; there have been different numbers from different sources and the division of the firms by size is not always the same
[27] Koschatzky/Boss/Stanovnik (1999); newer information not available
[28] Center for Entrepreneurship Development (2000)
[29] Bucar/Stare (2001)
[30] ibid

discrepancies between individual laws and bylaws; introduction of labor and employment legislation and regulations which provide for flexibility of SMEs and for social security of employees; and development of the "one-stop-shop".

On the regional and local level, there are Small Business Development Centers[31] (SBDC) that are the main support for SMEs, as well as the local and regional chambers of commerce and trade. Having both of these institutions sometimes creates confusion among the entrepreneurs, since their competencies overlap[32]. Furthermore local and regional development centers are still very bureaucratic in their procedures. For the future, the government plans to stop the direct financing of the local and regional development centers, while continuing with financing of specific programs of the centers. The government intends to re-establish subsidized loans and guarantees as an instrument for promotion of SMEs and centralize the allocation of financial incentives to entrepreneurs[33].

With the change of the government in 2000, the Ministry for SMEs was integrated under the Ministry of Economic Affairs. Due to this, the implementation of the already mentioned documents did not go according to plan. Subsidized loans and guarantees- under the regional guarantee funds, which were one of the most important instruments for promotion of SMEs, did not succeed because of the lack of financial resources that were supposed to be provided by the government. In connection with this, the EC Regular report on Slovenia (2000) points that the main obstacle for SMEs development is the access to finance[34].

5.1.5. Industrial R&D

The Yugoslavian companies were working under certain level of competition, set upon them with the constitution from 1974. However, the socialist atmosphere surrounding them influenced the innovation processes in the companies. Thus, science-pushed research and development was dominating, while the demand-pull was neglected. Interactive learning processes and the communication with customers and suppliers, for the purpose of product and process improvement, had a secondary position if they existed at all. This linear innovation model was presented by the high degree of fragmentation between individual innovation institutions as well[35]. These inherited characteristics are influencing the developments in the innovation system in the present as well, making the cooperation among the businesses and the business and the research institution the biggest problem for the innovation policy.[36]

---

[31] It was established already in 1992. In the beginning of 2001, 30 local and 13 regional business centers were included in small business support network which is to become a basis for pursuing the coordinated regional development policy

[32] Bucar/Stare (2001)

[33] ibid

[34] ibid

[35] Dyker/Perrin (1997), Meske (1998)

[36] Koschatzky (2002)

During the privatization and restructuring process of the enterprises, the R&D investment was reduced and a lot of R&D units in the manufacturing were disposed. In 1997, only one in ten manufacturing enterprises had its own R&D unit, on average employing only 10 engineers. Only enterprises in pharmaceutical, chemical, rubber and electric engineering have larger R&D units. While in 1995 only 36,1% of the R&D personnel were employed in the business sector, that number increased slowly in the following years reaching 39,5% in 2000 and 43,1% in 2002 (biggest reduction in share of R&D personnel can be noticed in the institutions of higher education, from 38,2% in 1995 to 32,4% in 2002). Changes can be noticed also in the expenditures made on R&D. Since 1996 the business spending in R&D is more than the governmental ones, and the difference is even increasing: in 2002 business investments represented 59,6% of the total. This increase in R&D spending is positive, however one should keep in mind that many firms, stating that they perform R&D in the different surveys, in reality are doing lower qualified work[37]. Very often what they count as "R&D work" has been found to be marketing, standardization (ISO) procedures or simply the acquisition of new equipment[38].

Importance	Success factor	Mean mark
1.	*Quality*	*7,21*
2.	*Compliance with dead lines*	*6,35*
3.	*Price*	*6,08*
4.	*Flexible response to customers needs*	*5,59*
5.	*Short delivery time*	*5,45*
6.	*Novelty of products*	*4,29*
7.	*Large product variety*	*3,73*
8.	*After-sales services*	*3,27*
9.	*Ecology*	*3,04*

Table 20: Success factors of firms with product innovations[39]

The survey among Slovenian firms on the success factors shows that they valued the quality as the most important factor, this is a characteristic of economy that cannot compete with low prices (like most of the transition economies), because of the high labour costs, but other important success factors for the advanced economies like the after-sales services and the ecology have still very low importance.[40]

In 1994 the Ministry of Science and technology prepared a "Program of support of technological development up to the year 2000", in order to support

[37] Money spent on certain activities often is not investment into R&D, according to the OECD's Frascati manual.
[38] Biegelbauer (1996)
[39] source: Koschatzky/Sternberg (2000)
[40] Bross/Koschatzky/Stanovnik (1999)

the technological development in the period of 1995-2000[41]. In this period the funds available for technological development have been decreasing as a portion of the state R&D budget. This can be seen also through the expenditures structure of this Ministry; where in 1990 the ratio between basic and development research was 70:30, the same in 1990 was 83:17[42].

5.1.6. Financial market reform

The privatization process in the state owned banks has been delayed[43]. This holds back the development of the banking system; the banks are not motivated to provide new/modern products and services to their clients, especially products and services adopted for the needs of SMEs and NTBFs (new technology based firms). The banks stay with the traditional banking services as their core-competence, neglecting the more sophisticated products and services (like investment banking). The capital market is underdeveloped (there is no primary issues of securities), so it is not an option for favorable long term financing[44]. In that situation the banks remain to be the major source, even of long-term, financing for the enterprises.

The problem with the financial sector is the lack of mechanisms, such as investment banking and venture capital funds[45], which can be used to support technological restructuring of enterprises and the introduction of innovation[46]. There are at present four private venture capital funds. The venture capital funds that do exist concentrate on big enterprises, leaving the SMEs without capital for innovation. However, the experts claim that, when venture capital funds for SMEs are established, there should be good results in short time, since the SMEs posses a large number of innovations that they couldn't market in the last period because of the lack of finances, since the credits that are provided by the banks are expensive and demand high guarantees[47].

The reforms done by the state in the finance sector include the Banking Act, the Securities market Act and the Insurance Act, which were adopted in 1999 and in 2000, but their implementation takes time[48].

---

[41] Bucar/Stare (2001)
[42] MST data
[43] The government accepted the plan for privatization of the two largest banks, where the state was the majority share holder in May 2001.
[44] Bucar/Stare (2001)
[45] At present only two venture capital funds exist. But according to financial journalist (Delo, Dec.2000) a number of new Funds are under preparation and are to be launched in 2001.
[46] Bucar/Stare (2001)
[47] ibid
[48] ibid

5.1.7. Fiscal/tax policy

The fiscal system does not provide any special incentives for innovation. The tax allowances relate to all investments, independent of their character. There are tax allowances for innovation only for the enterprises that are within the technology parks, but this is not sufficient since the innovation goes beyond the boundaries of the technology parks[49]. The Chamber of Commerce is supporting the introduction of special tax incentives for innovations[50].

A fiscal set-back for innovation was the introduction of the value added tax in 1999[51]. The R&D sector was not exempted for the 19% general value added tax rate, as for example education. This increased the price of the services that the R&D sector provides to the industry, thus interfering in the cooperation among different participants and affected the innovation process.[52]

Regarding the personal income tax, the tax base can be reduced up to 3 percent for school fees, voluntary financial contributions and donations for scientific and research purposes and the funding earmarked for the founding of science and research institutions[53].

5.1.8. Foreign direct investments

By the end of 2000 the foreign direct investment (FDI) stock in Slovenia totaled USD 2,808.5 million. The largest investors are the EU countries that at the end of 2000 had no less than 84% of the total FDI stock, with Austria leading with 45,6 percent share, followed by Germany and France. The biggest FDI are in manufacturing industry: paper manufacturing, motor vehicles, chemicals and chemical products; these have been closely followed by the services: banking, trade and business services.[54]

The importance of the FDI for the Slovenian economy has been increasing. Case study analysis[55] of the impact of FDI on local enterprises with foreign ownership show the positive changes that the existence of FDI brought into the economy, such as improvement of product quality, which was a result of changes in production and technological process, as well as management's and workers' training being considerably increased. "The contribution of FDI to innovation activity in Slovenia can be expected along with the growth of FDI."[56]

---

[49] Bucar/Stare (2001)
[50] ibid
[51] The Law on value added tax stipulates that Slovenian institutions participating in EU funded programs are not obliged to pay 19 percent value added tax. The introduction of by-laws which would enable to administer such provision of the Law on value added tax lags behind which is counterproductive also for innovation activity.
[52] Bucar/Stare (2001)
[53] ibid
[54] ibid
[55] Rojec (1998)
[56] Bucar/Stare (2001)

The annual inflows of FDI showed a decreasing trend in the late 1990s. This has been explained with the administrative barriers and delayed restructuring of the enterprise sector, as well as the passive policy towards FDI[57], also "...a widespread sense among Slovenes that strategic investors are unnecessary and politically harmful to the country's development, and ... an unwillingness of the more troubled companies to accept spinning off separate production lines"[58].

In 1999 and 2000 there has been a positive change in the policy towards FDI shown through different measures (Foreign Exchange Act, ratification of Europe Agreement, Program of the Government of the Republic of Slovenia for the Support of FDI in 2000)[59]. Although these measures have been introduced, large increase in FDI is not expected[60] without strict implementation of the Program for the support of FDI particularly concerning the simplification of administrative. The inflow of FDI has increased in 2001 due to the entrance of foreign suppliers of telecommunication services to the market[61].

5.2. Innovation policy community

The *Ministry for Science and Technology* (MST) used to be the main actor responsible for setting up technology and innovation policy. In this ministry since 1999 there has been a State Secretary appointed for Technology policy and innovation and there is a special Office for Innovation for Technology. The objectives of this office are the co-financing of industrial R&D projects, of technology parks and technology centers, as well as the mobility scheme (co-financing of the employment of research personnel in the industry)[62].

With the reorganization of the government the MST was split in two. The science segment went to the *Ministry of Education* and the technology segment went to the ministry of economy. The reasoning behind it is that the technology promotion programs would get closer with the activities of the ministry of economy and so there will be better coordination in the innovation promotion[63].

The newly formed *Ministry of Economy* is joining together the task previously organized in three and a half ministries (Ministry of Economic Affairs, Ministry of Foreign Economic Relations and Development, Ministry of SMEs and Tourism and technology segment of the Ministry of S&T). The fear is that in this new ministry the importance of the innovation system will be less compared to the other priorities of this ministry, but on the other hand the different sectors will be working closer together as well with the business sectors, so the results might be positive.

---

[57] Bucar/Stare (2001)
[58] Business Central Europe (1995), p.33
[59] Bucar/Stare (2001)
[60] IMAD (2000)
[61] Bucar/Stare (2001)
[62] ibid
[63] ibid

There is a *National Council for Research and Development* (NCRD). This is a body consisting of the chair persons of six research councils that are divided according to broad disciplinary areas. It used to be the highest expert body of the Ministry of Science, which advises the Minister on issues of research policy, evaluation criteria, distribution of funds, etc. The suggestion for the members of NCRD was made by the scientific community, but the decision was on the Minster[64].

There used to be a *Technology Development Council* as well and ịtwas also an expert body of the Ministry of Science and Technology. The purpose of this council was to advise on design and implementation of technology policy and assess technological relevance of projects and programs. Its members were appointed by the Minister. With the restructuring of Government, this council was found unnecessary by the current Minister of Economy, now in charge of technology development[65].

Another actor in the Slovenian innovation policy is the *Science and Technology Council***,** which is an advisory body to the government in matters of S&T, with chair person and members appointed by the government[66].

Additionally to the previous institutions there is Parliamentary *Committee on Science, Technology and Development*, that oversees S&T policy as the national legislative authority; as well as *Interdepartmental Committee for Research Co-ordination*, where representatives of all ministries discuss research priorities relevant for the government needs[67]. Under the new "Law on Support for Enterprises in the Development of New Technologies and Establishment and Operation of their R&D Units in the period from 2000 to 2003" this committee should become much more active in coordinating different joint schemes, as envisaged in the Program[68].

The *Slovenian Development Corporation* (SDC) deals also with the promotion of innovations and transfer of R&D results to the business community. It has a Program for project financing and favourable loans (500 million SIT=2,37 million €) for SMEs and individual entrepreneurs, with the goal of introduction of different types of innovations (diffusion of innovations, production and marketing of new products and services, establishment of start-ups for new products and technologies, increasing the quality and competitiveness based on new technologies and inventions). The problem with this Program is that the criteria set by the SDC are hard for the SMEs to meet. The offered financial help is not enough for innovators to start an enterprise without the sufficient counselling in business or finding business partners who will help them in commercialisation of their ideas.[69]

Slovenian Research Agency was established in 2004. It performs professional development and executive tasks relating to the National Research

[64] Bucar/Stare (2001)
[65] ibid
[66] ibid
[67] ibid
[68] ibid
[69] ibid

and Development Program, as well as other work to promote research and development activities; provides permanent, professional and independent decision-making on the selection of programs and projects that are financed from the state budget and other financial sources.

There are different institutions created by the state in order to support the innovation development. Those are[70]:

- *The Technology Development Fund*, established in 1994 as the first venture fund. Its objectives are: to increase investment in R&D by co-financing the development of new products or technology, stimulate the commercialization of domestic research and innovations, and provide help in establishing small size enterprises applying high technology. The experimental phase of the project was financed by the Ministry of Science and Technology with the help of PHARE. Afterwards the Fund was incorporated within the Slovenian Development Corporation. The enterprises can receive a loan from this fund; the Slovenian Development Corporation provides capital via equity ownership or issues bank guarantees.
- There were two *technology parks* established in Slovenia in 1994, by the interested ministries, public research institutes, business companies, banks, and local authorities and they were subsidized by the government. Besides the technology parks there are *Technology centers* as well. These are created on the base of co-operation between government, R&D sector and industry. They are aimed at the development of new technologies, prototype production and small-scale production of high-tech products.
- Under 4th Framework program, *FEMIRC (Fellow Members of the Innovation Relay Centers) Slovenia* was formed as part of a broader innovation relay network of the EU. FEMIRC was 100 percent financed from EU resources. Its principal task was to provide information and assistance to Slovenian R&D sector related to European Framework Programs. Since July 1, 2000 the role of FEMIRC has been transformed in such a way as to concentrate its activities on the promotion of innovation in enterprises and on the transfer of technology. Meanwhile FEMIRC was renamed to *IRC*, and EU funding presents half of its budget, while the other half is from the Slovenian government. IRC has a regional innovation project in co-operation with the Agency for Regional Development, which will aim to establish regional “one-stop shops”. This one-stop shop provides different support services for enterprises related to innovation. It is expected that the pilot one-stop shops will be effective in two years period. In order for this project to be successful there is the need of cooperation among all the parties involved (different ministries, chambers of economy, business service providers, and enterprises).

Institutions which are performing research and development and so participate in the innovation policy community can be divided in five different groups[71]:

- The two universities (University of Ljubljana and University of Maribor) and other tertiary educational institutions,

[70] Bucar/Stare (2001)
[71] Biegelbauer (1996)

- The nationalized research institutions,
- The independent research institutions,
- The Center for Scientific Research of the Academy of Sciences, and
- The business sector, consisting of commercial companies and public services.

Organization	**Status**	**Main responsibilities**
Technology Development Fund/ SDC	*Public, non-profit*	*Financing new products/new technologies development*
Technology parks	*Non-profit, mixed ownership*	*Providing infrastructure to high tech firms*
Technology centers	*Non-profit, mixed ownership*	*Joint research capabilities and equipment*
Innovation Relay Centre	*EU co-founded project*	*Information network*

Table 21: Government funded agencies[72]

Although in comparison to other transition countries, the decrease of the R&D capacities has not been too large, the small size of the national economy and thus the "critical mass" of R&D capacities in the small countries is more specific.

Other participants in the innovation community are[73]:

- *The Slovenian Science Foundation*, created by the government and sixteen other founders (financial and industrial firms and high-ranking scientific organizations). It is financed from donations and sponsorships, and its task is to provide moral and financial support for the development of science, scientific education and promotion of science in society.
- *Various associations* (association of innovators, associations of engineers and technicians, associations of other experts) also play catalytic role and help in establishing the link between R&D and industry.
- *Business incubators and networks* for the promotion of small scale business do not give financial support for the establishment and operation of small firms, but mainly provide consultancy and information services.
- *Private consultancy firms* are at present rarely involved in the promotion of innovation activity. Some do provide services to the business companies

[72] Bucar/Stare (2001)
[73] ibid

related to education, innovative management methods and tools, R&D or production and are engaged in activities indirectly supporting diffusion of innovation and technology transfer.

- *The Association of Slovenian Researchers* has organized several roundtable debates on innovation and technology policy as well as on co-operation between public research institutes and business, but without major policy impact. A more influential organization in the public sector is the *Chamber of Commerce and Industry*, also participating in the debate on innovation policy framework, stressing the need for more development oriented economic policy to help enterprises restructure, not only in terms of ownership, but also with new technologies, products and marketing methods.

5.3. Assessing innovation potential data: data collection, surveys and indicators

The innovation statistics in Slovenia are gathered mostly by the Slovenian Statistical Office. It collects the following statistics[74]:

- Annual Report on Research and Development Activity – is based on OECD Frascati methodology. The R&D data has been collected and published annually in Rapid Reports, Statistical Yearbook of the Republic of Slovenia, and Slovenia in Figures.
- Census on Innovation Activity in Manufacturing – is based on the Community Surveys and done under the recommendation of the Oslo manual and EUROSTAT.
- Census on Innovation Activity in Selected Services – it is also done under the recommendation of EUROSTAT and the services were selected under the recommendation of EUROSTAT[75].

Belonging to the Ministry of Science and Technology is the Slovenian Intellectual Property Office (SIPO). This Agency prepares patents, trade-marks and industrial design records according to WIPO methodology. And the data it has on these matters is available to the statistical Office and is regularly published in their annual SIPO Reports[76].

The Ministry of Science and Technology is another important institution which gathers information on R&D and innovation. This role has been transferred to the newly created Department of Science at the Ministry of Education, Science and Sport after the structural changes of the government. The data collected was on spending of resources (basic, applied and developmental research projects; young researchers program, equipment, literature, foreign travel to scientific meetings/conferences, publications, international projects, etc.). The evaluation

[74] Bucar/Stare (2001)
[75] These are enterprises in following activities: electricity, gas and water supply; wholesale; transport; telecommunications; financial intermediation, architectural and technical consultancy
[76] Bucar/Stare (2001)

of the collected data is the task of the Group for Research and Evaluation of Science attached to Slovenian Academy of Sciences and Arts, established in 1999[77].

Another agency founded by the government is the Institute of Information Science (IZUM). This Institute created and operates the COBISS (Co-operative online Bibliographic System and Services) system and the SICRIC database (Slovenian Current Research Information System)[78].

From the non-governmental institutions that collect data on innovation activity the Institute for Economic Research has the most important role[79]. There are also other institutions that had gathered information on the technological development and innovation activity in the past, but according to their own methodology and without much cross-referencing[80].[81]

The role of the Chamber of Commerce in gathering information has been presented through the establishment of Business Opportunity Exchange System on the Internet[82]. Slovenian and foreign firms can enter offers and demands there and search the data base for information and seek partners. The system has a database on offers/demands, agency, business cooperation, financial cooperation, business premises, sub-contracting, joint ventures, production cooperation, patents, licenses, innovation, and technology.[83]

5.4. Main developments in innovation policy

The Slovenian state has taken a large number of actions for the support of the innovative capacity of the industry and the research institutions. Laws that support this goal were passed. Different projects for financing, consulting and technical support for knowledge creation adoption and implementation were introduced.

5.4.1. Legal and institutional environment

The base for Slovene innovation policy was the creation of the Boris Kidric Fund in 1953, which was to support basic and applied research. This fund was an instrument for R&D finance in the Socialist Republic of Slovenia. Beginning with 1957, not only researchers from university and institutes but also from

[77] Bucar/Stare (2001)
[78] ibid
[79] IER has in the last five years conducted two major studies: the technological level of Slovenian manufacturing sector, and the innovation capability and technological intensity of the Slovene service sector; Špilek/Hedvika (2000)
[80] e.g. the Questionnaire on innovation activity prepared by the Technology Development Department and the Committee for Intellectual Property and Innovation Activity of the Chamber of Commerce and Industry.
[81] Bucar/Stare (2001)
[82] http://www.gzs.si/eng/borza/index.htm
[83] Bucar/Stare (2001)

industry could apply for financial support for R&D from this fund. The Fund had also other functions, like the Boris Kidric Award (started in 1956), as well as awarding scholarships for studies abroad (mostly for the western countries).[84]

In 1970, with the new law on S&T, the Research Community Fund was established. There were six committees which decided over the funding of projects. With the help of this fund the financing was steadier and the length of the projects was growing. With the constitutional changes in 1974 different councils which brought together the users and the producers of R&D were created, like the Assembly of the Research Community, which had the functions of the S&T Agency. The institution consisted of an executive council, twelve research committees and an increasing number of special research communities in different fields over time. Each research community consisted of an assembly of users (i.e. industry) and an assembly of producers (i.e. researchers), which were deciding on the R&D performed in their fields. The same system existed also on the level of the municipalities beginning with 1982. They all had their own research organizations responsible for the specific problems of the region. R&D on local level was funded up to 50% by the municipality, with the rest coming from industrial partners.[85]

Right after the independence Slovenia perused active changes in the financing and planning of R&D activities. Thus one of the first laws passed in the new country was the Law on Research Activities in 1991. The Law was created in cooperation with leading scientists. On the base of this law, in 1994 the National Research Plan (NRP) was drafted, which proposed the planning, financing and performing of R&D. The NRP defines long and medium term goals of the national R&D activities. Long term goals included an increase of national R&D investment of 2.5 % of GDP by the year 2000 (in 2002 R&D investments were 2,9% of the GDP[86]), and the development of a strong base in fundamental science, where 5000 researchers are to “cover all the fundamental scientific disciplines”. Medium term goals were the reform of postgraduate education and the enlargement of the output of such programs.[87]

The Technology Policy of the Republic of Slovenia was adopted in 1994, joint with a “Program of support to technological Development up to Year 2000”, prepared from the Ministry of Science and Technology. The implementation of this Policy faced certain problems over the years. The funds planned for technological development were supposed to grow on average 10% a year during the period that the program was covering, while in reality the funds were decreasing, because the share of science and technology in the budget was decreasing. Additionally the cooperation among different actors that were supposed to participate in the implementation faced problems. Since the Policy was prepared from the Ministry of Science hence it was left on this ministry even to implement it, although originally the participation of several ministries was

[84] Biegelbauer (1996)
[85] ibid
[86] http://www.stat.si/eng/index.asp
[87] Ministry of Science and technology (1995), p. 5

considered[88]. There was only one additional program in support for the Policy, that was prepared from the Ministry of Economy in 1997 and that was the "Strategy for increasing the competitiveness of the Slovenian industry", in which there are some key points that concentrate on the technological development and innovation[89].

One of the most important documents regarding innovation and industrial R&D is the "Law on support for Enterprises in the Development of New Technologies and Establishment and Operation of their R&D Units in the period from 2000 to 2003", which was adopted in 1999. In the preparation of the program for implementation of the law (Government Program for the Support of Technological Development) there were eight Ministries (Ministry of Science and Technology, Ministry of Economic Affairs, Ministry for SMEs and Tourism, Ministry for Economic Relations and Development, Ministry of Finance, Ministry of Environment, Ministry of Agriculture, Forestry and Food, Ministry of Labor), as well as the Chamber of Commerce and Industry, Chamber of Crafts, and the Slovenian Development Corporation involved. The funding should have come from the privatization of some government-owned enterprises. The program was to allocate 13,5 billion SIT, and the goal was to increase the financial support for enterprises for the promotion of technological development[90]. It gives specific measures, objectives and criteria that are to be used in selection of financed projects. It provides also a systematic approach to industrial R&D promotion and innovation policy. It was organized into six subprograms[91]:

1. The incentives for enterprises for R&D activities in development of new products and technologies (four types of measures, to be coordinated between MST, MAFF, MEA, MSEM, and SDC).
2. The incentives for enterprises for the establishment of their own R&D departments and units (three types of measures; MST, MLFS, MEA, MAFF, MSEM).
3. Incentives for networking and common activities in the field of R&D departments and units (three types of measures, MST, MEA, MSEM).
4. Innovation incentives in regional R&D (four types of measures; MST, MSEM, MEAD, MEA, MAFF).
5. Human development in R&D (six types of measures, MST, MLFS, MSME, ME, MEdu).
6. Other measures (risk fund for NTBF, etc.; 8 types of measures, all ministries, plus SDC).

The success of this Law and its implementation was done in coordination with the "Law on Organization and Funding of Scientific Activity and Research and Development". This second law was concerned with the better organization of the National innovation system, especially encouragement of networking of research organizations among themselves as well as with industrial R&D units. It

[88] Bucar/Stare (2001)
[89] Bucar/Stare (2001)
[90] ibid
[91] ibid

also assumed creation of two independent agencies: Agency for Scientific Research and Agency for Development and Technological Research. The creation of the Agency for Development and Technological Research would be helpful for the implementation of the program for the support of technological development.[92]

In 1998 there was a proposal by PHARE put forward to the MST for the creation of the Slovenian Innovation Agency. The tasks of this agency would be concerned with technology development, stimulation of E-commerce and Internet, stimulation of entrepreneurship, innovation, and internationalization. The Agency was never created, mainly because of lack of consensus of its status at the MST, there were also opinions that for its success there was the need of support from more than just one ministry, as well as the opinions that the proposed budget for the SIA was too ambitious in terms of available resources.[93]

The technology policy assumes also other instruments for the enhancement of S&T, in the following areas:

- Subsidies for development research which will depend on: the willingness of the other involved organizations to co-finance the project, the level of innovation and technological safety, the impact on the environment, the feasibility and applicability of results, the employment of researchers in an organization. Especially keeping young researchers in industry is going to be subsidized.
- Fiscal incentives for development: school fees and donations to S&T institutions would be deductible from income tax, certain non-profit activities would be de deductible from profit tax, moreover, there shall be exemptions from customs duties for research equipment and software;
- Under the heading of the “Technology Tolar”, examinations of technological incentives for the commercial sector, investments in research equipment, operations of infrastructure centers for know-how transfer and investments in the backbone of the research communication network are done.
- Pre-competitive projects in the form of cooperation between commercial and other entities will be promoted more intensively.
- Institutional measures to the promotion of technological development; the Technology Development Fund shall go into full operations; know-how transfer agencies at universities and scientific institutes shall be fostered; databases shall be linked and a “meta-database” be installed; cooperation of ministries through the interdepartmental committee for the coordination of research shall be intensified; more target-oriented research programs shall be introduced; a venture capital company for SMEs shall be established; the role of the Intellectual Property Organisation shall be increased.

[92] In 2004 Research Agency was created; Bucar/Stare (2001)
[93] Bucar/Stare (2001)

Title of document	Organization responsible	Legal status	Comments
Technology policy of the Republic of Slovenia, 1994	*Gov. of Slovenia*	*Government and parliament decision*	*not implemented in terms of planned allocation of resources*
Program of Support to Technological Development up to the Year 2000, 1994	*MST*	*Government decision*	*Action plan for the above policy*
National Program of Research, 1995		*Parliamentary decision*	*Failed in terms of providing increased share of R&D in GDP, poorly implemented in terms of enhancing transfer of knowledge to industry*
The Strategy for increasing the competitiveness of the Slovenian industry, 1997	*Ministry of Economic Affairs*	*Government decision*	*No evaluation of innovation impact*
Slovenian Innovation Agency	*PHARE founded project, MST*	*Project proposal*	*No follow-up*
Law on Support for Enterprises in the Development of New Technologies and Establishment and Operation of their R&D Units in the period from 2000 to 2003, 1999	*Gov. of Slovenia*	*Government and Parliament decision*	
Government Program for the Support of Technological Development, 2000	*Gov. of Slovenia*		

Table 22: Main policy documents and consultative papers since 1996[94]

[94] Bucar/Stare (2001)

The general opinion is that one of the key problems of the innovation policy in the 1990s was that different legal and policy document affecting innovation were often in collision with one another[95]. An additional problem was the lack of financial resources contributing to the successful implementation of those legal acts. The creation of institutions for innovation and transfer of the results to the industry is also not sufficient[96]. The positive conclusion is that there have been a lot of different initiatives, mechanisms and programs prepared and executed, though with not sufficient financial means awarded for these purposes which often lead to not reaching the desired effects.[97]

It seems that within the current organizational framework, funding and organizational set-up of sciences will be linked closer to funding and organization of higher education (universities), while funding of applied research and technology development will be coordinated jointly with the Ministry of Economy.

Evaluation studies on industrial R&D projects show that the state gets the investment back in a single year after the implementation of the project, through the taxes collected due to the increased production made possible by the projects themselves. This gives additional motivation for further support for the R&D projects.[98]

Since 2000 the R&D funding is organized through the new Research Program scheme, in which 334 research groups were selected and they received five year program financing[99]. The resources for the project funding are limited and this has negative implication for the applied R&D.

One study showed[100] that for Slovene industry of top priority is public support for training, which demonstrates that there is the need of new skills in the innovation processes in companies. It is followed by support for finding cooperation partners and ways for financing and promotion, which means that there is the need for soft factors and functioning innovation system, and not scientific or supporting organizations.[101]

[95] Bucar/Stare (2001)
[96] EC Regular report on Slovenia, 2000
[97] ibid
[98] ibid
[99] ibid
[100] Bross/ Koschatzky/Stanovnik (1999)
[101] ibid

Name of program	Government body responsible	Objectives of the program	Funding available
Industrial development research	*MST/now ME*	*Co-financing of development research in industry*	*From 75%-25% of total research costs*
Preparatory phase for invention	*MST/now ME*	*Co-financing of research and experimental development up to prototype phase*	*25-50% of total research costs*
Promotion of mobility of researchers	*MST/ now ME*	*Co-financing salaries of research personnel in industry (Ph.D. and MA)*	*Part of the salary*
Technology parks/centers	*MST/ now ME*	*Co-financing of infrastructure costs*	*Partly covered also from other investors*
SME support	*MSME/ now ME*	*Co-financing some of the costs of development projects in certain sectors for SMEs*	*Up to 50% of costs.*
Support schemes for restructuring	*Ministry of Economic Affairs: MEA/ now ME*	*Co-financing of restructuring programs in enterprises in selected sectors*	
Interest rate subvention	*MEA/ now ME*	*Subvention of interest rates for mid and long-term loans for companies undergoing restructuring (medium and large firms)*	
Interest rate subsidizing	*MSMEs, Public Fund for SMEs Development*	*Interest rate subsidizing for investment loans for young entrepreneurs, priority for projects related to innovations, technical improvement*	*For interest rates exceeding 2% nominal interest rate, individual subsidy less than 1.5 million SIT*
Development of rural economy	*MAFF*	*Development of innovative programs of activities for rural households (target group: local communities)*	
Development project financing	*Technology Development Fund/ Slovenian Development Corporation*	*Financing for new product/new technology development, transfer of R&D results and innovations to enterprises*	*Loans, equity investment, bank guarantees*

Table 23: Major government funded programs and initiatives in favor of innovation[102]

[102] Bucar/Stare (2001)

Importance	Promotion measures	Mean mark
1.	*(Vocational) training*	*5,50*
2.	*Brokerage: finding partners*	*4,53*
3.	*Information about financing and promotion schemes*	*4,36*
4.	*Organization of exchange of experiences*	*4,24*
5.	*Development of scientific and technological infrastructure*	*3,40*
6.	*Information about state of technology, licenses*	*3,22*
7.	*Foundation of technology parks*	*2,75*

Table 24: Priorities of public policy measures[103]

5.4.2. Financial help

The Ministry of Education and Sport finances the fixed costs of the educational institutions, including universities, with a small fixed sum for scientific research. Most of these activities are co-financed by the Ministry for S&T. The Ministry of S&T disperses by far the largest funds for S&T. Generally basic science is funded by the Ministry for S&T up to 100 %, applied research with up to 75 % and developmental research with up to 50 % of the actual costs. In addition to these programs and the previously mentioned subsidized instrument and technology centers, a number of other activities are financed, such as travel costs of researchers, postgraduate studies, libraries and information networks.[104]

University researchers can engage into R&D in economy, up to one third of their work time of the professors (1700 hours per year) can be for R&D projects, i.e. 567 hours, while university personnel with no pedagogical responsibilities might invest 1200 hours per year, with personnel featuring part-time obligations at the university ranging in between. This is comparable to regulations as may be found in most industrialized countries.[105]

Another large sum is used to cover the basic financing of the national research institutions. Additionally, the state funds the Young Researcher's Program. It has been setup already in 1985 to bring more young researchers into the R&D. Although the program was successful in bringing in more young researchers, it failed in its second goal which was the transfer of the researchers from the research institutions to the industry, since most of them stayed in the research institutions after obtaining their degrees.[106]

In order to bring closer the research institutions and the business, the state is subsidizing[107]:

- up to 75 % of industrial near-market research,
- interest rates of loans taken for product and process innovations,
- part of the salary of young doctorates employed in industry,
- part of the research or infrastructure of technology parks and centers,

[103] Koschatzky/Sternberg (2000)
[104] Biegelbauer (1996)
[105] ibid
[106] ibid
[107] ibid

- part of the research or infrastructure of developmental units in industry,
- part of the cooperation in international R&D projects are financed.

The Ministry of S&T together with the Academy of Sciences, the two universities and the two central research institutes, also banks, companies, media organizations and the Open Society Fund-Slovenia, in 1994 created the Science Foundation and the Technology and Development Fund. The tasks of the Science Foundation are to promote and finance science and establish a culture, friendly to science, in Slovenia. It should foster scientific cooperation, especially with similar institutions in foreign countries. It is financed by donations and sponsorships for individual projects.[108]

The purpose of the Technology and Development Fund (TDF) is to aid the transfer of R&D into marketable products. Moreover, the fund is to help start-up and spin-off firms from R&D institutions by providing know-how as well as capital. Investments are limited to USD 0.3 million due to the small size of the fund. Other companies may invest into this venture capital firm.[109] There are only four criteria to be fulfilled for investment of the TDF: a firm has to be more than 50 % Slovene, the product has to be an original Slovene development, the development phase has to be finished and the market chances have to be judged positively[110].

There are few venture capital funds that exist in Slovenia, which is very important for the financing of the new technology developed by enterprises, since the bank credits are not easily available for this purpose. Some of them are private, but there are some also opened with the support of the Ministry of economy as semi-state Fund[111].

Investments into research and culture can be deducted from taxes up to 3 % of the total sum of taxes of the legal or physical person. Furthermore, project funding by the state is taxed only with 5 %. Besides a number of small tax alleviations for institutions with a special status, as the national institutes, no further regulations are in effect. A special provision for innovations is only in discussion, but not even near realization.[112]

5.5. Measures to foster innovation

5.5.1. Human resource Programs in Favor for Innovation

During the transition period there were a lot of new programs introduced in Slovenia offering management training. Both Universities (University of Ljubljana and University of Maribor) offer MBA programs, there are also some programs

[108] Kobal (1996)
[109] Ministry of Science and Technology (1994)
[110] Biegelbauer (1996)
[111] Bucar/Stare (2001)
[112] Biegelbauer (1996)

that have been organized from foreign universities[113] as well as semi-private education institutions. These programs introduced modern (Western) management techniques to the business practice in Slovenia, but it is hard to assess how relevant they were for the innovation. Innovation studies have been offered basically on Masters of Science level at the Faculty for Economics and business at the University of Maribor. Another institution that offers innovation studies (focus on multidisciplinary) is the Politehnika, which is a higher education institution independent from the universities set up by the Institute Joze Stefan, the local community of Nova Gorica and business enterprises. The Politehnika has been financed from tuition fees, governmental co-financing and scholarships provided by business sector. The existence of these institutions (see Table: 25) shows the need of the Slovenian businesses for improvement of managerial skills and their awareness of importance of life-long training and education for managers.[114]

The Ministry of Science and Technology has developed a "Young researchers" program, which is concerned with the training and education of young researchers, meaning MSc, PhD students, and postdoctoral specializations. The ministry is refunding their salary and the mentor's fees to the institutions. This program is receiving approximately 20% of the ministerial budget. One of the ideas of this program was to provide mobility of researchers from industry to research institutions and back, but it has not been so successful in this, since the best researchers stayed in the research institutions, but it has been very successful in improving the quality of research and increasing the number of young researchers in research teams in the research institutions.[115]

In order to stimulate the increase of researchers in the business R&D the Ministry of Science and Technology is subsidizing for the enterprises part of the salary for the newly employed PhD and MSc graduates. The motivation for bigger employment of the researchers in the enterprises can be expected to come from inside the enterprises, when they start with technological restructuring (they will need more R&D personal, as well as closer relations with the research institutes). [116]

Different forms of training and education for the unemployed have been offered by the Employment Service of Slovenia (ESS), a public institution connected to the Ministry of Labor, Social Affairs and Welfare. The main goals of these trainings and education programs are[117]:

- To motivate and inform unemployed people in order to increase their active engagement in seeking employment. Assistance in identification of professional goals and development of personal skills and abilities for more efficient performance on the labor market.

[113] Some of these programs have governmental support as well (e.g. Gea College, which runs courses for managers of SMEs, partly run in cooperation with Babson College, USA)
[114] Bucar/Stare (2001)
[115] ibid
[116] ibid
[117] ibid

- Adjustment of knowledge, skills and abilities of the unemployed person to the staffing needs and of technological development.

Higher or further education organization	Main type of innovation related training or advisory services	Commentary	Involvement in networks
Faculty of Economics at the Uni. of Ljubljana	*M.B.A. programs, business consultancy in change management and ERP, special business – focused short courses*	*Focus on modern business techniques, strategic management, IT in business applications, ERP, etc.*	*Faculty is in the process of international accreditation, it runs jointly with The Center for Development of Enterprises an International MBA program in Slovenia and India*
Faculty of Economics and Business, University of Maribor	*Undergraduate and MBA programs, special seminars, conferences, short-term training*	*Focus on innovation management, ERP, new business techniques, TQM, etc.*	*Some of the programs are co-financed by different Ministries, Regional Development Agency and Chamber Commerce and Industry*
Bled School of Management with International Executive Development Center	*Top executive MBA program, specific programs for individual companies, specialized training for executives*	*Executive-style management education for executives and high potential young managers*	*Headquarters of the Central and East European Management Development association (CEEMAN). Cooperation with INSEAD, UNESCO, EU, EBRD etc.*
Politehnika	*Undergraduate and graduate studies in technological development and environmental studies*	*Strong focus on multidisciplinary: combination of social sciences (economics) and technical studies, special innovation program*	*International Board of Directors*
High School of Business and Management	*Undergraduate program in economics*	*Focus on business skills for successful running of SME*	
College of Management	*Undergraduate program in management*	*Focus on business skills, including innovation in production and ERP*	
Center for Technology Training, Chamber of Commerce and Industry	*Training in the field of quality management, including the introduction of ISO 9000 and ISO 14000 for SMEs*	*Focus: technical standards, internal quality assessment, R&D school*	

Table 25: Main organizations involved in human resource development for innovation[118]

[118] Bucar/Stare (2001)

In 1999 from the ESS total budget, 23.4% went for employment programs (from these to functional training 48.3%, for programs leading to qualification 27.6% and on-the-job training 21.9%). ESS also provides specific counseling and training programs for those who want to start their own business, by organizing informative seminars, finance introductory forms of training and individual counseling[119].[120]

Organizations responsible	Objectives	Target public	Funding
Ministry of Labor Social Affairs and Welfare, Employment Services of Slovenia	*Improve the employability via providing additional training (computer literacy, languages, basic management courses, setting up small business, etc.)*	*Currently unemployed*	*State budget*
Ministry of Education, Science and Sport	*Upgrade the R&D personnel (see more details in the text)*	*Young researchers*	*State budget*
Ministry of Economics and Chambers of SMEs	*Increased management skills in SMEs*	*SMEs managers*	*Co-financing (partly state Supported) education programs*
Local communities via regional Development Agencies	*Promote entrepreneurship in local communities*	*Unemployed, general public*	*Local communities' budget*

Table 26: Main initiatives taken in favor of human resources development for innovation[121]

The Computer Literacy Development Program was launched in 1994 and concluded in 1999 by the Ministry of Education, focusing primarily on elementary schools. This same Ministry together with the Ministry of Information Society plans to continue the computer literacy development program and expand it particularly for the adult population.[122]

In 1991 Slovenian Institute for Adult Education (SIAE) was established with a task to foster the development of a culture of life-long learning and education in Slovenia. This Institute collects annual data on both providers and

[119] In 1999, approx 6300 people participated in various programs for self-employment
[120] Bucar/Stare (2001)
[121] ibid
[122] ibid

programs of adult education and training. The surveys done by the SIAE show that as many as 90% of people with elementary school education and nearly 80% of those with vocational school education do not participate in any form of adult education, which is a sign that the adult education still needs to be promoted. For this purpose since 1996, the SIAE organizes annually *Life long learning week* action with adult education programs holding "open houses" to demonstrate the content and the teaching methods. There is a national program of adult education. The goal of this program is to increase the share of population (above 15 years) engaged in general education programs to 60 percent.[123]

The handbook "Innovativeness for the Youth" was published in 2000 and is intended for teachers of techniques and mentors of interest activities in elementary schools. The handbook deals with different dimensions of innovativeness, from the basic concept to the institutional support for innovation, innovativeness in schools, in education systems in general, and for learning societies. It also presents cases of youth and adult innovators and the importance of introducing basic knowledge on innovation and culture of innovation at the early stage of education so as to build the innovation awareness during the entire education process.[124]

5.5.2. Innovation Management Techniques

The awareness of innovative management techniques and tools is on a satisfactory level in the private enterprises. Especially good is the situation in the enterprises which participate in strategic partnerships or other forms of alliances with foreign partners. The problem of awareness can be found in the non-privatized enterprises.

Since its independence, Slovenia faced the problem of losing the Yugoslavian markets and had to reorient its production towards the developed countries' markets. In order for them to be competitive on these markets they had to improve quality and acquire quality certificates. In this area the managers were supported by the Chamber of Commerce with different trainings and education. The Ministry of Economic Affairs, Ministry for SMEs, Development Corporation of Slovenia, Ministry of Science and Technology, Chamber of Commerce and Industry, and Chamber of Crafts organized co-financing schemes for the introduction of ISO standards. Spreading of the ISO standards was supported also through universities curricula, specialized training courses and through Slovenian Award of Business Excellence. For this purpose the Chamber of Commerce and Industry established Slovenian Association of Quality which encourages the introduction of quality and business excellence to businesses. There were also advertising campaigns in business journals which publish supplements on quality management. Due to these circumstances, the ISO standards and quality certificates penetrated the Slovenian enterprises and are

[123] Bucar/Stare (2001)
[124] ibid

the most often used innovative management techniques. They lead to standardization of processes, improvement of quality and of efficiency of firms.[125]

Organization responsible (initiator and management structure)	**Objectives (e.g. awareness-raising, training in techniques)**	**Target public (e.g. SMEs, specific sectors, etc.)**	**Funding (level of funding, source: public/private)**
MEA, MSMEs, MST, Chamber of Commerce and Industry, Chamber of Crafts	*Awareness building on quality, training for ISO standards introduction*	*SMEs*	*Co-financing of up to 50 percent of costs is available after the acquisition of ISO certificate*
MEA, MSMEs	*European Quality Award*		*Co-financing of application costs for the European Quality Award*

Table 27: Main initiatives taken in favor of IMT diffusion[126]

Nevertheless for the SMEs, which started introducing the ISO standards later than the big enterprises, it has been shown that they do not increase the competitiveness of the enterprises. The ISO standards can be used as a starting point on which further rationalization of the processes, innovation, total quality management, self assessment, business excellence and other innovation management techniques can be built up. It has been acknowledged that the concentration on the promotion of the ISO standards and the quality management has outweighed the attention on innovation. That is why the Technology Development Department of the Chamber of Commerce and Industry shifted to the stimulation of innovation activities in enterprises; they organized workshops for enterprises for building awareness of innovation by presenting successful innovatory practices. Experts believe that the enterprises are more aware of the need for innovation and demand for the state support on this area, like pressuring for the law supporting innovation and industrial R&D. From the questionnaire done by the Chamber of commerce[127] it can be concluded that 60% of the large enterprises engage in innovation activities, but that they need help in promoting innovation activities in terms of training or establishing links with enterprises which have experience in innovation.[128]

[125] Bucar/Stare (2001)
[126] ibid
[127] "Questionnaire on innovation activity" was mailed to 500 larger enterprises covering all activities. The response rate was 47 percent; GZS (2000)
[128] Bucar/Stare (2001)

The analysis of the introduction of ISO standards to SME[129] showed that for SMEs the highest priority had the quality management, while innovation in processes is expected to be of higher importance in the future.[130]

5.5.3. Research Community – Industry Cooperation

The general conclusion[131] is that the cooperation among the industry and the research institutions in Slovenia is not satisfactory. On one side the situation in the industry in the early nineties was not favorable for this cooperation, considering that there was defensive restructuring (privatization, disinvestments, lay-offs, market re-orientation). With this period being over, the enterprises are prepared to invest more in the innovation and in cooperation with the research community[132]. On the other side the state policy is favoring the basic over the applied and development research and does not give sufficient support for industrial research. While the total amount of public funding of R&D is not low[133], the impact the public R&D has on the technological development of the industry is low. The research personnel in the research institutes that are involved in the development of research projects is decreasing: if in 1991 such projects amounted to 800 FTE (full time employee equivalent), in 1998 the figure was only 350 FTE[134]. This has been seen as the biggest challenge for the future of innovation policy.[135]

This is the reason why the law on support of businesses is concentrating on strengthening the ties between research and business communities in order to foster technological development and innovation. In connection to this law, different programs have been created with this purpose, but the financing continues to be a problem. The planned 13,3 bn SIT (67,5 million EUR) for 2001, in realty have been covered with budget of 1,7 bn SIT (8,63 million EUR)[136]

---

[129] Pivka/Uršič (1999)
[130] Bucar/Stare (2001)
[131] GOPA (1994), EU (1999), etc.
[132] In the discussion with business, it was pointed out that especially intensive export activity gives boost to innovation, since satisfying demanding customers requires continuous upgrading of the products and services.
[133] According to The World Competitiveness Yearbook 2000 (World Competitiveness Center, 2001) Slovenia is ranked 14 as to the percentage of GDP dedicated to public R&D, above USA (20) and much higher than other countries from Central and Eastern Europe – Czech Rep: 26; Hungary 28, Poland 29. However, Slovenia deteriorated its rank from 36 to 40 in the integrated indicator of science and technology composed of broader aspects, such as linkages between science and business community (technology management) and general environment for science.
[134] Špilek/Hedvika (2000)
[135] Bucar/Stare (2001)
[136] ibid

Organisations responsable	Objectives	Target public	Funding
Ministry of Economy Dep. for promotion of Technological development	*Support of projects of product/services development*	*Business enterprises, R&D institutes in cooperation with business*	*State co-financing up to 25%*
Ministry of Economy Dep. for promotion of Technological development	*Promotion of development and support to technological parks and centers (regional and by sectors)*	*Business enterprises, local communities*	*Co-financing of infrastructure costs*
Ministry of Economy, Dep. for increasing competitiveness of Slovenian industry	*Promotion of clusters*	*Business enterprises, R&D institutes, knowledge providers*	*Co-financing of network costs*
Ministry of Economy Dep. for promotion of Technological development	*Support to establishment and development of R&D units in industry*	*Business enterprises*	*State co-financing of researcher's costs*
Ministry of Economy Dep. for promotion of technological development	*Promotion of industrial research co-operation in EU projects, co-financing of EUREKA projects; technology foresight*	*Business enterprises*	*Co-financing of project preparation costs*
Ministry of Economy, Dep. for increasing competitiveness of Slovenian industry	*Promotion of integral approaches to productivity increase (systems of continuous improvement, benchmarking, flexible management, etc.)*	*Business enterprises*	*Co-financing of development and introduction costs*

Table 28: Main initiatives taken in favor of research – industry co-operation[137]

Some of the programs given in the previous table (Table.28) concentrate on the compensation of the cost that the enterprises have when involving research institutions, but some of them encourage more businesses to concentrate on innovation and not that much to stimulate cooperation among them and the R&D institutions.[138]

[137] Bucar/Stare (2001)
[138] ibid

The cooperation is also supported, not only through encouragement of the business side, but also through support for the research institutions. For this purpose, within universities, special institutes and centers were established that focus on the cooperation with the business sector. In these institutes/centers Professors and researchers offer their consultancy/research services in their area of expertise to different companies. There are also certain examples of research institutions which have special units for developing the links with the business (i.e. Jozef Stefan Institute has an Office for Transfer of Technology). A big set back for this cooperation is the small size of the research institution[139]. Another reason for the lack of cooperation given by researchers is the current evaluation system with strong emphasis on publications and citation index. The cooperation with the industry and the applied research are not given enough recognition. This problem has been recognized and the tendency is towards changing the evaluation criteria with a higher recognition for the industry cooperation.[140]

There is a program in development which is supposed to promote the researchers at the university to set up their own enterprises. With this program it would be allowed for the researchers to reenter the research institution/university in the period of two years, which would decrease the fear of failure on the market.[141]

The evaluation of industrial R&D projects[142] showed that resources allocated to such research projects were efficient and had a high return on investment for the Government[143].[144]

5.5.4. Start-ups and New Technology Based Firms Support

The policy for support of start-ups and new technology based firms is under the authority of the Ministry of Economy which is cooperating with the Agency for Regional Development. Before the restructuring of the government in 2000, there were special policies for the support of new enterprises created by the Ministry of Science and Technology and the ministry of Small-Scale business and Tourism.[145]

In the following table different initiatives for supporting start-ups are presented. For building of technology based firms, of great importance are the

[139] Only two research institutes employ more than 300 people, 18 out of 70 R&D institutes employ less than 10 and 22 (the largest single number) between 21- 50 employees. The fragmentation is further illustrated by the fact that nearly 800 individual units (be it departments, laboratories, groups, etc.) within Universities and ca. 290 units within R&D institutes offer their services on the market. (data collected by Researchers' Association, 2001)
[140] Bucar/Stare (2001)
[141] ibid
[142] carried out by the Institute of Economic Research and co-financed by the MST
[143] The evaluation showed that on each tolar invested into technological subsidies, there is return 8.7 times through taxes and contributions.
[144] Bucar/Stare (2001)
[145] ibid

technology parks. They provide the development of enterprises (generally SMEs) with advanced technology, so that they can commercialise their innovations, by creating favourable environment and infrastructure for their operations and provide help in marketing of their products. An additional goal is promoting mobility of researchers to entrepreneurship. In Slovenia they are partly financed through subsidies of the Ministry of Economy (originally by MST) and partly by selling of the services to the enterprises. The parks manage to satisfy their main goals, with some room for improvement: the companies in the parks want a prolonged "graduation" period, and there is the need for more cooperation from the local community, especially in terms of land for the further development of the parks (for this there is already cooperation established).[146]

Organisations responsable	Objectives	Target public	Funding
Ministry of Economy	*Promotion of high-tech firms*	*Technology parks*	*Infrastructure costs*
Horizonte ventures (private venture capital firm with foreign capital)	*Provision of venture capital to NTBFs*	*New start-ups*	*Starting capital*
Slovenian Development Corporation (SDC)	*Promotion of new high tech firms, new production programmes or new services*	*Open to business sector*	*Favourable credit lines*

Table 29: Main initiatives taken in favour of start-ups[147]

The first Technology Park in Slovenia was established in Ljubljana 1992, as part of the largest public research institute. Through the Technology Park the research institute tried to market some of the results from their work. The Park was transformed into independent company, owned by more institutes, business companies, a bank and the Slovenian Development Corporation[148]. The second Technology Park was established near Maribor. Besides services for the companies inside the park, it provides counselling to innovators for the region, counselling for applying for support at government tenders, preparation of business plans or company registration, and coordination of joint development projects of local communities.[149]

[146] ibid
[147] Bucar/Stare (2001)
[148] Lesjak (2001)
[149] Bucar/Stare (2001)

5.5.5. Business Networks for Innovation

During the transition period a lot of the old large conglomerates were separated into smaller entities. Due to this, the traditional business ties and networks disappeared, and it usually takes time for new ones to be established.[150]

To address this issue the ministry of Science and Technology passed a legal act on infrastructure development centers. The act prescribes what kind of centres can be subsidised, and under what terms and conditions, giving the distinction between technology parks and technology centres. The centers are important for bringing together enterprises from the same area or from the same industrial sector. They should provide marketing services, legal and technical information, besides the technological services.[151] The centers should concentrate on[152]:

- R&D activities for the needs of specific industrial branch
- Assistance in applying for international research funding
- Measurements and testing (with aim to become accredited laboratory)
- Providing information on research and technology developments in specific area
- Publications
- Education and training for the needs of the specific industry branch
- Additional tasks may be entrusted to the centre by its founders.

Two types of centres were established: regional and sector technology centres. At the end of 2000, there were approximately 31 branch technology centres operating, with additional 6 being proposed. Also four regional technology centres had been established, with another four in initial phase. The Ministry of Science and Technology subsidised the financing of these centers at the beginning, but the idea was for them to become independent and that they be financed by the research institutions and industries which will use their services. The coordination of these centers is under the Ministry of Economy now.[153]

In 2001 the Ministry of Economy presented the initiative for building clusters. The goal of the clusters is developing of a cooperation culture among enterprises and research institutions.[154]

Slovenian Business Innovation Network (SBIN) is created with the goal of promoting and supporting of innovative activities of small businesses. It is intermediary among national institutions related to innovation activities (different Ministries, Office of the Republic of Slovenia for Intellectual Property, Small Business Development Fund, Chamber of Commerce and Industry, Chamber of Crafts, Slovenian Development Corporation) and around 100 innovators (physical persons and independent researchers). It provides information and

[150] Bucar/Stare (2001)
[151] ibid
[152] ibid
[153] ibid
[154] ibid

consultancy relevant to innovators[155] (especially how to apply for funds under various schemes), and support in the promotion of their innovations[156]. The innovation networks did not show big success. One out of ten innovative proposals, submitted by the inventors to SBIN was successfully marketed. The biggest problems in the process of conversion of inventions of small businesses into market products are: limited funds for financial support of inventors, serious lack of knowledge related to evaluation and marketing of innovations, deficient entrepreneurship culture and mindset of innovators.[157]

The Small Business Development Centre (SBDC) is yet another institution in support of cooperation for innovative activities. It organises and performs innovative activities on the regional level through Regional Business Centres. The pilot project started end of 2001 in two regional business centers, and the objective is to train a promoter of innovative activity in each region. SBDC is trying to integrate into the system all actors who might contribute to the increase of inventiveness and faster market application of inventions[158].

5.6. Summary of the state of the innovation policy in Slovenia

It can be concluded from the previous presented situation in Slovenia that through the period of transition, the national innovation system continued to be developed. It cannot be said that this system was established in this period, since even before its independence and the transformation Slovenia had put the base for its innovation system.

The biggest economic problems of the transition were that the changes in the economical and social environment led to the breakdown of a lot of the old agglomerates and loss of markets, which had as consequences for the innovation process: lower interest (since the issues of concern were capturing new markets and survival in the new environment) and lower investment. Thus the industry needed support. However in the process of policy creation, the industry was not included enough so that its needs could be addressed at the right pace.

In general it could be noticed (and the problem is still existent to some extent) that the lack of communication and cooperation was spread wider than only on the contacts between the policy makers and the industry, and also among different communities and actors. The lack of cooperation can be seen between different ministries, different sections of one ministry, among various state institutions, state institutions and industrial and research actors, between

[155] They help with consultancy on: in which phase to apply for patent protection, when to disclose essential information about the innovation to potential partners in production, to avoid the danger of abuse of confidential information or copying of innovation, and when the innovation is ready for marketing.

[156] Financing of presentation of innovations at specialized fairs abroad and at home, and via the media, therefore enabling innovators to establish contacts with potential partners for marketing of the innovation.

[157] Bucar/Stare (2001)

[158] ibid

research institutions and the industry, and inside and among industrial sectors. In this sense there was the problem of communication, exchange of information, coordination among different projects, data collection, etc. For this purpose there was a suggestion to create an Innovation Agency which would take over the role of coordinator and information center for the national innovation system. Unfortunately, due to the lack of consensus this Agency was never established. With the reorganization of the state ministries the problem of coordination should have been partly solved, but that was not sufficient.

Another problem still present in the Slovenian innovation system is the innovativeness of SMEs. Although in the transition period there was a big development of the SMEs sector, SMEs continued to be backward when it comes to technology and innovation development. There are already programs for the support of the SMEs on these issues (Slovenian development Corporation helps the introduction of different types of innovations; there are programs for aid in the financing of development projects, and introduction of standards), but there is still need of further aid.

From the problems still faced by the Slovenian innovation policy it can be noticed that they are closer to the problems faced by the open capitalist states, rather than to the problems of the other developing transition countries, as Macedonia. Problems include: technology transfer between science and industry, information and documentation, information management, innovation financing, regional technological promotion; are all problems of developed innovation systems. Slovenia is passed the transition in its innovation policy. Today the Slovenian industry can compete on international markets with quality and innovation. This is due to the importance given to the innovation and technology development since the 1950s, and most importantly the measures taken in areas such as human resources, management technologies, and networking since its independence.

6. Innovation policy observations

The role of the state innovation policy is to improve the level of innovation in a country. The Macedonian innovation policy is not efficient in achieving this goal. Based on the positive and negative experiences in Slovenia, lessons can be learned and applied in the future for the Macedonian policy.

6.1. Policy implications coming from the systems of innovation approach

The typical policy assumption of the past was that the science is purely public good and technology is purely private good[1]. The state should provide the public goods (in this case science), and it should be left entirely on the market (industry) to provide the technology. Thus, the policy role in technology development was not conceived as necessary and not much attention and resources were devoted for this purpose. In the last decades the approach has changed and the idea of national innovation systems evolved. As Nelson and Rosenberg[2] define it „the innovation system … consists of a set of institutions whose interaction determines the production, diffusion and use of new and economically useful knowledge". Based on this concept, presented earlier in this work, changes in the innovation policy are to take place, which are going to involve support for technological development, based on cooperation, communication and networking as fundamentals for modern innovation and technology development.

The system of innovation approach regards the innovation process as ever-present and not as singular event, and as a "graduate and cumulative process"[3]. Since the innovative process takes time, the long term perspective is natural and important. These processes are evolutionary, path-dependant, and open-ended. Following the idea of the evolutionary character of the processes the conclusion follows that an innovation system never achieves its equilibrium, it continues evolving, so "there is no optimal or ideal system of innovation"[4]. Hence, the suggestion for the policy is to move away the focus from individual units and address the overall system[5], which needs permanent support for creation and development of its institutions and organisation.

Innovations happen very often outside the R&D units. They are developed via learning (learning-by-doing, learning-by-using, learning-by-investing, learning-by-interacting) in the process of working on other activities. After innovation development there are other steps that follow during which the innovation can change. These processes (innovations need to be produced, diffused, and used) influence the success and importance of the given innovation. All these elements are part of the systems of innovation[6]. Based on this, the policy should not concentrate only on R&D, as often happens (in Macedonia, till not long ago the innovation policy was concentrated on support for science through financing of specific R&D projects), but on the innovation system in total.

In this system the firms do not innovate in isolation from their surroundings, but in interaction with other actors in a framework and environment influenced by the

[1] Feldman/Link (2001)
[2] Nelson/Rosenberg (1993)
[3] Braczyk (1998)
[4] Edquist (2001)
[5] ibid
[6] ibid

institutions created by the state. Of great importance for the innovation process are the relations which exist among the different actors[7]. The inter-firm relations allow communication among producers and the users of innovation. They are far more than exchange of quantitative information on prices and volumes. Rather, they often develop via cooperation and sharing of knowledge and skills with others, which influences and directs the knowledge development and innovative activities. Besides the relations with other firms, for highly innovative firms, relations with the universities and research institutions is a factor for innovativeness. Keeping in mind the importance of these relations for the innovative performance of the enterprises, the policy should directly target their development. The relations between enterprises, and universities and research institution (specially the public ones) are often regulated with specific laws, which should be appropriate for allowing greater cooperation.

Besides giving the general policy implications the system of innovation approach is useful in identifying the problems that should be object of policy, the causes for the problems and helps in finding the solutions for these problems[8]. Identifying the causes behind the problems is necessary in order to choose the right measures for solving the problems. The OECD has dealt with 'systematic failures' as "mismatches between the components of an innovation system"[9] and divided them in failures in missing or inappropriate organisations, institutions or interactions in systems of innovation. Knowing the causes for the problems, the policy can easier decide on changes in the system it needs to influence.

Since there is no ideal system of innovation, this approach is based on comparisons between different existing systems. The comparison among different systems can be useful as indicators for creation of institutions and organisations, use of finance resources, organisation of education and learning, etc[10]. Important when using the comparison with other system as help for development of the domestic system of innovation is not to forget that copying of others experiences is not the solution, the point of the comparison is to identify the problems and learn, so that the experiences can be further adapted and built on. It is also important to look at incremental changes and not compare with the 'best practice'. That is why for the comparison of the system in Macedonia I have decided to take Slovenia, which facing similar problems, shows better results in developing its system of innovation. Though the Slovenian economy was more advanced even before the independence of the countries, the industrial gap (technological development, economical growth, efficiency of production) between the two countries grew even more due to the lack of long-needed policies. Macedonia should follow the example and engage more active in creation of innovation policy urgently. Since there is difference of the technological level, Macedonia can not use the same measures, but it can learn from Slovenia's experience.

6.2. Approach to the creation of policy

The problems for the Macedonian policy start with the approach towards the policy making and getting the issues on the agenda.

---

[7] Edquist (2001)
[8] ibid
[9] OECD (1998), p. 102
[10] Edquist (2001)

6.2.1. Political concept

The innovation is done by the firms and the research institutions and not by the state. The state should not substitute the market, but it should create conditions for its further development. The innovation policy measures, creation of institutions and organizations, should support the market in the knowledge development, adoption and application, in cases where for the financial and industrial markets it is more difficult to get to innovative goals without intervention[11]. The problems that the policy should cover are of a broad range.

Keeping in mind the specificities of small transition countries, the main topics are going to be somewhat different than the typical problems of other national innovation polices. The policy is often dealing with contradictory expectations. The need for short-term support in the creation of market-driven innovation system cannot be achieved without a long term planning[12]. In this situation the government should create a policy that is going to give the context for the knowledge development rather than setting one-shot projects[13]. It is more important to create a political concept with a plan for restructuring the economy, based on knowledge-based and technological development, than to use individual policy instruments[14]. The situation in the reference countries shows exactly the importance of an over-all concept for the economic development. Taken from the earlier presented analysis of the situation in the two countries, there is an evident difference in the approach. Slovenian policy has been concerned with the technological development of the industry from the early stage of its independence and from the beginning of the transition period[15], creating a base framework for the development of the policy, achieving a broad acceptance of the importance of the innovation and later on continuously working on building supporting institutions. At the same time Macedonian policy has not shown much interest in technological development, letting the industry fight its way through the transition period on its own, which brought it to technological lag and industrial non-competitiveness. Bringing up the issue on the political agenda was different in both countries. The lesson that Macedonia can learn from Slovenia is the need for consolidation approach to the agenda setting. The public is generally prepared and supportive for the policy but the concerned political actors need to initiate the process of problem solving, unfortunately these actions from the political actors are still in their starting phase.

6.2.2. Culture for innovation

Due to the transition in a state, when there are a lot of urgent changes to be done in the society and there is need of political adaptation to the new market situation, all of that done with limited resources, the concern for the innovation and technology development is often neglected. In a situation of fighting for survival on the market, at least on the short-term, the industry concentrates on reorganisation and cost reduction, and the market does not lead to innovative activities. Bringing up

[11] Amable/Barre/Boyer (1997)
[12] Walter/Broß (1997)
[13] Metcalfe (1994)
[14] Walter/Broß (1997)
[15] The innovation policy was different in the two countries while they were both still part of Yugoslavia, with Slovenian politics being more actively involved in the development and support of the technology and innovation even than

their importance for the general economic development and for building internationally competitive economy is of outmost importance for the countries. Thus, the role of the state should be to motivate the industry and the research communities and create a culture of innovation. “It is a culture that allows people to see the necessity of trying new things, of risking failure, of resisting social stagnation, of continuing to grow and adapt to a changing world in a coherent and reflexive way. That is, to have a social identity in which belonging to and maintaining the community means experimenting with doing things differently. Although the products of experimentation may be failures, or lacking durability, it is the institutional and cultural climate of trying to do new things and permitting people to fail that is durable……one way of looking strategically for appropriate policy direction is to acknowledge that a society will be unlikely to become a knowledge society if part of its identity is to be anti-intellectual to the extent that the assumption that knowledge is valuable has no credibility….. Becoming a knowledge-based economy includes the evolution of identity and government has a role in this through its policy settings and by providing intellectual leadership.”[16]

6.2.3. Cooperation and consensus among actors

Especially in the process of agenda setting and decision making, it is of crucial importance that there be cooperation among all actors. The role of innovation policy is to stimulate innovation in the industry and the research institutions, without their direct support in the creation of the policy there will be lack of information on their needs and the requirements they might have from the state. Without the necessary information the policy creators will be incapable of analysing the situation, setting the agenda, developing instruments and making the right choices, leading to failure of the whole policy. For successful policy there is the need for consensus among all involved actors in the policy, industry, and science, about the goals, strategies, and the measures of the policy. The policy should be developed with joint input from all parties concerned, with an ongoing dialogue with the business on their conditions and needs. This should be achieved from the early stage of the policy development[17].

All the attempts for developing an innovation policy and taking measures in that directions in Macedonia have failed because of not having cooperation among the political actors (mostly conflicts between the ministry of economy and the ministry of science). There have been projects developed from some of the political actors, without others even knowing about their existence. That brings inefficient use of resources and the projects not receiving the necessary support and leading to failures. The complexity of the problem asks for more coherent approach, so the implementation of the program should be done with the cooperation of more ministries and institutions[18].

As already noticed earlier, when analysing the problems of the Macedonian innovation policy, the lack of cooperation with the industry and research community in the early stages of the policy development has also brought negative results. As an inheritance from the period of the planned economy, there is mostly ‘top-down’ approach to the policy development. These centralistic policies led to the vertical

[16] Rooney/Hearn/Mandville/Joseph (2003), p. 89
[17] Koschatzky et al. (1995) notice this when discussing the measures for network development, but it is true for the general innovation policy as well
[18] Nyholm/Frelle-Petersen/Riis (2001)

structure of science and industry with seldom relations among actors on horizontal level.

The new innovation policy should be involved in changing the culture[19], through development of institutions and creation of interactive relations that will allow a 'bottom-up' principle, thus involving all policy communities, directly influenced by the policy, to participate in it from the very beginning from the agenda setting and decision making to its implementation and evaluation. The small size of the country, thus the number of actors, allows general cooperation and involvement in the process.

6.2.4. Institutions and organisations

The changes brought by the transition period undermined a lot of previously existent institutions and organisations for innovation support. Due to the changes in the society, the old institutions and organisations, although some of them still prevailing, lost a lot of their roles and are not creating the appropriate framework for development of knowledge-based economy. Thus the development of new institutions and organisations is in place. The type of institutions developed will be dependant on the goals of the policy.

In all transition countries, at the first phase of the transition, the industry is characterised by privatisation of the big state owned enterprises and their dissemination on smaller units. At the same time a lot of new small and medium size enterprises were started. The change of ownership and structure led to focusing on adapting to the new environment and a search for new markets, rather than devoting resources for the technological development and innovation. Thus there was at the beginning need for institutions that are going to support the industry to adjust to these changes. As given by the evolutionary theory, the innovation policy should develop and adapt to the changes in the society. So, due to the transition and the big changes in the surrounding there was need for further development of the policy and creation of new institutional framework which is going to allow the industry not only to adapt to the new environment, but it would also support it in creating a competitiveness through innovation.

Through the Slovenian example, as presented in the previous chapter, it can be noticed that the new institutions and organisations were capable of dealing with the changes in the environment much faster and more effective than the institutions that stayed from the previous system, as it was more the case in Macedonia, where especially in the field of innovation there was a slow change institutional framework.

6.2.5. Assuming responsibility

In the creation of the policy and building of the institutions and organisations, both reference countries (Macedonia and Slovenia) received foreign and international support[20]. Setting aside the conflicts in the interests between the countries receiving

[19] Braczyk (1998)

[20] It is very hard to compare the level of 'outside' involvement, since it is a non-measurable factor, but it can be noticed that Slovenia started cooperation with foreign institutions on the problems of science and technology, and innovation policy in the early 1990s, while in Macedonia that happened almost ten years later. The lack of cooperation and outside support for Macedonia can on one side

and contributing[21], in the early phases of transition, this support was very important for all transition countries. However, for the success of any policy it is not only important that help is received from the outside, but also the involvement of the 'home' actors. The international cooperation can only be seen as 'help for self help'[22]. Policy makers had the legacy of the centralized system and they needed support in learning how to adjust the policy to the new market and social conditions. The outside help should only assist the political actors in making their own decisions and getting involved into institutional learning, enabling them to learn about, adapt and change their institutional framework.

The real "owner" of the process should be the country itself. The responsibility for the development and the success of the policies lay in the hands of the domestic policy makers. In any case, the results from any policy are going to be felt mainly by the country's economy itself, so they are the ones that are most concerned with it. It is not even possible to simply copy the policy from somewhere else and expect positive results. There is the need to learn from others, but at the same time the lessons learned have to be adapted to the domestic circumstances, and for that the role the domestic actors are irreplaceable. From great importance for the success of the policies is that the 'domestic' actors are involved. They cannot and should not act as passive bystanders and expect from the foreign supporters to create miracles[23]. There are a lot of examples in different developing and transition countries where institutions and organisations were set up with foreign support and they were successful only as long as the foreign assistance was in place[24].

In the first decade of the transition, the interest and concern of the domestic actors in Macedonia was not concentrated on the innovation, technology and science development at all. Later on, under the influence and suggestion of the foreign consultants, the first steps towards a creation of innovation policy and system were made, but the domestic actors did not take an active role. The public institutions left not only the initiative, but also the creation and implementation of all the measures to the 'outside support', who were lacking the 'local know-how', so that the instruments were not always optimal for the specificities of the situation in the country, and additionally to that when the foreign support was finished the projects were failing. The Slovenian political actors were capable of taking over bigger responsibility for their policy and projects, which can be contributed to their own initiation for a lot of these projects as well as their previous interest and activities in the area. Another topic that I am not going to further discuss in this work but is influencing the capability for accepting responsibility, as it has already been mention earlier, are the interests and the type of support offered by the 'foreign contributors', which very often does not allow active role of the domestic actors.

Thus, there is the need to activate all the domestic resources available and all the potential actors, and with the help from outside, but domestic powers, create a policy community which is going to be capable to take over the responsibility for developing the necessary framework conditions. The public institutions involved in the policy can improve their support and influence on the innovativeness in the country through communication and cooperation[25] with the other actors, discussing

be because the country did not show any activities on its own in this field, on the other side because of politically different positions of the two countries.

[21] Though these conflicts influence the nature of the support given, it is not matter of analysis in this dissertation.

[22] Meske et al. (1998)

[23] ibid

[24] Radosevic/Walter (2002)

[25] Organizing seminars or workshops on this matter might show to be very fruitful

their behaviour and as result improving their activities, developing capability for taking over more responsibility and making autonomous decisions[26]. If that is successful, the help from outside will complement the domestic efforts, leaving the decisions, and with that the responsibility, to the ones receiving the help.

6.2.6. Endogenous development

In the technological and innovation development, the countries can rely only on their own strength. The "'endogenous' approach stands for a situation-oriented industrial strategy with a pragmatic approach relying, of necessity, on the country's own locally available 'endogenous' resources and exiting initiatives. It involves not only mobilizing previously unexploited resources, but also developing them further in order to make more efficient use of them in an autonomous modernization."[27] When developing the policy, the starting point is the industrial traditions[28]. Those traditions should be expanded and supported for technological and innovative development on the way to creating a competitive industry and research.

Supporting the endogenous development means that there is the need for creation of the techno-industrial elites[29]. The role of these elites is of even more significant importance in small countries, where small groups can make a big difference and lead the direction for the development of the country's economy. In the transition period, there is need for change in the elites as well, so new elites will emerge and they need to be management and innovatory elites[30]. They will evolve from qualified young people, who are the most future oriented population. At the same time companies that are going to employ them and provide working conditions that allow the use of their qualifications and knowledge will become industrial elites (e.g. technology-based companies, innovative enterprises, companies that participate in R&D cooperation). These elites, with the support of the policy, should change the attitudes towards science and innovation, and direct it towards more cooperative, market oriented approach.

6.2.7. Data collection

For the development of technology and innovation policy and for the creation of a political concept, there is a variety of data from different sources that need to be collected and analysed. Only based on hard data can the policy creator be able to identify and assess the issues and the problems where there is need for their involvement, and come up with the appropriate responses to those problems[31].

A system of indicators should be developed in which the traditional statistical data[32] will be expanded with data as on indicators on the issues of importance for the

[26] Kandil/Walter (2002)
[27] ibid
[28] ibid
[29] Schweickart (1996), Wollmann (1995)
[30] In the period of transition and building of new elites the problem has occurred of creation of unconstructive, instead of the so much needed constructive elites. The entrepreneurial potentials instead of being devoted for industrial growth and innovativeness, turn their energy towards short-term, not development-oriented activities
[31] Feldman/Link (2001)
[32] Some of the statistical data collected refers to proportion of engineers and scientists in the active population, university-industry relationship, capital risk industry which invests in high technological

enterprises, technology transfer between science and industry, cooperation among firms, innovation infrastructure and institutional framework conditions[33]. Foresight methods and instruments can be used for analysis of these systems of indicators, and with that it would be possible to establish the innovative potential of the country as well as typifying firms according to their innovative capabilities for the purpose of future promotional activities. Besides analysis of the industry, it is important to make a reflection of the situation of the scientific institutions and their capability for cooperation with the industry. On the base of the outcomes of this analysis it will be possible to acknowledge the functions that the state needs to take-over for their support.

In the course of my research I faced the problem of insufficient data. In Macedonia besides the traditional statistical data there is no system of gathering other information[34] and very often there are contradictory data coming from different state institutions (e.g. the data from the Statistics Office and the Ministry of Economy). The communication between the policy makers and the industry and research institutions is not on a high level, so that even informal gathering of information is not likely. This assessment of the situation of the country is based on all the available information, even on unverified reflections sometimes, because of the lack of data. In order to be able to truly assess the situation, one of the priorities for the policy should be creating a reliable system of data collection. Considering that the situation in Slovenia is not much better when it comes to data collection (the same problems that exist in Macedonia are there as well), this system in both countries can be improved based on international norms and standards for data collection, as well as examples from other 'best practice' countries.

6.3. Goals of the policy

The complexity of the system of innovation and the continuous changes and developments in this system asks from the innovation policy to be process oriented and focus on system design[35]. In order for the system to be functional it needs to be designed so that it is capable of self-referencing, self-organising and self-transformation. For the purpose of building this type of system, the innovation policy should involve far more than only considerations with research and development, but also knowledge, education and training, technology, culture, information society, regional development, and structural changes. In order to cover all of these topics, flexibility and differentiated approach dealing with the different problems are of use. All these issues cannot be solved with innovation policy only, but there is the need of cooperation with other state policies as later presented[36].

Innovation policy in different countries has different goals. For the reference countries, because of their small size, creating international competitiveness based on economies of scale and low costs is not possible[37]. The only option is to compete

---

firms, costs of filling licensing, time for firms creation, mobility of stuff between companies and inside the company

[33] Kandil/Walter (2002)

[34] There have been some 'one-time' surveys for the needs of specific projects, but they were mostly done without a proper statistical analysis

[35] Bryant/Wells (1998), p.92

[36] Rodrigues (2003)

[37] On this point one can add that competitiveness on international markets based on economies of scale and low costs is not possible any more. In the modern economy the competition forces the

with technologically advanced, innovative products and services on the international market. The problem of innovative capability arises. When there is a lack of this capability, adoption of the already existing knowledge, searching and learning to transform inventions from elsewhere is required. Thus the policy should support the development of adoption capacity through its measures concerning the education and creation of networks.

From the overview of the situation in both countries, conclusion follows that the policy is restrained with limited resources that the state is capable of devoting to it and due to the transition process, the need of new institutions that are going to give the framework conditions. Thus the state policy should not be devoted to only investments in projects and their direct financing. With direct financing the research institutions do not have motivation for cooperation with the industry, since they are going to be getting the necessary resources for their work and the innovation produced will not be according to the market demand, so their application might not be possible, which will make the investment economical unjustifiable[38]. The limited resources should be devoted to the creation of conditions for the market to assume the role of innovation, by supporting the creation of demand-oriented innovation. The innovation policy under the given circumstances should create conditions through institutions that are going to be concerned with the building of innovative infrastructure, knowledge creation and transfer, cooperation between industry and research institutions, networks of enterprises, international cooperation, innovation-oriented services, etc.

Thus, the goals of the innovation policy should be the creation of an innovation system that is going to give the framework for the industry and the research institutions to create their technology adoption capabilities and further develop it towards higher innovativeness; at the same time a system that is capable to develop and evolve with the changes in the environment and to follow the needs of the actors concerned.

6.4. Private public responsibilities

The question coming up when working on technology and innovation policy is to what extent should the state intervene? It is generally acknowledged that policy should not intrude in the areas of companies' decisions on innovations and investments[39]. But it is the role of the state to maintain innovative infrastructure. It is hard to put a strict line between the public intervention and the private activities, since it is often hard to separate the industrial innovations from the public infrastructure which contributes to their functioning. Very often the role of the state goes further than just creating the infrastructure; it initiates research programmes, supports cooperation…etc[40].

---

enterprises to have modern, technologically advanced and innovative products which will incorporate cost saving

[38] Bucar/Stare (2001)

[39] Fritsch/ Audretsch (1995)

[40] Rothwell/Dosgstone (1992) summarize the evolution of technology policies: innovation policy emerged in the early (initially in the USA). It included grants for innovation, the involvement of collective research institutes in product development for individual companies (as opposed to generic problem solving) and the use of innovation-stimulating public procurement. In early 1980s technology policy arose: 'it involved the initiation of major national technology programs in information technology (and to a lesser extent biotechnology)', focusing in firm-firm or firm-public research institutes collaborative pre-competitive research. 'A further major policy shift has been the

The innovation policy needs a wide range of institutions for achieving its goals. To some extent these institutions can be provided by the private sector or there are also possibilities for public/private cooperation in organisation of some institutions and provision of some services (provide information and consultancy and administer governmental programmes). These organisations could have an autonomy in the organisation of their work (day-to day activities), but they will have to work under certain rules and procedures and be responsible to the state for their actions and results. The policy can delegate certain tasks to private organisations but it should keep the responsibility for the cooperation and coordination; the state should be a moderator between the different actors[41].

6.5. Innovation agency

The biggest problem for the policy in both reference countries in the moment is the non-coordination and difficulty for creation of joint goals between the different political and administrative actors involved. Because of the conflicts between the actors, there is incapability for making decisions. Very often, instead of cooperation and joint work, there is a tendency to undermine the efforts of the others. Thus there is the need for an institution that is going to take over the responsibility for the policy development. A coordinative body will be able to manage the resources for innovation and synchronize the state activities, and have a leading role in the creation, implementation and evaluation of the policy. It should be created from representatives from all the actors dealing with the subject (ministries, agencies, universities, research institutions, enterprises, service providers). The leading role in this body can be given to an innovation agency.

The role of the innovation agency will be in the first hand to fulfil the administrative tasks in the public support for innovation and carrying out the state programs, as well as consultancy, planning, assessment, monitoring, steering and evaluation of the state measures[42]. It should be a 'contact point' and have a continuous contact with the industry and have knowledge of their needs, and provide services (information, consultancy, management support for innovative activities, contractual and cooperation mediation, etc.) that are demanded from the enterprises (taking into account the already existing institutions). This agency can take over the support for the necessary institutions (technology centres, industrial networks, chambers of commerce and handcraft, etc.) and assist the funding of projects by banks and special funds.

All these activities that can be done by the Agency might create the problem of not being able to provide specialized services and thus support the demands of the industry. So, not all of these tasks have to necessarily be assigned to one institution. Depending on the evaluation of the situation, supporting innovative infrastructure, organizations (e.g. consultancy houses, innovation centers) which can provide some of the services instead the agency can allow the agency to concentrate and specialize on the other tasks. A separate problem, as for most of the measures, is finding financial resources. Of utmost importance for the success of the agency is accomplishing to bring together the potential actors and customers to use their services. It needs to find its position in the existing structure, stressing out the new

change in emphasis from large to small firms…. By the early 1980s many instruments were in place to support innovation by SMEs' (Rothwell/Dodgstone, 1992, p.228).

[41] Radosevic/Walter (2002)

[42] ibid

functions that it offers for the innovation and technology development, this can be achieved by using the already existing institutions in the course of its activities.

In Slovenia there was a proposition for creation of such an Agency, but because of lack of consensus the idea was never brought to reality. Thus they are still facing the problems that might have been solved with such an institution. In the preparation phase of the Slovenian agency the importance of public-private founding for this agency[43] and the establishment of the agency in stages[44] was recognised, so that higher acceptance from the industry would be achieved. Considering that there is a need of a strong national innovation system and as already concluded higher level of cooperation and communication of the actions taken by different political actors in the area of innovation promotion, Innovation Agency should be created in both countries and the experiences gained in Slovenia in the previous development process as well as experiences in other countries where such coordinative bodies exist should be used.

6.6. Role of the infrastructure

The role of the state through the innovation policy is to create the framework and the condition for knowledge creation and diffusion, technology and innovation development and application. It can achieve these goals by supporting a knowledge and innovation infrastructure most suitable for the needs of the enterprises and the research institutions.

Technology infrastructure is an element of a given industry's technology that is jointly used by firms in competition with each other[45]. It is 'the set of specific industry-relevant capabilities which have been supplied collectively and which are intended for several applications in two or more firms or user organisations'[46].

Infrastructure organisations should actively participate in the policy process, build innovative climate and culture, turn latent into effective demand, and cover the whole wide range of demands (from technological needs to the improvement of learning abilities)[47]. For the policy it is important to support both material and non-material infrastructure. The non-material infrastructure should include workable administration and bureaucracy, as well as sustain legal certainty and sufficient political and social stability[48]. The innovation infrastructure includes the education system as source of qualified labour, information infrastructure[49], networks, technology transfer, technological centres and agencies, knowledge-based services…etc. The setting of standards can also be used as support rather than limit to innovation. The goal of the infrastructure should not only be to support the production of knowledge, but also its accommodation and application in the industry.

The importance of the infrastructure is increasing with the growing importance of the knowledge and technology development for market competitiveness. The technology and knowledge intensive industries are spreading among the

[43] Kandil/Walter (2002)
[44] Starting with administrative tasks and coordination among public institutions, continuing later to develop the demand-oriented services
[45] Tassey (1996), Dyker/Radosevic (2000)
[46] Justman/Teubal (1996), p.23
[47] Tsipouri (1996)
[48] Kandil/Walter (2002)
[49] Integration of the local information infrastructure into the international system, as connections with EuropeanNet, Ebonet and Internet information systems, or development of a library system is of great importance.

manufacturing and service sector, far out of the range of what is considered high-tech sector on the basis of the final products or R&D intensity. So, the range of enterprises for which regular knowledge and technology developments are relevant is wide. With technology becoming more complex and innovation bringing constant changes, companies need to regularly follow these technological changes and internalise them. In order to adapt to these changes they need to improve their own learning, technological, and managerial capabilities. For a lot of companies, especially for SMEs, the investments in R&D, technology monitoring and transfer, as well organisation of employee trainings is too high cost and they are not able to do it on their own, internally. Thus, the innovative infrastructure should give support and provide externally these functions[50]. Through innovation infrastructure economies of scale can be achieved, and thus the firms can replace not having these elements in-house and practice technology development. Without infrastructure in education, training, R&D, information, and other scientific and technical activities[51], the adoption of knowledge will be on a very low level[52].

Of great importance is the task of the policy to create a demand and motivate the enterprises to take advantage of the know-how supplied to them through the institutions, to convince them that their "entrepreneurial competence and learning ability are insufficient and more than that, that sources outside the firm itself are able to improve it effectively"[53].

The innovative infrastructure can be provided by the state, through public-private or private organisations. As long as it is possible, it is better to allow private provision and market oriented building of infrastructure (information services, consultancy organisations, university-industry consortia, semi-public networks of innovation centres, etc.). The government often is not capable of doing a good job or does not have the resources. In the big markets, the infrastructure services will be more demanded and more market driven, profit-making institutions will be able to exist. However, smaller markets (here considering the countries in question) there will be the need of bigger public intervention. This implies that the policy should be devoted, especially in the early stages of system development, on public provision of infrastructure services, with tendency for these organisations with time to become more market and demand oriented, and thus creates possibilities for private supply. 'Bottom-up' approach should lead to demand oriented services. For these the policy can cooperate with industry associations as builders of the technology infrastructure, targeting branch specific need, financing it through members' fees and customer contribution.[54]

For small countries, with limited resources devoted to the innovation policy it is of great importance for those resources to be put in use of the whole innovation community. The biggest advantages in this sense will be achieved through the infrastructure. The effects that building of efficient infrastructure (both material and non-material) in Slovenia, where in the last fifteen years there were wide variety of activities in support of human resources, networking development, technology transfer, innovation funding etc., can be a motivation for the Macedonian policy makers to pursue the development of the same in their country.

[50] Tsipouri (1996)
[51] Government laboratories can provide services for wide range of enterprises and thus realize economies of scale and scope from unique research skills and facilities
[52] Freeman (2001)
[53] Tsipouri (1996)
[54] Dyker/Radosevic (2000)

6.7. Knowledge-based services

As it can be concluded from the above, a big importance is given to the knowledge-based services. In the last decade this sector's importance for the economy has increased rapidly, with increasing proportion of the population being employed in creating, disseminating and using new competences. They are important because of their direct contribution to the creation of knowledge as well as indirectly by influencing enterprises from other sectors, helping to transform firms into 'learning organisations'. Communication services, consultancy, moderation and coordination, and financing are of great importance for functioning of networks (supporting flow of knowledge and information from one organisation and/or sector to another), but also for the whole industrial dynamics. They are key factors in the innovation system for "gathering and codifying knowledge, connecting users and producers of knowledge, and distributing knowledge, worldwide, between different localities"[55]. Their existence on the market is profitable for the whole economy[56].

Thus this sector should not be neglected in the policy. Acknowledging the role that these services have for economic networks, learning economies and systems of innovation, and for improving the economic efficiency, the policies have to tackle this issue and create a framework in which services can operate and take effective part in the economy. As some other forms of innovation infrastructure, the knowledge-intensive services can also be funded and facilitated from the state, but in the long term by providing services that are demanded by the market, services for which there is a sufficient number of enterprises able and willing to pay for, these organisations should not be supported from the state budget.

In Macedonia, where knowledge-based services are still not available as in other places, the state has to engage in their development as fast as possible, since the example of these services in Slovenia shows that there is need of such services in the industry and that they can function, after initial support from the state, under market conditions, from the revenues they gain from supplying the service. In Macedonia there are mostly services, both publicly and privately provided, close to the daily business (accounting, legal consultancy, basic IT services, marketing, business planning). These organisations can be used, with their experience and contacts on the market, and supported for the development of other more knowledge-based services. The assumption is that this way the cost for development of the services will be lower and it will be easier to create market demand and let them function under market conditions. Close contact with the demand, for users' easier and faster access to information and advice, can also be created through the already existing regional offices of different institutions (local offices of ministries, agency for SMEs, chamber of commerce, technology centres, etc.), which as local actors have more region specific information and informal personal contacts[57].

6.8. University-industry cooperation

In the past there was a clear division between universities and firms in the process of knowledge development. Universities were advancing the "knowledge frontier at the forefront of the unknown"[58], while firms were responsible for

[55] Lundvall (2001)
[56] Haunknes (1998)
[57] Walter/Broß (1997)
[58] Conceicao/Heitor (2001)

commercialisation and diffusion of technologies. For the firms devoting resources for scientific research was too risky. The role was taken by the universities, where the incentives were so developed that they did not penalize too much in case of failure but also did not reward exceedingly for successes[59]. In Macedonia and to certain extend still in Slovenia, as presented in the previous chapters, this relationship between universities and industry is still very much in place and this hinders and slows down the development, transfer and application of knowledge. Thus, there is an urgent need for changes and new state measures that will support these changes.

In the more developed systems of innovation the market evolution has changed the status. The boundaries between universities and enterprises are breaking. On one side as knowledge creation is increasingly important for the success of the companies, they are looking into the universities and how they organise and motivate creative activities. On the other side the universities dealing with limited resources for their research search for other sources for funding, and thus try to learn from companies how to commercialise their knowledge most efficiently[60].

The creation of knowledge and innovation demand cooperation and interaction among different actors from different institutions and locations. Firms that are cooperating with universities have shown much higher level of innovativeness and technological advance. This shows that the industry needs universities as a knowledge base. But the problem can not be solved only from the side of the universities. Firms have to show interest for cooperation as well. Thus the role of the policy is to create framework that is going to make this cooperation more accessible, but also, which is probably a much harder task, to persuade the enterprises of their need for cooperation with the universities and taking advantage of the knowledge gained from there. This can be done by offering, for a certain period, the enterprises cost-free information and consultancy, so that they realise the advantages of the cooperation. In that period consulting services might be useful to pinpoint the possible needs of the enterprises.

6.9. Networks

Aside from the cooperation between universities or research institutions and industry, of even bigger importance for transition economies, is the cooperation between enterprises. The level of knowledge incorporated in products and services has been increasing and there is no single firm that controls all the knowledge needed for development of new products, processes and services. For firms competence it is important to have a sufficient contacts with the suppliers, users and competitor. This is done through organisation of networks.[61]

Networks are characterised by their participants, the activities that they undertake (development, combination, exchange and transformation of resources) and the resources that they use in the course of these activities[62]. The experience and investments (knowledge, relationships, behaviour) from the present and past participants are embodied into the networks. There are certain power structures

[59] When university researchers are civil servants and the salaries (rewards for their work) are structured under limitations given for civil servant systems. The competition is not going to evolve around financial benefits.
[60] Caraca/Conceicao/Heitor (1998)
[61] Lundvall (2001)
[62] Hakansson (1987), Hakansson (1989), Harden (1992), Fritsch (1992)

inside them, influential potentials of actors who control activities and resources[63]. For the networks to function they need framework created out of political, legislative and administrative rules that the policy needs to set up[64].

Networks can be organised in different forms and for different purposes: information exchange, collaboration to reduce risk or costs, transfer of technology, industry forums, and strategic alliances[65]. Elgar [66] divides the networks in three different types: networks for services and assistance, for information and structuring, and for entrepreneurship and product development. Networks differ in their structure and legal status, some of them using direct others indirect mechanisms[67], and vary from formal-contractual networks, licences and royalties, through partnerships based on shared risks, joint project, personnel exchange, workshops, to informal interaction among individuals. The following table shows different forms of cooperation among firms.

	R&D	**Production**	**Distribution**
One-Way agreements	*Licensing* *Cross-licensing* *Early efforts to commercialize* *Public sector R&D* *Joint ventures*	*Sub-contracting* *OEM[68] (TV sets, PCs)* *Acquisitions*	*Franchising*
Two-way partnerships	*R&D-consortia (ESPRIT, EUREKA)* *Customer-supplier networks (textiles, electronics, autos)* *Inter-firm tech. collaboration agree-ments* *University/industry partnerships*	*Co-production* *Use of common components (across automobile models)* *Modularization (auto dashboards, aircraft)* *Joint ventures (biotechnology)* *New forms of sub-contracting*	*Joint marketing* *System-products (the weird house)* *Standardization of interfaces*

Table 30: Inter-firm technology agreements [69]

The participant of the network can be either only domestic or there can be foreign partners as well. The contacts with foreign partners make the organisation of the network more complicated. It is harder to solve problems and to organise projects because of the geographical, legal and cultural, and even language differences.

[63] Koschatzky/Uwe (1997)
[64] ibid
[65] Oliver/Blakeborough (1998)
[66] ibid
[67] Direct mechanisms concern, for example, a specific technology or specific ideas, indirect mechanism, publications or conferences; see Meske et al. (1998)
[68] An OEM (original equipment manufacturer) is a company that builds products or components that are used in products sold by another company (often called avalle-added resaler, or VAR). An OEM will typically build to order based on designs of the VAR. (http://en.wikipedia.org/wiki/Original_equipment_manufacturer).
OEMs buy products in bulk and customize the them for a particular application. (http://www.webopedia.com/TERM/O/OEM.html)
[69] Source: Mytelka (1993), p. 109

Networks can also differ according to the advantages that they create for the participants. It can be that the networks are created in order to organise activities, projects which could not be delivered unless inside a network. It can be that they are used for activating more reluctant players or limit negative influence of some agents (from inside or outside the network). In one network, not all the agents need to have the same influence and importance, it is often that there is one key player.[70]

There is an increasing trend in the development of networks. There are many reasons for this. The knowledge that needs to be exchanged among different economic actors is not only codified, and the transfer of knowledge is much more expensive when un-codified knowledge needs to be transferred[71]. Through the networks, the transfer of knowledge can be made easier. There are positive externalities created in the networks through the knowledge spill over and the knowledge is transferred much faster than outside the network. Network participants can specialize in one type of (tacit) knowledge and they can complement each others' needs. With the development of ICT, the cooperation is accompanied with lower costs, ways of communication get shorter and there can be faster reaction on the market participants, which will increase the efficiency and productivity[72]. In this way the network reduces transaction and development costs. Through cooperation: knowledge accumulation and innovations are built up faster, and going through all the phases of the innovation process is faster (commercialisation is easier)[73]. Networks are of most importance for the enterprises in the early stages of product development (when innovative activities are under-taken) and in the phase of growth (cooperation within the industry)[74]. The externalities that are created are not only on the reduction of transaction costs, but also creation of economies of scale for learning and other complimentary activities[75]. This is especially important for SMEs which often do not have the necessary resources, time and expertise for organising some activities and projects on their own. In networks, there is easier access to capital and there is risk-sharing. On one hand risk is reduced by setting the relationship in institutionalised framework, on the other hand there is risk-sharing by joint activities and projects in case of their failure.

Development of innovative networks brings skilled people, attracts new technologies, research investments and increases the economic activities of the regions/nations[76].

Thus, the reasons for firms to be part of networks are[77]:

- Need for complementary technologies
- Cost or risk sharing
- Access to new markets
- Lacking of information
- Quick changing of the markets
- Requirements for diverse range of knowledge
- Need of different expertise

[70] Bennet/Krebs (1994)
[71] Cohendet/Joly (2001)
[72] Imai/Baba (1989)
[73] Porter (2002)
[74] Dohse (2002)
[75] Walter, Broß (1997)
[76] OECD (1999c)
[77] Oliver/Blakeborough (1998)

For the existence of a network there is need for physical closeness[78]. Although with the modern communication technologies this is not that important any more, yet certain tacit knowledge demands 'eye-to-eye' communication among the partners[79]. The closeness improves efficiency, but at the same time it needs to allow for different participants to exist. Smaller geographical areas might be limited in number and differentiation of actors. Problem for the participants of the networks can be the non-existence of the right actors, so networks should bring the right partners together[80]. The advantages of participating in a network can be taken only if the number of actors exceeds a minimum necessary for cooperation, and where the sharing of individual competences promises a high degree of synergy on both sides[81].

There are certain assumptions made when creating networks[82]:

1. Participation of the network always brings advantage for the players. It might not be true if the partners do not fit together and do not compliment each other.
2. Communication is easy because there is perfect compatibility. The communication might be complicated because of the difference of companies' cultures and goals, it can function if all the participants are communicative, open and cooperative, if they are not all of these than they need training and good intermediary.
3. Homo economicus exists. The network participants are always trying to maximise their gains.
4. IT-technology will keep on building without any limits. The improvement of IT technology should only make the communication and cooperation in the network easier and more fruitful.

Network participants should keep in mind that these assumptions are not always satisfied. Besides these there are also other problems that occur in networks: organising the project management and the ownership of the intellectual property, problems about authority relations between players, and inter firm as well as intercultural differences that might arise form the cooperation. To cope with these problems there is need of good mediator and network organiser. The state can take over that role or it can be fulfilled by private organisation.

For the networks to function and fulfil the goal of their existence, cooperation among the players for mutual advantage, there is the need of creating a atmosphere of mutual support among participants from the different disciplines, business, professional and status groups, and coordinating the different skills (marketing, purchasing, industrial design, engineering, production) brought by them inside the network, which is a challenge done inside one enterprise and even bigger on the network level. For the functioning of the network, of great importance is trust among the players[83], since the information can be exchanged only if it is taken out of the market[84]. For this purpose the players need to create a long-term relationship. In the duration of these relationships the reliability of the parties can be detected and thus trust built up. All the participants making a specific investment for that relationship establishes trust, since there will be opportunity for punishing any disloyal behaviour. For creation of trust an existence of 'village-like environment' inside the network is of

[78] Porter (2002)
[79] There are authors that argue that on long run the geographical closeness can impede with the network development; Storper (1997), Lundvall (2001)
[80] Lazaric/Lorenz (1997)
[81] Koschatzky/Uwe (1997)
[82] Scholz (2002)
[83] ibid
[84] Braczyk (1998)

great advantage[85]. This environment does not force firms to cooperate but it gives them the opportunity for it. The existence of trust increases the communication and cooperation, and contributes to the creation of knowledge.

In order to create stronger networks, with more cooperative environment and feeling of trust between the participants, the policy (in cases where the networks are supported by the state) should motivate for participation into the network with means other than financing and subventions, in order for the network participation to be based on market needs. In this case the participation will be based on real desire for cooperation and not just taking advantage of the subventions, and there will be feeling of trust between the partners. Getting technologically advanced enterprises to participate in the networks can provide high spillover effects. The policy should create joint goals and objectives for tying the partners stronger to the objective of their cooperation and thus creating stronger connection. It also needs to set clear relations among the partners and rules of conduct, so that conflicts do not arise or are easier to be solved.[86]

The policy should not create networks. Networks should be business driven. What the policy can do is create conditions which encourage network creation, create institutions that reduce the risks involved and support existing initiatives in formation of networks[87], bringing closer the relevant public and private actors (enterprises, research institutions, universities and service providers)[88]. This can be done by strengthening the existing relations and if network deficit is identified (because of market failure the cooperation has not been established) by initiating new relationships[89]. The policy can sustain the coordination and interlinking between partners, by public organisations that are going to take over those responsibilities or support for private ones.

If there are no networks created, then the state can take over tasks as: performing objective diagnoses for enterprises, assisting in removing barriers, convincing firms of the need for innovation planning in the enterprise, and overcoming the doubts of entrepreneurs; as support for network creation[90]. The state can participate in the creation of the necessary infrastructure and services provision, support for trainings and education, and promotion for transfer of technology. Public financing of networks should be only for closing of ‘gaps’ in the joint activities and considered temporary solution; or financing of the start-up operating and equipment, or network relevant industrial R&D[91]. Cooperation with different networks on national or international level can also be part of the policy objectives[92].

The problem in the creation of a network is providing the necessary services and creating demand for them. There are two ways to create networks[93]: one, through organisations that start with providing some ‘basic’ services (business plan, accounting) and than gradually add other services to their assortment which are going to be more network relevant (business partnering, venturing, projects cooperation, etc.); two, through organizations that are able and willing to create networks (public programs or governmental agencies) and provide information to

[85] Braczyk (1998), p.199
[86] Scholz (2002))
[87] Lundvall (2001)
[88] Meske/ et al. (1998)
[89] ibid
[90] Koschatzky/Uwe (1997)
[91] Radosevic/Walter (2002)
[92] Koschatzky/Uwe (1997)
[93] Radosevic/Walter (2002)

potential customers. These organizations should take over the network coordinator's function.

The role of coordinator in the networks can be taken over from some of the participants or from outside organisations. It can be from private or public organisations. The coordinators can be representatives of research institutes, entrepreneurs, or public administrators. They need to have technical qualifications, communicative competence, authoritative and well-accepted personalities and good relations with regional administration[94]. The position needs personal contacts, so they are more important than the technical skills.

The function of the coordinator is to gather data (on demand and supply of technology, technological and market trends, innovation services and demand for them), takes on documentation, as well as acting as a contact partner for the other network partners as well creating contacts with partners outside the networks[95]. It should do functions as[96]:

- supporting of innovation activities, use contacts with players in research and economy
- identification and organization of exchange of specific capabilities of existing and potential network actors
- elaboration of cooperative strategies (together with business sector)
- assistance of the science sector to provide demand oriented services to the industry, especially to identify technologies with market potential and facilitate the direction of the demand for research results
- taking over activities that are not provided by market (venture funding, real estate development)
- connecting with other networks on same or different levels (national, global)
- providing additional services (e.g. issuing information letter, organizations of conferences, fairs)

Network development is of great importance for small countries, where big multinational organizations are rear and in general the size of the firms is much smaller than elsewhere. Macedonia can develop a knowledge-based economy only by supporting cooperation among enterprises (especially SMEs) and among industry and research institutions (universities). There are no enterprises that have the necessary resources for innovativeness on their own hand. In Slovenia the state has been promoting network creation and cooperation among enterprises and enterprises and research institutions since the beginning of the transition process and although there is still insufficient cooperation with the research institutions, the cooperation awareness between enterprises has increased and already showing some of the advantages of networking mentioned above. The fact that the country is small contributes to the village-like environment, which can be used for stimulation of cooperation and network building. The goal is to build up an economy with functioning innovation oriented networks

6.10. SMEs

In both Macedonia and Slovenia, of great importance for the economy, are the SMEs. They employ the biggest number of people and have the potential for biggest

[94] Koschatzky/Uwe (1997)
[95] Walter/Broß (1997)
[96] Radosevic/Walter (2002)

development. Since Schumpeter the small firms have been seen as "key actors for new industries that emerge as a result of 'creative destruction'"[97]. This idea was later developed, the evolutionary approach views small firms as a source of innovative activity, and source for market instability, which leads to creation of mechanisms for regeneration[98], as well as the biggest creators of jobs.

However, the presentation of the situation in the reference countries, but also in other economies, shows that the actual situation is that SMEs as a base of innovative activities have weaknesses. The problems concerning SMEs can be divided in few groups:

- Financial difficulties
- Human resources: managerial capacity, and technology and knowledge adoption capacity (small number of people, covering also day-to day responsibilities)
- Contacts with sources of knowledge and higher costs than big enterprises, they do not have internal sources, have to rely on external ones
- Cooperation reluctance, the usual channels are not sufficient, they need to be led towards the R&D infrastructure and use of the services offered

The main weaknesses coming out of the previous problems and issues that the policy needs to be considered are similar for both Macedonia and Slovenia. Though at the beginning of the transition period there was a rapid creation of new enterprises whose rate has been showing stagnation in the recent years. The existing SMEs show slow rate of growth and there is small number of those that can be considered high tech or high value-added enterprises, as well as SMEs that have links with international markets. This is due to lack of resources and expertise to dedicate to exploring and developing technological issues; SMEs approach technological development in an ad hoc way, preferring incremental, learning-by-doing experience rather than organised activity. SMEs do not take advantage of the knowledge and expertise which exists outside the firm; insufficient high skilled personnel and lack of managerial skills. SMEs in these countries show reluctance for cooperation among each other. They face insufficient infrastructure, sources of financing (especially problem of non-existing venture capital suppliers), 'grey economy', and complicated bureaucracy.

The needs of the SMEs are in all areas of industrial innovation, the development, production and market entry of new products, as well as use of new technologies in their activities[99]. For stimulating technology competitiveness of SMEs the policy actions should concentrate on two levels, level of the firm and level of the firm's environment[100].

On the firm level a policy should:

- Help SMEs recognise the importance of technological development, set goals, and create and implement development and competition strategies, based on market needs and existence of actual demand for new products and process. Through stimulation of public dialogue (possibly including technology-intensive SMEs in the process) and public promotion programmes, using more informal and personal relations than formal ones, the policy can influence the spread of innovative culture and awareness. The science and technology push approach should be substituted with measures that stimulate market orientation and strategies that are devoted

[97] Pfirrmann (2002)
[98] Acs/Audretsch (1993)
[99] Muller/Gundrum/Koschatzky (1997)
[100] Kuhlmann/Reger (1996)

towards the demand. Support of services of innovation management, marketing and financing, as well as providing technology assessment and foresight might be some of the instruments used by the policy.

- Assist them in improving their information research capability in relation to technology and in their ability to evaluate and apply this information. It can be done through information about various R&D institutions, publications/open meetings, information about potential cooperation partners and possibilities for communication with other enterprises, information about promotional possibilities; support for technology transfer institutions (providing information on technological developments and ways of solving problems in the enterprise itself) and their promotion among SMEs. The most effective way is to assist the enterprises in the creation of their own 'force' of people who are capable of cooperation with researchers, of following technical developments and finding ways in applying them in the enterprises' activities. These can be done through support for hiring skilled personnel, providing various trainings (e.g. in innovation management techniques such as quality, business re-engineering or value analysis, as well as trans-disciplinary, technical trainings).

On environmental level the policy should support:

- Efforts to promote the creation and development of new technology-base firms, through start-up support, technology incubators and centres, providing initial help in general services (book keeping, marketing, legal consultancy), as well as knowledge and technology oriented services; providing information and programmes for improving the supply to SMEs with start-up capital
- Cooperation between enterprises and between industry and research institutions on more general issues, activities that are too expensive for enterprises to conduct on their own (e.g. trainings, market research), but more important in matters of benefit for knowledge and technology research, development, and applications. Besides supporting the enterprises in improving their capability for knowledge acceptance, evaluation and application, the policy should promote pre-competitive joint research projects with other enterprises/research laboratories, network oriented R&D activities, joint development of high quality products and services, and joint activities linked with attracting foreign markets. This cooperation, in particular the ones between enterprises and universities, can involve personnel and training, e.g. placing university graduates and external specialist as 'innovation assistants' together with firm's own specialists as part of mixed teams in order to improve condition for the cooperative development of new products and processes in SMEs[101]. A very important issue will be the promotion of sub-contracting relations between SMEs and large companies; this will help the SMEs to become demand driven and encourage the large enterprise to be more open for SMEs is needed.
- Innovation services and infrastructure: It is a wide range of services that are closely connected with the efforts and topics of the policy. Following the previous problems and measures for their solution, the most important services that need to be supported by the state should be providing technology oriented demonstrations (for promoting the need for the knowledge-based services among the SMEs) and trainings (training should be provided for communicative skills as addition to the already suggested managerial and technical skills), which will create inside the enterprises, on one hand the necessary skills for following and evaluating the new developments, and on the other hand the capability of adopting and applying them in

[101] Koschatzky/Gundrum (1997)

the firm's activities. For support of networking and cooperation the state can create organisations that are going to take over the role of initiators, mediators and consultants. For these services, it is important to find people with experience and as well as professional skills to act as mentors for the SMEs. Creation of certain organisations as for science parks, demonstration centres, technology watch and technology transfer organisations, technology information dissemination, and research and development.

Both in Macedonia and Slovenia there has been a SMEs policy developed during the years concentrating on support for the creation of SMEs, but there is a difference in the support for innovativeness and knowledge development in the SMEs. In Slovenia due to the more advanced innovation policy and far more activities and measures taken on the areas of knowledge, innovativeness and technology development, these issues were transferred and considered even in the development of the SMEs policy, while in Macedonia there is no specific support for innovativeness in SMEs. Although as the empirical analysis show the SMEs even in Slovenia, despite the measures for their aid, are still lacking innovative skills, they are more aware of the need and capable of gathering and application of knowledge, primarily because of their mutual cooperation and networking, as well as the knowledge-based services offered to them.

6.11. Technology watch and technology transfer

For Macedonia it is important to create policy that is going to support the industry in the technological catching-up with the developed countries, only with advanced products and processes the domestic enterprises can be competitive on international markets. Thus the policy needs to be concerned with measures that are going to support skills for gathering, evaluating, accepting and adopting the information. The creation of new knowledge comes as a combination of the already existing knowledge. Direct investment in R&D projects, as the empirical analysis shows, does not bring the desired results. Often the results of these investments are products and processes that are not demanded by the market. For countries trying to catch up with the technological development it is important to create a broad access to information and knowledge, and support the application and creation of knew ones. The measures of the state should be devoted to this direction.

Technology watch supposes gathering, administration and disposal of information. It is information on competitors, suppliers, markets and technological innovation that is helping the enterprises to anticipate and better adapt to changes in the needs of their clients, develop new technologies and allows innovation and its application while minimizing risks. The institutions created for this purpose have the goals to provide these services depending on the customers' necessities and increase their awareness and possibilities for access to technological information.

The benefits for the enterprises from the existence of these organizations are:

- Decreases the volume of information that they need to use in order to get the useful knowledge
- Acquiring packages of 'right information' specified for their need supports better decision making and better investments
- Assures better quality of products and services, through modern strategies and product and service differentiation
- Allows faster reactions in emergency situations

- More efficient search for new businesses, customers and markets
- Helps in decisions of R&D directions of the company

Technology watch organizations are mostly used by enterprises that have too high costs compared for the benefits of doing these actions on their own, or that do not have right channels to look for new ideas of research and development and thus it takes them too long time to gather (obtain) these information, and loose business opportunities because of that; these especially goes for SMEs.

For the supply of necessary information, the policy can support creation of technology transfer infrastructure. This can be done from an organization specialized in this service (consultants), through joint forces of more enterprises (networks, different clubs) or through branch organizations, chambers of commerce or regional development institutions. Technology transfer is "the exchange of technological or technology-related organizational know-how between partners to mutually reinforce the competitive position of each partner….in every phase of the innovation process"[102]. It is the acquisition of a technology by a user from a technology provider (innovator or intermediary). Technology transfer is important to be done in regular business relations (demands from customers, practices from competitors, cooperation with suppliers). Thus the role of the policy institutions is support for these relationships and technology transfer (e.g. through networking). It can be done through benchmarking, a tool used for improving of the performance through identification and adoption of 'better practices'. Thus support of benchmarking centers will sustain technology and knowledge transfer. This tool analysis activities of the enterprises, their strengths and weaknesses, and position on the market, and helps in acknowledging the necessary changes and their faster application, through identifying, studying, analyzing and adapting of best practices and implementing the results. With this tool the enterprises improve their performance and efficiency.

In Macedonia there was already an attempt for creation of a Technology Watch Centre, but there was not consensus for its creation from the different public organisations, and there were not enough resources devoted to its implementation. Unfortunately the project was stopped soon after the establishment of the Centre. This does not mean that there is no need of such an institution, but there should be much more effort put into presenting this institution to the industry and brining its services to the market. For the creation of such an organisation experience from other centres can be used, as for example from Slovenian Technology Watch Organisation.

6.12. Technology centres and clinics

Technology incubator centers are created to support firms in the beginning phases of their formation, especially for technology-based firms. They provide good conditions for the development of the firms and support the transfer of knowledge, information, and technologies and thus help the technological development of the enterprises from the center. Through participation in centers the enterprises gain from the network effects created and from services offered. The centers can offer help in business plan creation, legal services, support in funding, help in utilization of new technologies, building up technology assessment, supporting technology monitoring, project management of joint projects, mediation of business contacts and

[102] Meske et al. (1998)

contacts with authorities and banks. The centers can participate and have an advisory role in the creation of the innovation policy.[103]

Besides for the first period of their existence, enterprises need support later as well, this especially goes for SMEs, and institutions for providing this support are technology parks/clinics. Technology clinics help in technology problem solving, technology watch and technology transfer. The clinics should support SMEs in gaining know-how and help in implementation of new technologies with the lowest cost possible. They should promote cooperation between different enterprises and between enterprises and research institutions.

There are arguments against state intervention in creation of technology centers and parks. The cooperation stimulated by these organizations, if efficient should come out of the market and not through state programs, and the 'public good' character of the knowledge and inventions (as market failures) created by cooperation can not be solved by the centers. Besides, by policy subsidizing the firms in the centers, it is neglecting the other firms in the economy, showing preferences.

When creating centers one has to be aware of the problems that arise in the centers, which come from the role of the academics, universities and the management of the centers. It might happen that the academics participate in the centers so that they get funding for their research, and not for commercialization of their inventions. They do not have incentives to create their own firms because of the accompanying risks. For academics it is safer to do the 'consultation' as a side activity and gain extra financial benefits out of it, while keeping their positions in the universities. Typical for transition countries is that even if they do decide to leave their work, than they normally chose to emigrate or take offers from foreign enterprises. The universities support the side-activities of their employees, because having personnel with marketable ideas can present additional source of funding, and they get the property rights on the inventions since the patents of their inventions are given to the institutions and not to the person that invented them. The managers of the parks have incentive problems with keeping technology-intensive firms in the park, instead of non-innovative but solvent firms.

Besides all the troubles that might arise in the creation and functioning of technology clinics and parks they have an important function in the support for the enterprises in developing of their innovative activities and that is why the policy should support them. In Macedonia there have not been any steps taken in promotion of this type of measures. Important thing for the involvement of the policy in the creation of these institutions is that they should be created in a way that they are capable of surviving by providing their own services to the market, but there is always a need of initial aid from the state. In Slovenia there are already number of examples of successful technology centers that provide services especially to the SMEs, so their experience can be used and adapted for the Macedonian conditions, and institutions like that can be created in the future as support for the industry.

6.13. Education and training

The biggest problem of the previously presented knowledge distribution institutions is that the firms that need their help the most are the ones that are least likely to receive it. So they have to fight first against the reluctance of the managers towards systematic search for information. Even if the enterprises are persuaded that

[103] Pleschak (1997)

there is need for information, they might not have the capability for the use of this information. Thus the policy has to take measures in creating competence. The more knowledge is available in the company, the higher the capability for absorbing knowledge from outside. Measures for support of increasing the competences are employment of technicians and engineers, training of the work force, and training for the managers.

A firm can increase its competence by hiring skilled employees or developing the skills of the workers already employed. The state can support both with its policy. It can create incentives[104] for the firms to employ higher educated people (e.g. researchers) with technical skills and research capabilities needed for knowledge understanding and applying as well as creating new ones. This goal will be influenced by the labor market and the education system[105].

Programs for education of specialists with necessary skills for the industry can also be supported by the state. This can be done by changes in the nation's education system, through the education policy. In small countries, sometimes there is no possibility on the short term to provide education possibilities for all the needed specialization areas. This can be substituted by supporting programs for education in foreign countries. Besides formal education, support of practical experience for gaining know-how is also important. It is best done in enterprises and countries with relevant 'best practice' experience. The state can support these programs by mediating in search and establishing contacts with cooperation partners, and financial support. The people that are going to take part in this program should be obliged and provided with possibilities to come back in the country and transfer the gained knowledge and know-how to others. These employment and education programs should in first hand be directed towards young people and researchers.

The policy can also provide infrastructure that will support training services. The training should not be limited to explicit knowledge but also tacit knowledge, and learning-by doing programs. The formal education should emphasise the capability for learning, as well as communication skills (e.g. languages, computer skills), concentrating on problem-solving and project-organized learning[106].

Life-long learning can also be supported through different state programs following the goal of increasing the learning capability. Using new user-friendly technologies (e.g. multi media) can be useful for all the education programs. Also, making information technology and communication systems (e.g. internet connections) accessible for broader range of people and firms are of great importance for them getting easier to information and upgrading their learning capabilities[107].

The problem of brain-drain is present in all countries in transition, for small countries, where the number of skilled people is small, it is of even higher importance to prevent it from happening. It can be done by creating macro economic conditions that are going to be more attractive for them to stay in the land, but that is more of a long-term objective. Short term programs funding training for doctoral research on the condition that their work is carried out in the country can be organized or even programs for gaining back those that have already left the country by offering them competitive salaries.

[104] Financial support for salaries, social and pension contributions, educations fees, for limited period of time, till they finish their studies (master, doctoral studies)
[105] Lundvall (2001)
[106] ibid
[107] ibid

In the area of education and training Slovenia has taken a lot of measures to develop of the skills of technical personnel as well as management techniques. Thanks to these measures the awareness of the importance of knowledge and innovation is higher among the Slovenian managers and the capability of the employees for gathering and adopting knowledge is increasing. It can be also noticed that the emigration of the young high educated people in Slovenia is lower than in other transition countries. Unfortunately the Macedonian policy did not manage to transform the education system fast enough. Measures in the area of education were not taken until recently and even now they are based on creating a market for supply of education services (allowing possibilities for private education institutions) without additional measures for support for creation of highly skilled people. The rear programs for promotion of the life-long learning were not organised efficiently, so there were no high effects from them. The little importance given to the skilled, educated people in the society drives even those that are there out of the country.

6.14. Finance support

When previously discussing different measures the problem of financing of learning, trainings, knowledge gathering and creation was stated as one of the biggest problems for enterprises. Due to the lack of private financing possibilities, the state can financially support different programs, institutions and infrastructure elements, even directly invest in research projects. In the transition countries the market often fails to develop a supply of venture capital, which is important for financing innovative activities. The slow transformation of the finance sector is partly responsible. Having in mind the limited resources that the state possesses, the role of the state in the funding of research, and knowledge and technological development should be in support for faster transformation of the financial system, easier access to funding for the enterprises (especially SMEs) and creation of venture capital market. The main promotional instruments for achieving these objectives are re-financing and taking over investment risk[108].

For the creation of these funds Macedonia can take the example of the Funds created in Slovenia, where it was also hard and took a lot of time for them to be developed, but slowly with the development of the industry the door for functioning of these type of financial institution was opened and now there are more venture capital funds exiting, some of them organised without any state support.

6.15. Importance of other policies for the innovation systems

For the spreading of knowledge-based society and creation of functioning system of innovation, the efforts coming only from the innovation policy are not enough. The innovation system is a complex system that needs to be supported from all the relevant elements of the society and politics. The knowledge, technology and innovation development of a country is influenced by different factors, thus the state can contribute to it in different levels and with various policies.

a) Education policy-for the knowledge gathering, acceptance, distribution and creation where the most important factor are the people and their skills. Thus besides the innovation policy, the most important policy for development of knowledge-based

[108] Kandil, Walter (2002)

society and for technological 'catching-up' is the education policy. Besides the traditional forms of education, which should be modernised, adapted to international standards, oriented towards projects and development of learning skills, the policy should concentrate resources for development of life-long learning and providing forms of education or skills that are needed by the market but are not existent because of the small size of the country (see section 12 of this chapter).

b) Investment policy-the investment in most transition countries (in Macedonia it is very much present as well) has been high in production capacities, and not enough in organisation, finance and marketing. There is need of investments into processes that generate 'learning by investment', through cooperation between industry, research and finance. Since the market is still not prepared to promote these types of investments hence the policy should take this role.

c) Competition and monopoly policy-The competition support measures in transition countries are not sufficiently developed, and they are mostly anti-monopoly instead of pro-competition measures. Having a small market (as in Macedonia and Slovenia) does not have to support creation of monopolies, increasing the number of potential entrants on the market increases the competition, thus leads to higher efficiency and competition through technological development.

d) Foreign direct investments (FDI) policy-FDI are very often seen as substituted for domestic investments. Especially the low investments in R&D are expected to be supplemented through foreign investments. Another advantage seen in FDI is the transfer of technology. They usually bring more modern processes and production of technologically developed products. But the FDI have not made big structural changes very often. They do lead to technology transfer (even on that point it is more transfer of management and office techniques, than technical know-how) but do not present great support for the technological 'catching up' process, leaving the hosts behind the advanced economies.

e) Tax policy-Incentives for technological development can be created through tax policy by measures as writing off R&D expenditures against tax, faster depreciation for equipment, import duty exemption for equipment. The tax policy in Macedonia has changed a lot during the transition period, unfortunately without any advantages created for innovation activities.

f) Budget policy-The state funds devoted to the innovation as well as other supporting policies are important. Having the funds devoted for this purpose for longer periods of time is also of high importance, since it happens often that projects have failed because of lack of funding for a longer period.

g) Credit policy-Funding of innovative activities is a problem everywhere. In transition countries non-existence of venture capital funds and slow transformation of the financial system in general makes it even harder for the enterprises to finance these kinds of projects. Thus the state can intervene by active role in the credit policy (risk sharing, credit guarantees, etc.)

h) Export-import policy-By supporting export oriented enterprises there will be indirect support for innovative activities, since international competitiveness can be achieved only through technologically advanced products and services.

The measures taken in the previously discussed areas are important for the creation of a national innovation system. The existence of this framework is crucial for the enterprises to be capable to develop their innovative capabilities and competitive strengths. The role of the policy is not to innovate, but to create the necessary conditions, through institutions and organisation, for the industry and the research institutions to be able to use their knowledge and skills and practice

innovative activities. On one side are institutions and organisations without which existence the enterprises will be set-back and limited in their performance (Patent Office, institutions of higher education), and on the other side are institutions and organisations that are helping and supporting them to further improve their work (technology transfer centers, networks). They are both of great importance for the national innovation systems and should be supported from the innovation policy, although not necessary publicly provided. At the same time the policy creators have to keep in mind that the innovation system needs constant changes and improvements, since the environment is also changing and developing, which means that the innovation policy creation process is endless.

As it has been shown the situation in small countries has its specificities and that is the reason why for country as Macedonia, which is still in a phase of transition and moving slow with the implementation of all the political, economical and social changes, it is important to learn from another country, as Slovenia, that has similar problems and already experience it their solution. Though it has to be kept in mind that the level of development and the economical as well as political environment in both reference countries has its differences, so the lessons should be learned and adopted, not directly copied.

7. Concluding Remarks

This dissertation has concentrated on the identification of the problems of Macedonian innovation policy. The result of it is not a set of solutions for these problems, but a provocation for further analysis and a foundation on which the state innovation policy can be built.

It can be deducted that the biggest problem of innovation policy in Macedonia is the lack of it and this is not because of a conscious decision made on the subject. There is a need for resources and time for the creation of a national innovation system with a policy that will concentrate on the big picture, enhancing demand for technology within enterprises and restructuring knowledge and information supply. To some extent this innovation system can be treated as regional rather than national innovation system, considering the innovation infrastructure and the size of the country, comparable with some regions in other European countries. This system needs to be open, subjected to constant improvement and capable to adapt to changes. For the policy to be successful there needs to be consensus on the subject among all the actors involved as well as coherence among the different political institutions. This is important because of the complexity of the innovation process and the involvement of different policy elements in it. The goal should be the creation of a system which will be based on the autonomy and cooperation, but also competition among its institutions and organisations.

These conclusions are based on the comparative analysis between the reference countries. While the similarities of the countries allow this type of analysis, there are certain differences that make it impossible for them to have the same innovation policies successful in both environments, which have not been considered in the dissertation. Their geographical differences have influenced the general development of the countries including the innovation systems. While Slovenia, bordering developed Western European countries, has been much more open towards the market economies and technologically leading countries with wider economical and research cooperation even in the period before its independence, Macedonia did not have much opportunities for regional market-oriented cooperation, because of the economical and political restrictions of its surrounding. Although it should be stated that even in the recent period, with the neighbouring countries being more open for economical cooperation, there has not been much collaboration on the level of knowledge, technology, know-how and experience exchange. This lack of cooperation can be contributed to the political instabilities and conflicts in the region.

Macedonia stayed distant of the war that followed the splitting up of Yugoslavia, but there were in recent years ethnic and political tensions which led to military action in the country.

The political instability of the country combined with the tardiness of the structural reforms, slowed down the development of the country's economy. Instability of the legal and judicial systems, corruption and problems of contract protection are reasons of fear for foreign and domestic actors to engage in economical activities in Macedonia, since an important condition for motivation

for investment in innovative activities is achieving macroeconomic stability. Slovenia had successfully adapted its political, social and economic system to the new situation, and created a more appropriate economic environment, which motivates innovative activities.

The differences in the economical development of both countries was relevant even before their independence, but at the same time the fact that they are of similar size and that they were part of the same Federation, subjected to the same political, legal and economic system, brings these countries close together. Ties from the past are being rebuilt, which leads to wider cooperation, not only economical but also political collaboration and exchange of experiences in the political developments. Slovenia can be and is in a lot of cases, a great adviser and supporter for Macedonia for the structural changes, especially since Slovenia has already been through the same changes in its way to the EU membership.

Further research needs to be done on the requirements of the industry and the research institutions in the country and the exact situation based on reliable data according to which the goals and strategies can be set up and steps for further actions planed.

References

Interviews

Cadikovska Lile (Officer responsible for Chemical Industry in the Macedonian Chamber of Commerce); Skopje, 06.02.2002

Delovska Beti (Officer at the Agency for Small and Medium Size Companies); 13.02.2002

Dimitrovski Mile (Professor at faculty of Mechanical Engineering at the University Sv. Kiril and Methodij); Skopje, 22.04.2002

Filipov Gorgi (President of the Association of Innovators); Skopje, 23.04.2002

Galevska Elizabeta (Technical officer in USAID, Macedonia); Skopje, 14.02.2002

Handziska Liljana (Officer in the Sector for Science in the Macedonian Ministry of Education and Science); Skopje, 25.04.2002

Ivanovska Evica (Officer in the Sector for Science in the Macedonian Ministry of Education and Science); Skopje, 06.02.2002

Jakovljevik Kaliopi, (Officer in the Sector for Industry and Structural Reforms in the Macedonian Ministry of Economy); Skopje, 07.04.2004

Janevska Slavica (Officer in the Tax Policy and Administration Department in the Macedonian Ministry of Finance); Skopje, 07.02.2002

Josifovska Antonija (Researcher in the Institute for Economy); Skopje, 06.02.2002

Kurcieve Maja (Officer in the Sector for Support of Foreign Direct Investments in the Macedonian Ministry of Economy); Skopje, 08.04.2004

Lisicova Dimitrula (Technical Advice and Support to the Bilateral Development Cooperation Local Coordinator-GTZ, Macedonia); 22.04.2002

Nikolovska Sonja (Technical Officer in GTZ-Technology Transfer, Macedonia), Skopje, 24.04.2002, 09.04.2004

Popovska Zlatka (Professor at Faculty of Economics at the University Sv. Kiril and Metodij); Skopje, 24.04.2002

Quazzotti Sergio, (Director of the Technology Transfer Center, Luxemburg); Luxemburg, 27.11.2001

Ralev B. (President of Lendo'Lakes); Skopje, 12.02.2002

Spasovski, A. (Chamber of Commerce), Skopje, 15.02.2002

Stefov Viktor (Secretary for Science in the Macedonian Ministry of Education and Science); Skopje, 08.04.2004

Tasevska Slavica (Officer in the Macedonian Privatization Agency); Skopje, 08.02.2002

Zarezankova Marija (Officer in the Sector for Support for SMEs in the Macedonian Ministry of Economy); Skopje, 05.02 2002

Bibliography

Abramovitz, Moses; Catching up, forging ahead, and falling behind; in Journal of economic History, Jun1986, vol. 46, iss.2 pp. 385-406; 1986

Acheson, A.L. Keith; McFetridge, Donald G.; Intellectual property and endogenous growth; in: The implications for knowledge based growth for micro-economic policies ed. Howitt, Peter; Calgary: University of Calgary Press, 1996

Acs, Z.J.; Audretsch, D.B.; Conclusion; in: Small firms and entrepreneurship: an east-west perspective; eds. Acs, Z.J.; Audretsch, D.B.; Cambridge, MA: Cambridge University Press, pp.227-232; 1993

Aghion, Philippe; Howitt, Peter; A Schumpeterian perspective on growth and innovation in Advances; in: Economics and econometrics: Theory and applications: Seventh World Congress. Volume 2, 1997, pp. 279-317; eds. Kreps, David M.; Wallis, Kenneth F.; Econometric Society Monographs, no. 27; Cambridge; New York and Melbourne: Cambridge University Press; 1997

Akerblom, M.; Internationalisation of R&D in Finnish Multinational Firms; Discussion Paper, Helsinki: Statistics Finland; 1993

Allison, Graham T.; Halperin Morton H.; Bureaucratic politics: A paradigm and some policy implications; in: World Politics, vol. 24, pp. 40-79; 1972

Amable, Bruno ; Barre, Remi ; Boyer, Robert ; Les Systèmes d'Innovation a l'Ere de la Globalisation; Paris: Economica; 1997

Anderson, James E.; Public Policy-Making: An Introduction, 3rd ed.; Boston: Houghton Mifflin 1984

Andersson, Thomas; Internationalization of research and development-causes and consequences for small economy; in: Economics of Innovation & New Technologies, Sep1998, vol.7, iss. 1, pp.71-91; 1998

Andersson, Thomas; Fredriksson, Torbjörn; International organization of production and variation in exports from affiliates; in: Journal of International Business Studies, vol. 27, iss. 2, pp. 249-63; 1996

Archibugi, Daniel; Iammarino, Simona; The Globalization of technology and national policies; in: The globalizing learning economy pp.111-26; eds. Archibugi, Daniel; Lundvall Bengt-Ake; Oxford and New York: Oxford University Press 2001

Arthur, W. Brian; Competing technologies, increasing returns, and lock-in by historical events; in: Economic Journal vol. 99, pp. 116-31; 1989

Atanasovska, Violeta ed.; Science in Macedonia; Skopje: Ministry of Science of the Republic of Macedonia; 1994

Barro, RobertJ.; Lee, John-Wha; International comparisons of educational attainment; in: Journal of Monetary Economics Dec93, vol. 32 Iss. 3, p363-394, 1993

Barro, Robert J.; Sala-i-Martin, Xavier; Technology diffusion, convergence, and growth; in: Journal of Economic Growth, March 1997, vol. 2, iss. 1, pp. 1-26; 1997

Baumgartner, Frank R.; Jones, Bryan D.; Agenda Dynamics and Policy Subsystems; in: Journal of Politics, Nov91, vol. 53, iss. 4, pp. 1044-74; 1991

Bell, Daniel; The coming of post-industrial society: a venture in social forecasting; New York: Basic Books; 1973

Benhabib, Jess; Spiegel, Mark M.; The role of human capital in economic development: Evidence from aggregate cross-country data; in: Journal of Monetary economics, Oct94, vol. 34, iss. 2, p143-173; 1994

Benhabib, Jess; Spiegel, Mark M.; The Role of financial development in growth and investment; in: Journal of Economic Growth Dec2000, vol. 5, iss. 4, pp. 341-60; 2000

Bennet, Robert J.; Krebs, Gunter; Local economic development partnerships: An analysis of political networks; in: EC-LEDA Local employment development strategies; Regional Studies, Apr1994, vol. 28, iss. 2, pp. 119-40; 1994

Bernstein, Jeffrey I.; A tour of innovation and productivity: Measurement, determinants and policy; in. Productivity issues in Canada pp.213-43; eds. Rao, Someshwar; Sherpe, Andrew; Industry Canada Research Series, vol. 10; Calgary, Alberta: University of Calgary Press in cooperation with Industry Canada and Public Works and Government Services Canada--Canadian Government; 2002

Besley, T.;Case, A.; Incumbent behavior, tax-setting, and yardstick competition; in: American Economic Review vol. 85, p. 25-45; 1995

Biegelbauer, Peter; The final report: The Slovene innovation system; ICCR, Vienna, August 1996

Bloom, Nick; Griffith, Rachel; Van Reenen, John; Do R&D Tax credits work? Evidence from an international panel of countries 1979-97; in: Journal of Public Economics, Jul2002, vol. 85, iss. 1, pp. 1-31; 2002

Bodenstein, Martin; Ursprung, Heinrich; Political yardstick, economic integration and constitutional choice in a federation; in: Public Choice Journal, vol. 124, iss. 3, pp.329-352; 2005

Braczyk, Hans-Joachim ed.; Regional innovation systems: The role of governance in a globalized world; London: UCL Press; 1998

Brada, Josef C.; Technology, new globalization, old cultural identities and the emergence of new small countries; in: Small economies' adjustment to global tendencies, pp. 17-30; eds. Bara, Zoltan; Csaba, Laszlo; Budapest: Aula Publishing; 2000

Braybrooke, David; Lindblom, Charles; A strategy of decision: Policy evaluation as a social process; Free Press of Glencoe; 1963

Breton,Albert; Competitive governments. An economic theory of politics and public finance; Cambridge: Cambridge University Press; 1996

Brewer, Gary D.; The political sciences emerge: To nurture and structure a discipline; Policy Sciences vol.5, iss. 3, pp.239-44; 1974

Brewer, Gary; DeLeon, Peter; The foundations of policy analysis; Homewood: Dorsey; 1983

Bross, Ulrike; Koschatzky, Knut; Stanovnik, Peter; Development and innovation potential of Slovene manufacturing industry: First analysis of an industrial innovation survey; Working Papers Firms and Region; No. R1/1999; Fraunhofer Institute for System and Innovation Research; 1999

Bross, Ulrike; Zenker, Andrea; The performance of innovation networks in transition economies: An empirical study of Slovenia; Fraunhofer Institute for Systems and Innovation Research Department Innovation Services and Regional Development; 1998

Bross, Ulrike; Walter, Günter H.; Transfer of S&T policy know-how: Experience from Slovene-German cooperation; in: Transforming science and technology systems - the endless transition?, pp. 323-335; eds. Meske, Werner; Mosoni-Fried, Judith; Etzkowitz, Henry; Nesvetailov, Gennady; Amsterdam, Berlin, Oxford, Tokyo, Washington, DC: IOS Press; 1998

Bryant,K.; Wells A.; The Consequences of complexity: Implications of ‘systemic economics in discussions in science and innovation; DISR; 1998

Bucar, Maja; Stare, Metka; Innovation policy in six candidate countries: The challenges; Innovation Policy Profile: Slovenia; 2001

Business Central Europe; Slovenia; in Business Central Europe, vol. 12; 1995

Cannell William; Dankbaar, Ben eds.; Technology management and public policy in the European Union; Luxembourg: Office for Official Publications of the European Communities; Oxford and New York: Oxford University Press; 1996

Caraça J.; Conceição P.; Heitor M.V.; A contribution towards a methodology for university public funding; Higher Education Policy, vol. 11, iss. 1, pp.37-58; 1998

Casella, Alessandra; On Market integration and the deveopment of institutions: The case of intrenational commercial arbitration; in European Economic Review, vol. 40, pp. 155-186; 1996

Center for Entrepreneurship Development; Draft Strategy for SMEs and Entrepreneurship Development in Slovenia in the Period 2001-2005; Ljubljana: Center for Entrepreneurship Development; October 2000

Chenery, Hollis B.; Patterns of industrial growth; American economic review, Sept1960, pp 624-654; 1960

Church, Jeffrey; Ware, Roger; Network industries, intellectual property rights and competition policy; in: Competition policy and intellectual property rights in the knowledge-based economy, eds. Anderson, Robert D.; Gallini Nancy T.; Industry Canada Research Series, vol. 9; Calgary: University of Calgary Press; 1998

Clarke Michael; Implementation; in: Power and policy in liberal democracies, pp.221-40; ed. Martin Harrop; Cambridge: Cambridge University Press; 1992

Cobb, R.; Ross, J. K.; Ross, M. H.; Agenda setting and the denial of agenda access: Key concepts; in: Cultural strategies of agenda denial: Avoidance, attack, and redefinition; eds. Cobb, Roger; Ross, Marc Howard; 1997

Cohen, Wesley M.; Levin, Richard C.; Empirical studies of innovation and market structure; in: Handbook of industrial organization; eds. Schmalensee, Richard; Willig, Robert D.; Handbooks in Economics, no. 10 Amsterdam; Oxford and Tokyo: North-Holland; 1989

Cohen, Wesley M; Levinthal, Daniel A.; Absorptive capacity: A new perspective on learning and innovation; in: Administrative Science Quarterly, Mar1990, vol. 35, iss. 1, pp. 128-152; 1990

Cohendet, Patrick; Joly, Pierre-Benoit; The production of technological knowledge: New issues in a learning economy; in: The globalizing learning economy , pp. 63-82; eds. Archibugi, Daniele; Lundvall, Bengt-Ake; Oxford and New York: Oxford University Press; 2001

Coleman, James S.; Social capital in the creation of human capital; in: Organizations and institutions: Sociological and economic approaches to the analysis of social structure, pp. 95-120; American Journal of Sociology, vol. 94; Chicago: University of Chicago Press; 1988

Conceicao, Pedro; Heitor, Manuel; Universities in the learning economy: Balancing institutional integrity with organizational diversity; in: The globalizing learning economy, pp. 83-96; eds. Archibugi, Daniele; Lundvall, Bengt-Ake; Oxford and New York: Oxford University Press; 2001

Cowling, Keith; Sugden, Roger; Technology Policy: Strategic failures and the need for new directions; in Globalization, growth and governance: Creating an innovative economy, pp.239-61; eds. Michie, Jonathan; Grieve Smith, John; Oxford University Press, 1998

Daft, Richard L.; A dual-core model of organization innovation; in: Academy of Management Review, vol. 21, iss. 2, pp. 193 –211; 1978

Damanpour, Fariborz; Evan, Wiliam M.; Organizational innovation and performance: The problem of ‚organizational lag'; in: Administrative Science Quarterly; Sep84, vol. 29, iss. 3, pp. 392-410; 1984

Damanpour, Fariborz; Gopalakrishnan, Shanthi; Organizational adaptation and innovation: The dynamics of adopting innovation types; in: The dynamics of innovation: strategic and managerial implications, pp. 57-80; eds. Brockhoff, Klaus; Chakrabarti, Alok K.; Hauschildt, Jurgen; Heidelberg and New York: Springer; 1999

Damijan, Joze P.; The size of the country and the level of development; in: Slovenian economic review, vol. 44, iss. 6, pp. 510-530; 1993

Damijan, Joze P.; Small countries in world trade; Ljubljana: Krt; 1996

Damijan, Joze P.; Main economic characteristics of small countries: some empirical evidence; in: Small countries in a global economy: new challenges and opportunities, pp. 91-130; eds. Salvatore, Dominick; Svetličič, Marjan; Damijan, Joze P.; Houndmills and New York: Palgrave; 2001

David, P.A.; Path-dependance: Putting the past into the future of economics; Stanford institute for mathematical science in the social sciences (economic series) technicla report: 533; 1988

David, P.A.; Mowery, D.; Steinmueller, W.E.; Analysing the economicy payoffs from basic research; in: Economics of Innovation and New Technology, vol. 2, iss. 4, pp. 73-90; 1994

David, Wilfred L.; The IMF policy paradigm: The macroeconomics of stabilization, structural adjustment, and economic development; New York: Praeger; 1985

Deans, Robert H.; Bernstein, Richard Eric; Country size, trade concentration and trade instability: an alternative approach; Weltwirtschaftliches Archiv, vol. 114, iss. 2, pp. 258-274; 1978

Dearden, James; Ickes, Barry; Samuelson, Larry; To innovate or not to innovate: Incentives in hierarchies; in: American Economic Review, vol. 80, pp. 1105-1124; 1990

Deininger, Klaus; Squire, Lyn; A new data set measuring income inequality; in: World Bank Economic Review, Sept1996, vol. 10, iss. 3, pp. 565-91; 1996

Dewar, Robert D.; Dutton, Jane E.; The adoption of radical and incremental innovations: An empirical analysis; in: Management Science, Nov1986, vol. 32, iss. 11, pp. 1422-33; 1986

Dinopoulos, Elias; Thompson, Peter; Endogenous growth in a cross-section of countries; in: Journal of International Economics, Aug2000, vol. 51, iss. 2, pp. 335-63; 2000

Dodgson, Mark; Organizational learning: A review of some literatures; in: Organization Studies, vol. 14, iss. 3, pp. 375-394; 1993

Doern, Bruce G.; Reed, Ted; Risky Business: Canada's chnaging science-based policy and rgulatory regime; in: Public Administration Review, Sep2001, vol. 61, iss. 5, p 636; 2001

Dohse, Dirk; Regionen als Innovationsmotoren: Zur Neuordnung in der Deutschen Technologiepolitik; Kiel: Institut für Weltwirtschaft; 2000

Dommen, Edward; Hein, Philippe; States, microstates and islands; London, Sydney and Dover: Croom Helm; 1985

Dosi, Giovanni; Technological paradigms and technological trajectories; in: Research Policy, vol. 11, pp. 147-162; 1982

Dosi, Giovanni; Pavitt, Keith; Soete, Luc; The economics of technical change and international trade; New York: New York University Press; 1990

Drzaven Zavod za Statistika (State Statistic Office – Macedonia); Statistical yearbook of the Republic of Macedonia, 2004; Skopje: DZS; 2005

Dunn, Christopher Chase; Socialist states in the world-system; Beverly Hills: Sage; 1982

Dunning, John H.; Narula, Rajneesh; The R&D activities of foreign firms in the United States; in International Studies of Management & Organization; Spring/Summer95, vol. 25, iss. 1/2, pp. 39-74; 1995

Dyker, David A.; Perrin, Jacques; Technology policy and industrial objectives in the context of economic transition; in: The technology of transition: Science and technology policies for transition countries, pp. 3-19 1997; Budapest: Central European University Press; 1997

Dyker, David A.; Radosevic, Slavo; Building the knowledge-based economy in countries in transition-From Concepts to policies; in: The Journal of Interdisciplinary Economics, vol. 12, iss. 1, pp.41-70; 2000

Earl, Peter E. ed; The legacy of Herbert Simon in economic analysis, vol. 1; Cheltenham and Northampton: Elgar; 2001

Economist Intelligence Unit; EIU report on Slovenia; EIU; 2000

Edquist, Charles; Innovation policy – A systematic approach; in: The globalizing learning economy, pp.219-38; eds. Archibugi, Daniel; Lundvall Bengt-Ake; Oxford and New York: Oxford University Press; 2001

Edquist, Charles; Johnson, Bjorn; Institutions and organizations in systems of innovation; in: Systems of innovation: Technologies, institutions and organizations; ed. Edquist, Charles; London: Pinter/Cassell Academic; 1997

Ehrlich, Eva; Posiblities, problems and options of small national economies in the globalising intrenational economy on the threshold of the 21st century; in: Ungarian responses to global chalanges, pp. 69-75; ed. Gabor Foti; Budapest: Institute for world economics of the hungerian academy of science; 1998

Ettlie, John E. ; Bridges, William P.; O'Keefe, Robert D.; Organization strategy and structural differences for radical versus incremental innovation; in: Management Science, Jun1984, vol. 30, iss. 6, pp. 682-95; 1984

Ettlie, John E.; Reza, Ernesto M.; Organizational integration and process innovation; in: Academy of Management Journal; Oct92, vol. 35, iss. 4, pp. 795-828; 1992;

European Bank for Reconstruction and Development; Transition report 1997: Enterprise performance and growth; EBRD; 1997

European Commission; 2000 regular report from the commission on Slovenia's progress towards accession; EC; 2000

European Reconstruction Agency; Opservatorija za MSP vo Makedonija; Izvestaj 2003 (Observatory for SMEs in Macedonia: Report 2003); EAR; 2004

Eureopan Union; An evaluation of Phare SME Programmes: Hungary. Final report; Brussel: EU; 1999

Fabricant, Solomon; Study of the size and efficiency of the American economy; in: Economic consequences of the size of nations, pp. 35-53; ed. Robinson E.A.G.; London: Macmillan; 1960

Fayol, Henry; Studies in the science of administration; 1895

Feldman, Maryann P.; Link, Albert N.; Innovation policy in knowledge-based economy; Kluwer Academic Publishers; 2001

Forester, John; Bounded rationality and the politics of muddling through; in: Public Administration Review, Jan/Feb1984, vol. 44, iss. 1, pp. 23-31; 1984

Freeman, Chris; The learning economy and international inequality; in: The globalizing learning economy, pp.219-38; eds. Archibugi, Daniel; Lundvall Bengt-Ake; Oxford and New York: Oxford University Press; 2001

Fritsch, M.; Unternehmens- "Netzwerke" im Lichte der Institutionsökonomik; in: Jahrbuch für Neue Politische Ökonomie, pp. 89-102; eds. Boettcher, E; Herder-Dorneich, Philip; Schenk, K.-E,; Schmidtchen, D.; Band 11: Ökonomische Systeme und Ihre Dynamik; Tübingen; 1992

Fritsch, M; Audretsch, D.B.; Betriebliche Turbulenz und regionale Beschäftigungsdynamik; in: Betriebliche Modernisierung in personeller Erneuerung, pp. 59-74; eds. Semlinger, K; Frick, B; Berlin: Edition Sigma; 1995

Garvin, David A.; Building a learning organization; in: Harvard Business Review, Jul/Aug1993, vol. 71, iss. 4, pp. 78-92; 1993

Gawthrop, Louis C. ; Administrative politics and social change; New York: St. Martin's Press; 1971

Geroski, P.A.; Innovation, technology opportunity, and market structure; in: Oxford Economic Papers, N.S., July1990, vol. 42, iss. 3, pp. 586-602; 1990

Goolsbee, Austan; Does government R&D policy mainly benefit scientists and engineers?; in: American Economic Review, May1998, vol. 88, iss. 2, pp.298-302; 1998

GOPA Consultants; A Science and technology strategy for Slovenia; PHARE Operational Programme: Mimeo; 1994

Griliches, Zvi; Issues in assesing the contribution of R&D to productivity growth; in: Bell Journal of Economics, Spring1979, vol. 10, pp. 92-116; 1979

Griliches, Zvi; Patent sttistics and economic indicators: A survey; in: Journal of Economic Literature vol. 28, iss. 4, pp. 1661-707; 1990

Gulick, Luther; Urwick, Lyndal eds.; Papers on the science of administration; New York: Institute of Public Administration; 1937

GZS; Analiza stanja inovacijske dejavnosti po slovenskih podjetjih v letu 1999 (The analysis of innovation activity in Slovenian firms in 1999); Komisija za intelektualno lestnino in inovacijsko dejavnosti pri GZS (Slovenian Chamber of Commerce); Spetember 2000

Håkansson, Håkan; Industrial technological development: A network approach; Billing & Sons Ltd., Worcester; 1987

Håkansson, Håkan; Corporate technological behaviour, co-operation, and networks. London, New York: Routledge; 1989

Hall, Bronwyn; Van Reenen, John; How effective are fiscal incentives for R&D? A review of the evidence; National Bureau of Economic Research, Inc, NBER Working Papers: 7098; 1999

Hall, Peter A.; Policy paradigms, social learning and the state: The case f economic policy making in Britain; in Comparative Politics, vol. 25, iss. 3, pp. 275-96; 1993

Hall, Robert E.; Jones, Charles I.; Why do some countries produce so much more output per worker than others?; in: Quarterly Journal of Economics, vol. 114, iss. 1, pp. 83-116; 1999

Hamm, Keith E.; Patterns of Influence among committees, agencies and interest groups; in: Legislative Studies Quarterly, vol. 8, iss. 3, pp. 379-426; 1983

Haunknes, J.; Services in innovation – innovation in services; STEP Group. SI4S final report; Oslo; 1998

Hayek, Fredrich A.; The use of knowledge in society; in: American Economic Review, Sep1945, vol. 35, iss. 4, pp. 519-30; 1945

Herden, Rainer; Technologieorientierte Außenbeziehungen im betrieblichen Innovationsmanagement: Ergebnisse einer empirische Untersuchung; Heidelberg: Physica-Verlag; 1992

Hirshhorn, Ronald; Nadeau, Serge; Rao, Someshwar; Innovation in a knowledge based economy-the role of government; in: Productivity issues in Canada,

eds. Rao, Someshwar; Sharpe, Andrew; Calgary: University of Calgary Press; 2002

Hodgson, G.M.; Evolutionary and competence-based theories of the firm; in: The economics of industrial and business strategy; ed. Pitelis, C.; 1996

Hofferbert, Richard I.; The study of public policy; Indianapolis: Bobbs-Merrill; 1974

Howlett, Michael; Ramesh M.; Studying public policy: policy cycles and policy subsystems; Toronto: Oxford University Press; 1999

Hu, Y.S.; Global or stateless corporations are national firms with international operations; in: California Management Review, vol. 34, pp. 107-26; 1992

Hughes, Helen; Industrializing small countries; in: Industry and development, vol.0, iss. 12, pp. 89-99; 1984,

Hymer, Stephen; The internationalization of capital; in: Journal of Economic Issues, Mar1972, vol. 6, iss. 1, pp. 91-111; 1972

Institute of Macroeconomic Analysis and Development; Development Report; IMAD 2000

Institute of Macroeconomic Analysis and Development; Development Report; IMAD 2001

Imai, Kosuke; Baba, Yasunori; Systemic innovation and cross-border networks: Transcending markets and hierarchies to create a new techno-economic system; International Seminar on Contributions of Science and Technology to Economic Growth, Paris: OECD; 1989

Isenman, Paul; Biases in aid allocations against poorer and larger countries; in: World Development, Aug1976, vol. 4, iss. 8, pp. 631-41; 1976

Jalan, Bimal; Classification of economies by size; in: Problems and policies in small economies, pp. 39-47; ed. Jalan, Bimal; London: Croom Helm; 1982

Jänicke Martin; Kunig Philip; Stitzel Michael; Lern- und Arbeitsbuch Umweltpolitik: Politik, Recht und Management des Umweltschutzes in Staat und Unternehmen; Bonn: Bundeszentrale für Politische Bildung; 2000

Jenkins, William I.; Policy analysis: A political and organizational perspective. London: Martin Robertson; 1978

Jenkins-Smith, Hank C.; Sabatier, Paul A.; The study of the public policy processes; in: Policy change and learning: An advocacy coalition approach; eds. Sabatier, Paul A.; Jenkins-Smith, Hank C.; Boulder: Westview; 1993

Jones, Charles O.; An introduction to the study of public policy, 3rd ed.; Monterey, CA: Brooks/Cole; 1984

Justman, Moshe; Teubal, Morris; Technological infrastructure policies: Creating capabilities and building markets; in: Technological infrastructure policy, pp.

21-58; eds. Teubal, Morris; Foray, Dominique; Justman, Moshe; Zuscovitch, Ehud; Dordecht and London: Kluwer; 1996

Kandil, Fuad; Walter, Günter H.; Industrial modernization in post-socialist economies: primary endogenous and elites oriented modernization as a socio-economically oriented strategic concept; in: Small firms and entrepreneurship in Central and Eastern Europe, pp. 73-95; eds. Pfirrmann, Oliver; Walter, Günter H.; Heidelberg: Physica-Verlag; 2002

Kang, Sung Jin; Relative backwardness and technology catching up with scale effects; in: Journal of Evolutionary Economics, vol. 12, iss. 4, pp. 425-41; 2002

Kaplan, Robert S.; Norton, David P.; Having trouble with your strategy? Than map it; in: Harvard Business Review, Sep/Oct2000, vol. 78, iss. 5, pp. 167-76; 2000

Katzenstein, Peter; Small states in world markets. Industrial policy in Europe; Ithaca/London: Cornwell University Press; 1985

Kerber, Wolfgang; Evolutorische Ökonomik und Wirtschaftspolitik: Probleme und Perspektiven am Beispiel des Wettbewerbsföderalismus; in: Studien zur Evolutorischen Ökonomik, Band VIII; ed. Dopfer, Kurt; Berlin; 2004

Kiel Institute of World Economics; HWWA- Institute for Economic Research; National technology policies and international friction: Theory, evidence, and policy options; Kieler Diskussionsbeiträge; June, 1996

Kimberly, J. R.; Evanisko, M. J.; Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations; in: Academy of Managment Journal, vol. 24, iss. 4, pp. 689-714; 1981

King, Anthony; Ideas, institutions and the policies of governments: A comparative analysis, Part III; in: British Journal of Political Science, vol. 3, iss. 4, pp. 49-23; 1973

Kingdon, John W; Agendas, alternatives and public policies; New York: HarperCollins Publishers; 1995

Kobal, Edvard; Slovenia, science and the Slovenian science foundation; The Slovenian Science Foundation, Ljubljana; 1996

Kogut, B.; Country competiveness: Technology and the organizing of work; Oxford: OUP; 1992

Komisija za intelektualno lastnino in inovacijsko dejavnost pri GZS; Analiza stanja inovacijske dejavnosti po slovenskih podjetjih v letu 1999 (The analysis of innovation activity in Slovenian firms in 1999), GZS (Slovenian Chamber of Commerce); 2000.

Koschatzky, Knut; Networking and knowledge transfer between research and industry in transition countries: Empirical evidence from the Slovenian innovation system; in: Journal of Technology Transfer, Jan2002, vol. 27, iss. 1, pp. 27-38; 2002

Koschatzky,Knut; Boss, Ulrike; Stanovnik, Peter; Development and innovation potential in the Slovene manufacturing industry; Karlsruhe: Fraunhofer ISI (Arbeitspapier Regionalforschung Nr. 16); 1999

Koschatzky Knut, Gundrum Uwe; Innovation networks for small enterprises; in: Technology-based firms in the innovation process: Management, financing and regional networks, pp. 203-24; ed. Koschatzky, Knut; Series of the Fraunhofer Institute for Systems and Innovation Research, Heidelberg: Physica; 1997

Koschatzky, Knut; Gundrum, Uwe; Muller, Emanuel; Regionale Innovations- und Technologieförderung. Ansatzpunkte für die Nutzung regionaler Innovationspotentiale; Working paper; Karlsruhe: ISI; 1995

Koschatzky, Knut; Sternberg, Rolf; R&D cooperation in innovation systems-Some lessons from the European Regional Innovation Survey (ERIS); in: European Planning studies, vol.8, pp. 487-501; 2000

Krugman, Paul; Scale economies, product differentiation, and the pattern of trade; in: American Economic Review, Dec1980, vol. 70, iss. 5, pp. 950-9; 1980

Krugman, Paul; Geography and trade; Cambridge: MIT Press; 1991.

Kuhlmann, Stefan; Reger, Guido; Technology-intensive SMEs: Policies supporting the management of growing technological complexity; in: Technology management and public policy in the European Union, pp. 73-102; eds. Cannell, William; Dankbaar, Ben; Luxembourg: Office for Official Publications of the European Communities; Oxford and New York: Oxford University Press; 1996

Kutznets, Simon; Economic growth of small nations; in: Economic consequences of the size of nations, pp.14-32; ed. Robinson E.A.G.; London: Macmillan; 1960

Kuznets, Simon; Level of structure of foreign trade: comparison for recent years; in: Economic development and cultural change, vol. 12, pp.1-106; 1964

Lamberton, Donald M.; National information policy; in: Annals of the American Academy of Political and Social Sciences; Mar1974; vol. 412, pp. 145-51; 1974

Lazaric, Nathalie; Lorenz, Edward; Trust and organizational learning during inter-firm co-operation; in: Trust and economic learning, pp. 209-26; eds. Lazaric, Nathalie; Lorenz, Edward; Cheltenham and Northampton: Elgar; 1998

Leduc, G.; Weiller, J.; The size of the economy and its relation to stability and steady progress; in: Economic consequences of the size of nations, pp. 200-219; ed. Robinson E.A.G.; London: Macmillan; 1960

Lesjak, Iztok; Tehnološki part Ljubljana d.o.o.- Kaj smo in kakšni so naši načrti (Technology park Ljubljana - Who we are and what are our plans); in: Poslovne priložnosti, May/Jun2001, vol. 4-5/6, pp. 12-14; 2001

Levine, Ross; Financial development and economic growth: view and agenda; in: Journal of Economic Literature, vol. 35, iss. 2, pp. 688-726; 1997

Leydesdorff, Loet; Etzkowitz, Henry; The transformation of university-industry-governments relations; in: Electronic Journal of Sociology, vol. 5, iss. 4; 2001

Lindbloom, Charles; The market as prison; in: The political economy; eds. Ferguson, T.; Rogers, J.; Armonk: M.E. Sharpe; 1984

Lloyd, Peter J.; International trade problems of small nations; Durham: Duke University Press; 1968

Lundvall, Bengdt-Ake; National systems of innovation: Towards a theory of innovation and interactive learning; London: Pinter; 1992

Lundvall, Bengt-Ake; Innovation policy in the globalizing learning economy; in: The globalizing learning economy, pp.273-91; eds. Archibugi, Daniel; Lundvall Bengt-Ake; Oxford and New York: Oxford University Press; 2001

Makedonska akademija na naukite i umetnsotite (Macedonian academy of science and arts); Nacionalna strategija za ekonomski razvoj na Republika Makedonija (National strategy for economic development of R. Macedonia); Skopje: MANU; 1997

March, J.G.; Simon, H.A.; Organizations, 2nd ed.; Cambridge, MA: David Blackwell; 1993

Marcy, G.; How far can forging trade and customs agreements confer upon small nations the advantages of large nations?; in: Economic consequences of the size of nations, pp. 265-81; ed. Robinson E.A.G.; London: Macmillan; 1960

Marschall, A.; Industry and trade; London; 1919

McFetridge, Donald G.; Intellectual property, technology diffusion and growth in the Canadian economy; in: Competition policy and intellectual property rights in the knowledge based economy, pp.65-104; eds. Anderson, Robert D.; Gallini, Nancy T.; University of Calgary Press; 1998

McGrath, J. Paul; Patent licensing today: A fresh look at antitrust principles and misuse in a changing economic environment; in: Proceedings of the Twenty-third Annual Institute on Patent Law; ed. Moss, J.R.; Matthew Bender Publishing; 1985

Meske, Werner; Institutional transformation of S&T systems in the European economies in transition; Berlin: Veröffentlichungsreihe der Forschungsgruppe Wissenschaftsstatistik des WZB; 1998

Meske, Werner; Mosoni-Fried; Etzkowitz, Henry; Nesvetailov, Gennady A.; Transforming science and technology systems - The endless transition?; in: NATO Science Series 4/23; Amsterdam: IOS Press; 1998

Metcalfe J.S.; Evolutionary economics and technology policy; in: Economic Journal, Jul1994, vol. 104, iss. 425, pp. 931-44; 1994

Michaely, Michael; Concentration in international trade. Contribution to economic analysis; Amsterdam: Elsevier; 1962

Miles, Edward L.; et al.; Environmental regime effectiveness: Confronting theory with evidence; Cambridge and London: MIT Press; 2002

Ministry of the Economy – Slovenia; Benchmarking Slovenia; Ljubljana: Ministry of the Economy; 2000a

Ministry of the Economy – Slovenia; Program priorities for 2001-2005; internal document; 2000b

Ministry of Science and Technology – Slovenia; Science in Slovenia; Ljubljana: Ministry of Science and Technology; 1994

Ministry of Science and Technology – Slovenia; Nacionalni raziskovalni program (National Research Programme); Ljubljana: Ministry of Science and Technology; 1995

Morck, Randall; Yeung, Bernard; The economic determinants of innovation; Occasional Paper No.25; Ottawa: Industry Canada; 2000

Mowery, David C.; Teece, David J.; Japan's growing capabilities in industrial technology: Implications for U.S. managers and policymakers; California Management Review, Winter1993, vol. 35, iss. 2, pp. 9-34; 1993

Muller, Emmanuel; Gundrum, Uwe; Koschatzky, Knut; Methods for ascertaining firms' needs for innovation services; in: Technology-based firms in the innovation process: management, financing and regional networks, pp. 245-62; ed. Koschatzky Knut; Heidelberg: Physica; 1997

Myrdall, Gunnar; Economic theory and underdeveloped regions; London: Duckworth; 1956

Mytelka, Lynn Krieger, ed; Strategic partnerships: states, firms and international competition; London: Printer; 1991

Mytelka, Lynn Krieger; Strengthening the relevance of European science and technology programs to industrial competitiveness: The case of ESPRIT; in: The impact of globalization on Europe's firms and industries, pp. 56-63; ed. Humbert, Marc; London: Printer; 1993

Nelson Richard R.; Research on productivity growth and productivity differences: Dead ends and new departures; in: Journal of Economic Literature, vol. 19, iss. 3, pp. 1029-64; American Economic Association; 1981

Nelson, Richard R., ed; National innovation systems: A comparative analysis; Oxford: Oxford University Press; 1993

Nelson Richard R.; Rosenberg Nathan; Technical innovation and national systems; in: National Innovation Systems, pp. 3-21; ed. Nelson, Richard R.; Oxford: Oxford University Press; 1993

Neuman, W.L.; Social research methods; qualitative and quanititative approaches, 3rd edition; Toronto: Allyn and Bacon; 1997

Nice, D.C.; Incremental and non-incremental policy responses: The states and the railroads; in: Polity, vol. 20, pp. 145-56; 1987

Niosi, Jorge; National systems of innovations are “x-efficient” (and x-effective): Why some are slow learners; Research Policy, Feb2002, vol. 31, iss. 2, pp. 291–302; 2002

Nord, Walter R.; Tucker, Sharon; Implementing routine and radical innovations; Lexington, MA: Lexington Books; 1987

Normann, R.; Organizational innovativeness: Product variation and reorientation; in: Administrative Science Quarterly, vol. 16, pp. 203-15; 1971

North, Douglas C.; Institutions, institutional change and economic performance. Cambridge: Cambridge University Press; 1990

North, Douglas C.; Economic perofrmance thrugh time; in: American Economic Review, vol 84, iss. 3, pp. 359-68; 1994

Nutzinger et.al.; Sustainable development and innovation in the energy sector; Heidelberg: Springer; 2005

Nyholm, Normann; Frelle-Petersen; Riis, Torstensn; Innovation policy in the knowledge-based economy-Can theory guide policy making?; in: The globalizing learning economy pp. 253-72; eds. Archibugi, Daniel; Lundvall Bengt-Ake; Oxford and New York: Oxford University Press; 2001

OECD, Information networks and new technologies: Opportunities and policy implications for the 1990s; Information Computer Communications Policy, No. 3; Paris: OECD; 1992

OECD; Developing environmental capacity. A framework for donor involvement; Paris: OECD; 1995

OECD; The economic impact of counterfeiting; Paris: OECD; 1998

OECD; Science, technology and industry scoreboard 1999; Paris: OECD; 1999a

OECD; Managing national innovation systems; Paris: OECD; 1999b

OECD; Unlocking knowledge in the learning economy. Paris: OECD;1999c

OECD; Dynamizing national innovation systems; Paris: OECD; 2002

Ohlin, Bertil; Interregional and international trade; Cambridge: Harvard University Press; 1933

Oliver, Nick; Blakeborough, Michelle; Innovation networks: The view from inside; in: Globalization, growth, and governance: Creating an innovative economy, pp.146-60; eds. Michie, Jonathan; Grieve Smith, John; Oxford University Press, 1998

Olson, Mancur; The logic of collective action; Cambridge: Harvard University Press; 1965

Parente, Stephen L.; Prescott, Edward C.; Barriers to technology adoption and development; in: Journal of Political Economy, Apr1994, vol. 102, iss. 2, pp. 298-321; 1994

Pavitt, Keith; Sectoral patterns of technical change: Towards a taxonomy and a theory; in: Research Policy, vol. 13, pp. 343-73; 1984

Pfirrmann, Oliver; Summary; in: Small Firms and Entrepreneurship in Central and Eastern Europe, pp. 301-17; eds. Pfirrmann, Oliver; Walter, Günter H.; Heidelberg and New York: Physica Verlag; 2002

Pivka, Marjan, Uršič, Dusko; ISO 9000 and competitiveness of SMS, large and other organizations in Slovenia; Ljubljana: Ministry of Science and Technology; 1999

Pleschak, Franz; Technology and incubator canters as an instrument of regional economic promotion; in: Technology-based firms in the innovation process: Management, financing and regional networks, pp. 225-43; ed. Koschatzky, Knut; Series of the Fraunhofer Institute for Systems and Innovation Research; Heidelberg: Physica; 1997

Popovska, Zlatka; Politika na tehnoloski razvoj (Technology development policy); Skopje: Ekonomski fakultet; 2000

Porter, Michael; The competitive advantage of nations; New York: Basic Books; 1990

Porter, Michael, interview; How big is a cluster?; in: McKenzie Wissen Quarterly, no. 1; 2002

Prittwitz, Volker; Das Katastrophenparadox: Elemente einer Theorie der Umweltpolitik, Opladen: Leske und Budrich; 1990

Putnam, Robert D.; Bowling alone: America's declining social capital; in: Journal of Democracy, vol. 6, iss. 1; pp.65-78; 1995

Putnam, Robert D.; The prosperous community: Social capital and public life; in: Foundations of social capital, pp. 529-36; Northampton: Elgar; 2003

Putnam, Robert D.; Goss, K.; Introduction; in: Democracies in flux: The evolution of social capital in contemporary society, pp. 3-21; ed. Putnam R.; New York: Oxford Press; 2002

Radosevic, Slavo; Walter, Günter H.; Supporting innovation through institutions building in Central and Eastern Europe: between visions and realties; in: Small Firms and Entrepreneurship in Central and Eastern Europe; eds. Pfirrmann, Oliver; Walter Günter H.; Heidelberg: Physica; 2002

Rhodes R.A.W.; Power-dependence, policy communities and intergovernmental networks; in: Public Administration Bulletin, vol. 49, pp. 4-31; 1984

Robinson, E.A.G.; The size of the nation and the costs of administration; in: Economic consequences of the size of nations, pp. 223-339; ed. Robinson, E.A.G.; London: Macmillan; 1960

Rodrigues, Maria Jooao; European policies for knowledge economy; Cheltenham: Elgar; 2003

Rojec, Matija; Restructuring with foreign direct investments: The case of Slovenia; Institute for Macroeconomic Analysis and Development; 1998

Romer, Paul; Endogenous technological change; National Bureau of Economic Research, Inc, NBER. Working Papers: 3210; 1991

Rooney, David; Hearn, Greg; Mandeville, Thomas; Joseph, Richard; Public policy in knowledge-based economies: Foundations and frameworks; Northampton: Elgar; 2003

Rosenberg, N.; Perspectives on technology; Cambridge: Cambridge University Press; 1976

Rothwell, Roy; Dodgstone, Mark; Technology strategies in small firms; in: Journal of General Management; Autumn1991, vol. 17, iss. 1, pp.45-56; 1991

Salisbury, R.; Heinz, John; Laumann, E.; Nelson, R.; Who works with whom? Interest group alliances and opposition; in: American Political Science Review, Dec1987, vol. 81, pp. 1217-34; 1987

Salmon, Pierre; Decentralization as an incentive scheme; in: Oxford Review of Economic Policy, vol. 3, iss. 2, pp. 24-42; 1987

Schilder, A.; Government failures and institutions in public policy evaluation; the case of Dutch technology policy; dissertation; Assen: Van Gorcum; 2000

Scholz, Christian; Überleben im Netzwerk; in: McKinsey Wissen Quarterly, no. 1; 2002

Schumpeter, Joseph A.; Capitalism, socialism and democracy, 3rd ed.; New York: Harper and Row; 1950

Schweickart, Patrocinio P.; Speech is silver, silence is golden; in: Knowledge, difference and power, pp. 305-31; eds. Goldberger, N. R.; Tarule, J. M.; Clinchy B. M.; Belenky M. F.; New York: Basic Books; 1996

Senju, Shizou, ed; TQC and TPM; Tokyo: Asian Productivity Organization. 1992

Senjur, Marijan; Višina javnih izdatkov glede na gospodarsko razvitost in velikost drvžave: primer Slovenije - proraeun 1991 (Level of public expenditures depending on the development and the size of the country: example of Slovenia-1991); Slovenian Economic Review, vol. 43, iss. 3, pp.239-50; 1992

Sianesi, Barbara; Van Reenen, John; The returns to education: A review of the macro-economic literature; London: London School of Economics and Political Science; 2000

Simeon, Richard; Studying public policy; in: Canadian Journal of Political Science, vol. 9, iss. 4, pp. 548-80; 1976

Smith, Martin J.; Policy networks and state autonomy; in: Political influence of ideas: Policy communities and the social sciences; eds Brooks, S.; Gagnon, A.-G.; New York: Praeger; 1994

Špilek; Hedvika; Trendchart report – Slovenia; IER; 2000

Sporer, Zeljka; Knowledge-based economy and social capital in CEECs; in: Eastern European Economics, Nov/Dec2004, vol. 42, iss. 6, pp. 39-71; 2004

Stanovnik, Peter; Lapornik, Milan; Privatization in Slovenia and the restructuring of manufacturing industries; Paper presented at the international conference 'Path to Economic Development'; Budapest; 1994

Stoneman, Paul; Vickers, John; The assessment: The economics of technology policy; in: Oxford Review of Economic Policy, vol. 4, iss. 4, pp. 1-16; Oxford: Oxford University Press; 1988

Storper, Michael; The regional world: Territorial development in a global economy; New York and London: Guilford Press; 1997

Streeten, Paul; Special problems of small countries; in: World development, vol.21, iss.2, p.197-202; 1993

Svetlic, Marjan; Rojec, Matija; Short overview of the Slovenian economy and foreign investments in Slovenia; in: Eastern European Economics, Sep/Oct1998, vol. 36, iss. 5, pp. 60-73; 1998

Swann, G.M. Peter; Innovation in consumption and economic growth; in: Globalization, growth, and governance: Creating an innovative economy, pp. 161-73; eds. Michie, Johnatan; Grieve Smith, John; Oxford: Oxford University Press; 1998

Tassey, Gregory; Choosing government R&D policies: Tax incentives vs. direct funding; in: Review of Industrial Organization; Oct1996, vol.11, iss. 5, pp. 579-600; 1996

Therborn, Göran; At the birth of second century sociology: times of reflexivity, spaces of identity, and nodes of knowledge; in: British Journal of Sociology, Jan/Mar2000, vol. 51, iss. 1, pp. 37-57; 2000

The World Bank; Milestones of transition; in: Transition newsletter, vol. 7, iss. 5/6, p.24; 1996

Thurow, Lester C.; Globalization: the product of the knowledge–based economy; Annals of the American Academy of Political and Social Science; Jul2000, vol. 570, iss. 0, pp. 19-31; 2000

Tidd, Joe; Bessant, John; Pavitt, Keith; Managing innovation: integrating technological, market and organizational change; Chichester: Wiley; 2001

Trajtenberg, Manuel; Government support for commercial R&D: Lessons from the Israeli experience; in: Innovation policy and the economy, vol. 2, pp. 79-134; Cambridge and London: MIT Press; 2002

Tsipouri, Lena; The role of infrastructure; in: Technology management and public policy in the European Union; eds. Cannell, William; Dankbaar, Ben; Europenan commission, office for official publications of the European Community and Oxford University Press; 1996

United Nations; World investment report 1993: Trans-national corporations and integrated international production; New York: United Nations; 1993

Utterback, James M.; Abernathy, William J.; A dynamic model of process and product innovation; in: Omega, The International Journal of Management Science, vol 3, iss. 6, pp. 639-56; 1975

Van Reenen, John, The new economy: reality and policy; in: Fiscal Studies, vol. 22, iss. 3, pp.307-36; 2001

van Waarden, Frans; Dimensons and types of policy networks; in: European Journal of Political Research, vol. 21, iss. 1/2, pp. 29-52; 1992

Varian, Hal; Microeconomic Analysis, 3 ed.; New York: W.W. Norton; 1992

Venables, Tony; Trade and trade policy with differentiated products: a Chamberlian-Ricardian model; in: Economic Journal, vol. 97, pp. 707-17; 1987

von Hippel, Eric; The sources of innovation; New York, Oxford: Oxford University Press; 1988

Waldman, Don E.; Jensen Elizabeth J.; Industrial organization: Theory and practice; Reading: Addison-Wesley; 2001

Walter, Günter H.; Broß, Ulrike; The adaptation the German experience to building up innovation networks in central and eastern Europe; in:

Technology-based firms in the innovation process: Management, financing and regional networks, pp. 263-86; ed. Koschatzky, Knut; Series of the Fraunhofer Institute for Systems and Innovation Research, Heidelberg: Physica; 1997

Weiss, Andrew; Woodhouse, Edward; Reframing incrementalism: A constructive response to critics; in: Policy Science, vol. 25, iss. 3, pp. 255-73; 1992

Wilks, Stephen; Wright, Maurice; Conclusion: Comparing government-Industry relations: Statism, Sectors and Networks; in: Comparative government-Industry relations: Western Europe, The United states and Japan, eds. Wilks, S.; Wright. M.; Oxford: Clarendon Press; 1987

Williamson, Jeffrey G.; Real wages and realtive factor proces in the thirs world 1820-1940: the Mediterranean Basin; Harvard - Institute of Economic Research, Harvard Institute of Economic Research Working Papers; 1998

Wollmann, Hellmut; Variationen institutioneller Transformation in sozialistischen Ländern: Die (Wieder-)Einführung der kommunalen Selbstverwaltung in Ostdeutschland, Ungarn, Polen und Russland; in: Transformation sozialistischer Gesellschaften: Am Ende des Anfangs, pp. 555-96; eds. Wollmann, H.; Wiesenthal H.; Bönker F.; Opladen: Westdeutscher Verlag; 1995

Won-Ki, Kwon; Knowledge-based society and engineering education; International Conference of Engineering, Oslo; 2001

World Competitiveness Center; The World Competitiveness Yearbook 2000; IMD; 2001

Yehezkel, Dror; Muddling Through - “Science” or Inertia; in: Public Administration Review, vol. 24, iss. 3, pp. 154-7; 1964

Zarezankova-Potevska, Marija; Perspektivite na maloto stopanstvo (Perspectives for SMEs); Skopje: NEOL; 2000

http://www.esa.com.mk

http://www.finance.gov.mk/

http://www.stat.gov.mk/

http://www.gzs.si/eng/borza/index.htm

http://www.stat.si/eng/index.asp

http://www.cia.gov/cia/publications/factbook/rankorder/2004rank.html

http://eni.interliant.com/ENI/jssuccess.nsf/413a058054decf3b8525664e00696631/7f92273765aac0ad862569bd0068c7b7?OpenDocument

http://en.wikipedia.org/wiki/Original_equipment_manufacturer

ftp://ftp.cordis.lu/pub/innovation-policy/communications/communication_2003_en.pdf

www.oecd.prg/document/14/0,2340, en_2649_201185_1894478_1_1_1_1,00.html

http://www.webopedia.com/TERM/O/OEM.html