View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Research Papers in Economics

MPRA

Munich Personal RePEc Archive

Technology policy: patent protection and industrial R&D subsidies in Turkey

Soyak, Alkan

Silesian University in Opava

2002

Online at http://mpra.ub.uni-muenchen.de/2985/

MPRA Paper No. 2985, posted 07. November 2007 / 02:52

Transition Countries Joining The European Union, The 2nd Joint International Symposium, Silesian University in Opava,
Karvina-Czech Republic, 2002, pp:86-102.

TECHNOLOGY POLICY:
PATENT PROTECTION AND INDUSTRIAL R&D SUBSIDIES IN TURKEY

Alkan SOYAK

Marmara University, Department of Economics, Bahcelievler, Istanbul
e-mail: asoyak@marmara.edu.tr

Abstract

Some developing economies (especially East Asian Countries) have long imitated western technology. It means that these economies adopted an imitative attitude to new industrial technologies with regard to technology policies. Some changes recently have occurred. Asian economies such as South Korea and Taiwan begin to become fast innovators. Since this development that stimulates the imitation of technology makes worried some rich countries, some measures against this development have been taken by the global economic institutions which are driven by rich countries. In the process of globalization, the main measures, which focus on industrial property rights and industrial R&D subsidies, have been insisted on developing countries by WTO and etc. The present paper examines how national technology policy in Turkey is affected by the globalization process and proposes an evaluation on the pros and cons of patent system and industrial R&D subsidies.

Keywords: Turkey, Technology, Technology Policy, R&D Subsidy, Patent Protection

Introduction

Because of the stimulating imitation of technology by some developing countries, industrialised countries have been worried, some measures against this development have been taken by the global economic institutions. In the process of globalization, the main measures, which focus on industrial property rights and industrial R&D subsidies, have been insisted on developing countries by WTO and etc. This study aims to analyse how national technology policy in Turkey is affected by global economic institutions such as WTO and TRIPS in 1990's. In this concept, it will be an evaluation on patent protection and industrial R&D subsidies.

The structure of the paper is as follows: Section first discusses the theoretical background and defines the main concepts such as technology, technological capability and technology policy. Then this section is introduced to patent systems and R&D subsidies by the critical views. It will be examine techno-legal dimension of the globalization process and solve the question of how this processes have affected national technology policy in Turkey. Section two discusses the main characteristics of Turkish industry and the industrial strategy in the light of the technological dynamism of manufacturing industry in 1990's. Then this section focuses on patents' applications and R&D subsidies in Turkey. Finally the paper is concluded with a few policy that remarks on R&D subsidy and patent protection in Turkey.

1) Technology and Technology Policy: Theoretical Background, Concepts and Instruments

1.1 Theoretical Background

There are numbers of different approaches to technology policy in economic theory. From the 1960's to the early 1980's, the early stage in the literature on technology policy in developing countries (DC) focused on the concept of "*appropriate technology*". It was arisen from the Neoclassical views on the choice of technique. Under the free market conditions, firms choose the optimal combination of capital and labour which give the relative cost of factors of production. Developing countries where capital-intensive techniques are choosen, this is usually attributed to government intervention. Economic policies which cheapen the cost of capital (eg. negatif real interest rates) or increase the cost of labour (eg. social security payments) are regarded as fundemantal factors that limit to use more labour intensive technologies in DC (Jenkins, 1987: 69).

Many neoclassical economists criticized the developing countries for choosing capital-intensive technologies in their industrialisation strategies. They proposed to them to choose more labour-intensive technologies which were more appropriate to their factor endowments. This concept was adopted by more radical schools, brandly the "*Approach of Appropriate Technology*" (Stewart 1978), and the "*Dependency School*" (Emmanuel 1982).

After the late 1970s, the debate on technology policy in DC moved to a more useful phase. The fundamental question of why some countries were more successful in absorbing imported technologies than the other countries. Pioneering studies by Fransman and King (1984), Katz (1984), Teitel (1984), Bell (1984), Ansal (1988) opened a whole new page in the study of technology policy in DC.

"The consensus that emerged out of this phase was that developing countries need some degree of "technological capability" if they were to be successful in choosing, adapting, and making incremental improvements of imported technologies. It was also emphasised that (often irreversible) investments are needed in building such technological capability, and that policy actions have an important role to play in the process".(Chang and Cheema, 1999: 2-3).

After the 1980, The theoretical developments in the economics of technology became more sophisticated by Nelson & Winter (1982), Rosenberg (1982), Freeman (1982), Dosi (1988) and Lundvall (1992). *Neo-schumpeterian Approach* to technology had an emphasis on the evolutionary nature of technological progress and the importance of institutional and policy factors in the process, so that the concept of "*national innovation system* " or "*technological system*" was born in the light of these developments. The literature on technology policy in developing countries was influenced by these new theoretical developments. In this concept, Lall and Teubal (1998) provide the synthesis of this literature (Chang and Cheema, 1999: 3-4). According to these writers, technological problems can be resolved by some of state intervention.

1.2 Technology and Technology Policy: Concepts and Instruments

Technology is one of the most important determinants of productivity and industrialization for developed and developing countries. Accelerated economic growth and development are not conceivable without technological progress and productivity gains. Technological development is known as a vital determinant of national economic development. Many studies have shown that more than 50 percent of long-term economic growth arises from the technological progresses that improve productivity or lead to new products, processes or industries in industrialized countries (Kim, 1998: 311).

Technology may be defined as the set of skills, knowledge and procedures for making, using and doing useful things in both market and non-market settings. The concept of technology includes technical knowledge as well as organizational arrangements and skills which are necessary to efficiently transform inputs into outputs (Pack and Westphal 1986). Furthermore,

> "*technology is not (...) like 'manna from heaven', easily obtained and costlessly applied. On the contrary, it is often complex, multi-dimensional and specific to a particular firm, and a large part of it is tacit (i.e. uncodifiable) knowledge that derives mainly from trial, error and learning, rather than from the systematic application of science-based knowledge*." (Sharp and Pavitt, 1993: 130).

The question raised often is how industries and technology can be effectively used for economic and social development in developing countries. In fact, industrial development is a process of acquiring technological capabilities in the course of continuous technological development. The concept of '*technology* policy' refers to a set of instruments the government uses in promoting and managing the process and a direction of acquiring technological capabilities (Kim, 1998: 312). Another definition of technology policy is "*systematically stimulating technical progress, i.e. enhancing the skills, knowledge and procedures applied in the production of goods and services.*" (Ahrens, 1999: 8). Industrial and technology policies are different from macroeconomic policies. Because they are focused on more specific sub-industries of the economies.

All approaches to technology policy aim to enhance a firm's, (industry's or economy's) competitiveness and accelarete economic growth. The justification of technology policies is to combat private under-investment in R&D and the main scope of technology policies can be divided into two parts (Mani 1999):

"*First, the creation and maintenance of a legal environment conducive to private-sector investment in technological activities. This is created by legal measures which enhances the power to appropriate the fruits of R&D and other technological development activities. Industrial property rights such as patent are the main means by which the government creates such a conducive environment. Second, the provision of sufficient stimuli to overcome the natural inclination of private agents to consider only their private benefits when choosing the level of innovative activity in which to engage. This takes a variety of forms ranging from governmental grants and contracts to targeted tax incentives*" (Mani. 1999: 18).

Generally, technology policy is vary significantly across countries and it contains various major instruments in Table 1.

Table 1 Technology policy: Scopes and Instruments

Type of Measure **Relationship with the Market**	**Financial Instruments**	**Non-Financial Instruments**
Public provision of goods and services	• Subsidising exchange of R&D personnel between public and private sectors	• Policies aimed at diffusion of technology • Human resources development policy • University and government R&D • Industrial Standards
Modification of market incentives	• Tax incentives for R&D • Direct Funding through grants, soft loans, loan guarantees for R&D projects; • Promotion of National R&D projects; • Joint co-operative R&D projects between government and the private sector	• Public procurement particularly in defence • The IPR Regime • Industrial and Trade Policies
Support of the improvement of market mechanism	• Creation or improvement of specialised financial market mechanisms (e.g., Venture Capital)	

Source: Mani 1999, p. 18

However, instruments of technology policy in developing countries (DC) are different from industrialised countries. Technological activities often concentrate on adaptive R&D activities in DC;

> "*...technology policy in developing countries is different from its counterpart in developed countries in a fundamental way. Because it is through the process of assimilating and making incremental improvements over imported technologies that the bulk of technological progress in developing countries occurs, and therefore the policy needs to be focused on learning, rather than on conventional R&D as in developed countries"* (H. Chang ve A. Cheema,1999: 7).

What are the implications of these objectives and general principles of technology policy for the agenda of DC governments that seek to promote technological change? Basically, governments can play two complementary roles in a technological progress. On the one hand, they need to ensure a suitable policy environment, provide an adequate technological infrastructure for private investment in technology and enhance a private-sector coordination. On the other hand, governments can directly intervene in market processes by using specific instruments. If private enterprises can not be operated effectively in specific areas, the public sector itself can be the principle investor in those areas (Evenson and Westphal, 1995).

In spite of many financial and non-financial instruments for DC, the tax incentives and (Intellectual Property Rights) IPR regime have attracted more attention because of their market friendly natures. So that, I will discuss the implications of patent protection and R&D subsidies in this study.

1.2.1 Patents and Policy Objectives: Global Issues

According to the approaches in favour of patents;

> "*patents protect the inventions that business exploits as a result of R&D efforts. The main goals of patent system are to promote the creation and diffusion of technology*

> *by providing an inventor with limited monopoly over a technological solution in exchange for a full disclosure of invention. Even though they are often combined with other forms of protection, patents have traditionally been considered as one of the main incentives for R&D*" (OECD, 1997: 6-7)

The first policy scope of patent is the creation of new technology, both by stimulating national scientific research and improving the national technological base. An efficient patent system is expected to contribute to innovation in three respects:

- "*Patent system grant the right of exclusive use of an invention to inventor for a certain period of time, so that allowing for recovery initial R&D costs.*
- *This period of time is granted to inventor creates a favourable economic environment for development of marketable products.*
- *The patent system establishes a framework for collection of the world's largest store of technological information*" (OECD, 1997: 7-8)

The second policy objective of patents is the diffusion of technology that explains why patent period is limited and non-renewable.

Today's rapid pace of globalization and economic integration at world level reinforces demands that differences between national patent systems be overcome to remove what are felt to be obstacles creation of a global environment that will be fully conducive to innovation. During the Uruguay Round, IPR emerged as a major topic negotiation. After the WTO, the resulting "*Agreement on Trade Related Aspects of Intellectual Property Rights"*, (TRIP's) is the most comprehensive international agreement on intellectual property rights in 1990's (Carlos, Braga, 1995:25-27). The TRIPS's Agreement should foster greater harmonization of rules and practises for protection of intellectual property. As regards the term of patent protection the global standard set by Article 33 of the TRIP's is now somewhat longer 20 years from the filling date. In the result of arrangement, patent system is to be strengthen at the global level.

Developing countries have long been imitators of western technology. Some East Asian countries are fast becoming innovators during 1990's. Newly Industrialising Countries such as South Korea and Taiwan already spend as much on R&D as a proportion of their GDPs' like many European economies and their spending has grown more rapidly in recent years than of any developed economy. Should developed economies worry as they turn in to innovators? (Economist: 1996:80-81). And, so that who will benefit from this arrangements in the global environment? These questions are very important for developing countries now because negotiations over patent protection were at very core of the North-South conflict over IPR since Uruguay Round.

Many DC believe that a strict enforcement of all the provisions TRIP's would yield considerable rents to developed countries based on significant negative net transfer from DC. Philip McCalman has made possible a depper underestanding of the distrubution of direct gains and loses from TRIP's. The results show that nine developed countries would have positive net receipts if TRIP's were to be fully enforced. US alone receive a net transfer greater than all other countires combined about US$19 billion per year. Net losers in the terms of fee income are usually DC's such as Korea, Greece, New Zealand, Brazile, India and S. Africa (Technology Policy Brief, INTECH, 2002: 6-7). Central developed economies do not permit the industrialisation of new developing economies by the road of imitation any more[1].

1.2.2 Global Trends in Industrial R&D and Importance of Industrial R&D Subsidies

While governments in general have had abolishing support to industry and agriculture, the role of R&D subsidies has become more prominent. Since 1990's have witnessed three major

[1] About the road from imitation to innovation in newly industrialising countries see; L.Kim, R. Nelson, **Technology, Learning, and Innovation (Experiences of Newly Industrializing Economies)**, Cambridge University Press, 2000.

events with respect to the financing of industrial R&D; "*First, there has been a significant slow down in the financing of R&D by business enterprises in developed countries. Second, there have been significant reductions in the share of business enterprise R&D supported by governments. Third, there has been little or no evidence of internationalisation of corporate R&D, especially in the developing world*" (Mani 1999. 17). But East Asian countries such as South Korea and Taiwan are fast becoming innovators during 1990's.

This situation has brought to agenda more popularly technology policies to stimulate R&D investments by business enterprises. Another important event have occurred that most developing countries in the world are engaged in efforts to pare down the role of their governments in most areas of economic activity especially in industrialization. In the context, "*Agreement on Subsidies and Countervailing Measures"* have been accepted by Uruguay Roud Final Act. This Aggrement has prohibitted the subsidies to industry by goverments, excepts R&D and environment investments. According to this aggrement, the following subsidies shall be non-actionable*: "assistance for research activities conducted by firms or by higher education or research establishments on a contract basis with firms if the assistance covers not more than 75 per cent of the costs of industrial researcher 50 per cent of the costs of pre-competitive development activity*"[2].

So that, R&D Subsidy has a fairly universal application at globalization processes. However what is little known is it's efficiency to stimulate further investments in industrial R&D. (Mani 1999. 17).

---

[2] http://www.jurisint.org/pub/06/en/doc/23.htm

2) Patent Protection and R&D Subsidies in Turkey

2.1 Patent Protection and Statistical Information on Patens

Turkey is one of the countries in the world which have started the protection of industrial property rights in very early years in the history. But in the year 1994, It accepted the Decree Law for Establishment of Turkish Patent Institute (TPI) and accepted the duties, functions, organs and power of TPI in 1994. Turkey conducted necessary legislative studies to establish an efficient and contemporary industrial property system in 1995. Turkey participated in WTO and TRIP's Agreement in 1995 *(TPI, Report of Industrial Property, 2000).*

Patent applications in the last 17 years are given below in the Table 2. The number of the applications to the some selected OECD countries and Turkey are also given below in the Table 3. Tablo 4 includes the disportion of given patents in Turkey according to IPC codes. Table 5 includes the information about the disportion of patent applications in Turkey in between 1993 - 1996 according to some selected countries

Table 2. Patent Applications in Turkey

YEARS	DOMESTIC	FOREIGN	TOTAL	P Ratio
1981	157	368	525	2.3
1984	153	447	600	2.9
1986	175	551	726	3.1
1988	154	746	900	4.8
1990	138	1,090	1,228	7.9
1993	169	1,057	1,226	6.4
1995	210	1,521	1,731	8.5
1997	423	1,340	1,763	6.3
1998	213	2279	2492	10.7
2000	266	3178	3444	11,6

Source: *(TPI, Report of Industrial Property, 2000)*

There are two fundamental conditions for the patent system which make a positive contribution to the national technological system in Turkey. The first condition, non-resident/

resident ratio -*P- ratio* is 1 approximately. The second condition, patents of B,F,G,H groups have to be a dominant portion into disportion of given patents according to IPC cods.

Ratio of external patent applications to domestic patent (Non-resident/ resident ratio *–P-ratio) is* bigger than 1 since 1980's. This ratio is 11,6 in the year 2000. Same ratio in Japan is 1.2 in the year 1998. This situation means that Turkish patent system has been used to obtain a monopoly power by Multinational Companies (MNC's) such as pharmaceuticals (See Table 2).

Table 3. Patent Applications to Turkey and Some OECD Countries (1981-1997)

YEARS	TURKEY	UK.	GERMANY	SPAIN	USA	FRANCE	GREECE	JAPAN	PORTUGAL
1981	525	39,214	46,579	10,227	106,413	24,668	3,154	216,307	1,933
1982	511	37,083	47,826	10,201	109,625	22,242	3,260	235,524	1,826
1983	511	34,691	47,103	9,146	103,703	21,176	3,211	252,685	1,851
1984	600	32,828	45,209	10,700	111,284	20,200	3,490	282,314	1,852
1985	593	70,182	83,103	11,298	117,006	56,114	3,158	305,395	1,991
1986	726	73,421	86,108	14,358	122,433	58,848	5,324	322,561	2,268
1987	898	82,184	94,247	23,368	133,807	63,280	12,787	344,138	2,319
1988	900	84,175	95,998	26,229	147,344	68,384	13,758	345,418	2,464
1989	1,048	90,234	102,427	30,685	161,660	74,942	14,675	357,464	3,397
1990	1,228	97,891	110,349	49,026	176,100	81,884	18,908	366,792	3,642
1991	1,209	95,533	109,187	48,929	177,388	79,075	32,359	380,453	3,555
1992	1,252	99,241	115,209	53,605	187,291	82,038	35,958	384,456	13,402
1993	1,226	101,242	117,768	56,733	191,386	82,141	36,907	380,035	42,932
1997	1,763	117,506	134 775	89,227	230,336	107,413	-	415,698	82,744

Source: *(TPI, Report of Industrial Property, 2000 and* OECD, *Main Science Technology Indicators,* OECD, 2000-1

According to IPC cods, groups are described as follows: group A (human requirements), B (production technologies and transportation), C (chemistery and metallurgy), D (textile and papers), E (fixed structures), F (machine engineering, lighting, weapons and explosive materials), G (physical materials) and H (electrical materials). Patents of A, C, D groups such as pharmaceuticals and chemistery have been controlled by MNC's. However, patents of B, F, G, H groups contain products of the engineering industries that based on technological activities such as R&D in Turkey. In this classification, A,C,D groups' patents are consist of

55 percent of total patents and the others groups are 45 percent (See Table 4). So that, national engineering industries do not benefit from national patent system and it is used to obtain a monopoly power and royality by MNC's in Turkey. Also these MNC's do not transfer new technologies to Turkey by patents.

Table 4 Dispertion of Given Patents in Turkey According to IPC Codes (1994-1998)

IPC Codes	1994	1995	1996	1997	1998	Total (1994-1998)	%
A	222	132	90	103	169	716	18.8
B	248	130	140	85	163	766	20
C	326	233	162	146	204	1071	28
D	62	40	48	31	59	240	6.3
E	39	27	16	13	35	130	3.4
F	129	86	63	35	57	370	9.7
G	39	34	29	19	48	169	4.4
H	127	81	53	26	61	348	9.1

Source: *(TPI, Report of Industrial Property, 2000*)

Table 5. Dispertion of Patent and Utility Model Applications in Turkey

According to some countries in 1993-1996

YEARS	USA	JAPAN	EU	TURKEY	OTHERS	TOTAL
1993	453	19	534	169	51	1,226
1994	468	24	639	148	113	1,392
1995	530	37	752	210	202	1,731
1996	177	26	367	374	142	1,086

Source: *(TPI, Report of Industrial Property, 2000*)

2.2. Industrial R&D and R&D Subsidies in Turkey

Sanjaya Lall makes a dramatic identification about Turkish Industry and R&D activites;

> *"Turkish industry had practically no tradition of conducting R&D, preferring to rely passively on imported technologies. Only 13 per cent of national R&D is financed by the private sector.The government offers fiscal incentives for industrial R&D in 1989, only 13 firms applied for these incentives. Private R&D is far below levels in the advanced NIEs, and too low to support sustained industrial competitiveness in advanced European markets. The lack of technological activity has led to a significant brain drain of the best Turkish technical graduates. The need for technology support is particularly pressing for the large number of SMEs that dominated Turkish industry and that tend to lag in technology. The large amount of general R&D in Turkey, financed by the central government, takes place in public research institutes and universities. This R&D has had few linkages to the productive industrial sector, and private industry has been avoid to collaborate with the public laboratories. The pattern of public R&D does't match national industry's technological needs. The technology infrastructure is generally inadequate to current industrial needs, and even more so to the demands of a more dynamic export structure. The metrology, standards, testing and quality system has been unable to provide the services needed by exporters, raising their costs, constraining technology development and reducing their ability to compete internationally*". (Lall, 1998: 25-26

There are few sources of technology finance for private enterprises in Turkey. It has recently introduced policies to improve tax incentives for industrial R&D, R&D subsidy to encourage technological effort, and improve links between industry and the science institutions. (Lall, 1998: 26-27).

There are two channels of R&D Subsidy System for Turkish industry. First, TTGV provides financial support to innovative and market oriented industrial projects by grating soft loans to Turkish Industrial companies. The form of loan is free of interest. The support is made available as a loan through the Undersecretariat of Foreign Trade of Turkey and through the World Bank. Second, TÜBİTAK supports to R&D activities and innovations in industry (See Appendix 1). Also TÜBİTAK-TİDEB monitors the research projects of industrial establishments aimed at developing new products, production methods and innovative technology to see whether they conform to international rules and are on par with current R&D standards. It also plans supportive studies to enhance technology development capability and devise policies to increase cooperation between universities and industry.

There are two fundamental conditions for the R&D Subsidy System which make a positive contribution to the national technological system in Turkey. The first condition, this system has to be a large scaled financial pool. The second condition, the priorities of strategic industrial and technology policy in Turkey are information industries, electronic-flexible production, machinery and material industries.

GDP share of R&D expenditure in Turkey is approximately 0,5-0,6 percent. Hovewer this ratio is 2,5 – 3 percent in Japan and USA (See Appendix III. Table 7) . 180-190 Million USA$ R&D subsidies have been distributed by TTGV and TÜBİTAK since 1990's. Total cumulative R&D expenditures are 7.5 billion USA $ in 1990's and manufacturing industries have 25 percent of total R&D expenditures . So that 1 USA$ subsidy is given for every 10 $ industrial R&D expenditures in Turkey. This is a fairly little value for Turkish Industry. Industrial R&D subsidy's amount of Turkish government is 0,001 percent of R&D subsidy's amount of USA and Japan Governments.

The priority of R&D subsidies is used directly for information-communication technologies. But, the priorities of TTGV's Subsidy System are material industries, chemistry, bio-technology- agricaltural industries and the others (See, Chart 5). However, the priorites of TÜBİTAK in R&D subsidies are covered by the priorities of strategic industrial and technology policy (see Table 6). In the disportion of the given subsidies by TÜBİTAK, according to the firm scales, the large scaled enterprises (LSE's) have 65 percent of total realised subsidies. But, TTGV supports the small-medium scaled enterprises (SME's). This means that there is a dilemma in the industrial R&D Subsidy System in Turkey (See, Table 6 and Chart 3).

Conclusion

Turkish industry is appeared as a passive user of transferred technologies. Although this structural characteristic of industry, national engineering industries do not benefit from national patent system to transfer new technologies. Patent system is used to obtain a monopoly power and royality by pharmaceutical and chemistry MNC's. These MNC's do not transfer the new strategic technologies such as informations and communications to Turkey by patents. So that, R&D Subsidy System is more useful than the patent system to current accumulation of national technological capability. However, R&D Subsidy system have had to be self-financial systems such as venture capital and it has to be mastered by a large financial capacity. If the structural arrangements in R&D System is realised, it may be reach to a more efficient system for national technology policy in Turkey. In the medium term, there is no another chance for Turkish government to encourage the national industries except to use R&D subsidy systems in the global world.

In the long term, technology policy is to focus on the technological system that is the institutional and organizational framework which firms operate in. Institutionally, a technological system is described as a network of agents interacting in the economic-industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilization of technology. Technological systems are qualified in terms of knowledge flows rather than flows of ordinaray goods and services (Carlsson and

Stankiewicz, 1991: 94-111). Long term technology policies in Turkey must be focus on the national technological system which depends on technological and market stimulates, the capabilities of scientific and technological agents, the degree of interdependence among these agents.

References

Acharya, R., "Intellectual Property Rights And Information Technology: The Impact Of The *Uruguay Round* on Developing Countries", **Information and Communications Technology Law**, Vol. 5 Issue 2, June 1996, ss.149-167.

Ahrens, J., Governance And The Implementation Of Technology Policy In Less Developed Countries, **INTECH, International Workshop: The Political Economy of Technology in Developing Countries** Isle of Thorns Training Centre, Brighton, 8-9 October 1999

Ansal, H., " Technical Change in Turkish Truck Manufacturing Industry", Ph.D Thesis, University of Sussex, Science Policy Research Unit, 1988.

Ansal, H., A. Soyak, "Impact of Privatization on R&D Activities: The Case of Turkish Telecommunications Industry", **Civilization, Modern Technology and Sustainable Development**, The 8. International Conference on Management of Technology, IAMOT, 1999, ss.39-49

Bell, M., " Learning and The Accumulation of Industrial Technological Capacity in Developing Countries " , **Technological Capability in The Third World**, M. Fransman and K.King, London:Mac Millan Press, 1984.

Bifani, P., "Intellectual Property Rights and International Trade", in The Uruguay Round: Papers on Selected Issues", **UNCTAD/ITP/10**, (New York: United Nations), 1989

Carlos, A., P. Braga., "Protection on A Global Scale", **China Business Review,** Vol.22, Issue.2, March/April 1995, ss.25-28.

Carlsson,B., R.Stankiewicz , " On The Nature , Function and Composition of Technological Systems, **Journal of Evolutionary Economics**, Vol.1, No.2 ,1991.

Chang H. and A. Cheema, Polıtıcal And Instıtutıonal Aspects Of Technology Polıcy Desıgn And Implementatıon In Developıng, Countrıes **INTECH, International Workshop: The Political Economy of Technology in Developing Countries**, Isle of Thorns Training Centre, Brighton, 8-9 October 1999

Dosi, G., " Sourcess, Procedures and Microecenomic Effects of Innovation " , **Journal of Economic Literature**, Vol.26, 1988.

Economist "The Road From Imitation to Innovation", **the Economist**, Vol.339, Issue. 7966, 18.5.1996, s.80

Emmanuel, A., **Appropriate or Underdeveloped Technology**?, Chichester Wiley/IRM Series on Multinationals, 1982.

Evenson, R. E. and L. E Westphal,, "Technological Change and Technology Strategy", in J. Behrman and T. N. Srinivasan (ed.), **Handbook of Development Economics**. *Volume 3A.* Amsterdam: Elsevier, 1995.

Fransman, M. K. King, **Technological Capability in The Third World,** (Ed.) London: Mc Millan Press, 1984.

Freeman, C., **The Economics of Industrial Innovation**, London: Pinter Publishers. 1982.

INTECH, **Technology Policy Brief**, United Nations Universty, INTECH, Vol.1, Issue1, 2002

Jenkins, R., **Transnational Corporations and Uneven Development: The Internationalization of Capital and The Third World**, London:Methuen Press,1987

Katz, J. M., " Domestic Technological Innovation and Dynamic Comperative Advantage ", **Journal of Development Economics**, Vol.16,1984.

Kepenek, Y., **Some Technological Aspects of The Turkish Manufacturing Exports During the 1990's**, http://www.intech.unu.edu/publications/conference-workshop-reports/seville/kepenek.pdf

Kim, L.,"Technology Policies And Strategies For Developing Countries: Lessons From The Korean Experience",**Technology Analysis and Strategic Management**, Vol. 10 Issue 3, September 1998, ss.311-324

Kim, L. R. Nelson, Technology, Learning, and Innovation (Experiences of Newly Industrializing Economies), Cambridge University Press, 2000.

Lall, S., "Technological Capabilities and Industrialization", **World Development***, 20(2*) , 1992, pp. 165-186.

Lall, S. & Teubal, M. "Market stimulating' Technology Policies in Developing Countries: A Framework with Examples from East Asia", **World Development**, Vol. 26, No. 8, 1998.

Lall, S., "Turkish Performance in Exporting Manufactures: A Comparative Structural Analysis" **QEH Working Paper Series** QEHWPS4*,* Working Paper Number 47, August, 2000

Lundvall, B-Å., **National Systems of Innovation**, (ed.), London: Pinter Publishers,1992.

Mani , S., "Public Innovation Policies and Developing Countries In a Phase of Economic Liberalisation" United Nations University, Institute for New Technologies, **Discussion Papers**, Oct. 1999

Nelson, R.R. and S. Winter, **An Evolutionary Theory of Economic Change,** Cambridge, Mass: The Belknap Press of Harward University Press1982,.

OECD, **Patents and Innovation in International Context**", OCDE/ GD (97) 210, Paris, 1997.

OECD, **Main Science and Technology Indicators**, OECD, Volume 2001/1.

OECD, **Main Science and Technology Indicators**, OECD, Volume 2001/2.

Pack, H. and Westphal, L. E), "Industrial Strategy and Technological Change", **Journal of Development Economics***, 22*, 1986, pp. 87-128.

Rosenberg, N, Inside The Block Box: Technology and Economics, Cambridge: Cambridge University Press, 1982.

Schumacher, E, **Small is Beautiful**, London: Blond & Briggs. 1973

Sharp, M. and Pavitt, K. "Technology Policy in the 1990s: Old Trends and New Realities", **Journal of Common Market Studies***, 31(2*), 1993, pp. 129-151.

Stewart, F., **Technology and Underdevelopment**, London: Macmillan Press, 1978

Teitel,S., " Technology Creation in Semi Industrial Economies" , **Journal of Development Economics,** Vol.16 ,1984.

TPE, **Statistics of Industrial Property in Turkey** , No: TPE/20, June 1999.

<u>Related Web Sites</u>

Juris International...**http://www.jurisint.org/**

Organisation For Economic Co-Operation And Development................**http://www.oecd.org**

Republic Of Turkey, Prime Ministry State Institute Of Statistics..........**http://www.die.gov.tr**

Republic Of Turkey, Prime Ministry, State Planning Organization...... **http://www.dpt.gov.tr**

Technology Development Foundation Of Turkey....................................**http://www.ttgv.org.tr**

The Scientific And Technical Research Council Of Turkey.....................**http://www.tubitak.gov.tr**

http://www.tideb/tubitak.gov.tr

Turkish Patent Institution..**http://www.turkpatent.gov.tr**

World Intellectual Property Organization...**http://www.wipo.org**

World Trade Organization... **http://www.wto.org**

APPENDIX -I-

THE SCIENTIFIC AND TECHNICAL RESEARCH COUNCIL OF TURKEY

(TUBİTAK)

"***Founding and Function***

- *Founded in 1963, TÜBİTAK is the supreme organization put in charge of promoting, developing, organizing and coordinating research and development in the fields of exact sciences in Turkey in line with the national targets of economic development and technical progress.*

- *It functions under the fold of the Prime Ministry with adequate administrative and financial autonomy. The Council's decision-making body is the Science Board, composed of the President and 12 members. The President, as the chairman of the Science Board implements its decisions and is the head of the entire administration.*

Primary Functions

TÜBİTAK's main tasks have been set as the following:

- *Determining Turkey's science and technology policies;*

- *Supporting, encouraging and coordinating scientific research;*

- *Establishing and operating special institutes to conduct research and development activities geared to the targets of the five-year economic development plans and the priorities set by the Science Board;*

- *Providing scholarships and other support to researchers and organizing contests to discover and train future scientists.*

- *Supporting R&D activities and innovations in industry, promoting university-industry collaborations and establishing techno-parks to facilitate their realization.*

- *To implement tasks undertaken through international scientific and technical cooperation agreements;*

- *Publishing scientific journals, as well as books and monthly popular science magazines that make science accessible to the public;*

- *Supporting scientists and researchers with awards and programs that incent scientific publication".*

Source: http://www.tubitak.gov.tr/english/ffpf.html

TECHNOLOGY DEVELOPMENT FOUNDATION OF TURKEY

(TTGV)

"***Mission:***
TTGV was founded in June 1991 by the joint efforts of private and public sectors through a loan agreement signed between the Turkish Government and the World Bank.

The main missions of TTGV are:

- *To stimulate a real increase in industries own investment in R&D.*
- *To encourage the development of technologies which have broad application.*
- *To strengthen the links between industry and scientific organizations like Universities, TÜBITAK, and other research organizations.*
- *To help industry to exploit developments in science.*

Activities
TTGV provides financial support to innovative and market oriented industrial projects by grating soft loans to Turkish Industrial companies. The form of loan is free of interest. The support is made available as a loan through the Undersecretariat of Foreign Trade of Turkey and through the World Bank.

The fund of 39m euros made available by the World Bank in 1991 has totally been allocated to the implementation of one hundred technology projects. Currently TTGV supports projects through the fund of 54m euros made available by the World Bank in 1999 under Industrial Technology Project (ITP) and the Foreign Trade Undersecretariat from which 25.5 m euros has been allocated.

Under ITP, TTGV started new schemes as Technology Support Services, Technology Service Centres, Technoparks and Venture Capital.

TTGV also supports international collaboration in R&D through the funding of Turkish partners of EUREKA projects.

Besides R&D support in technology development projects, TTGV gives support to environmental projects specifically aiming to Phase Out of zone Depleting Substances in Industry. The fund for this project group is made available by the World Bank through the Montreal Protocol. 11.5m euros has been allocated for the Ozone Projects through the 16.5m euros fund provided".

Source: www.taftie.org/members/ttgv.html

APPENDIX -II-

Statistics on TUBİTAK's R&D SUBSIDIES

Chart 1 The Statistics of Project Applications to TÜBİTAK

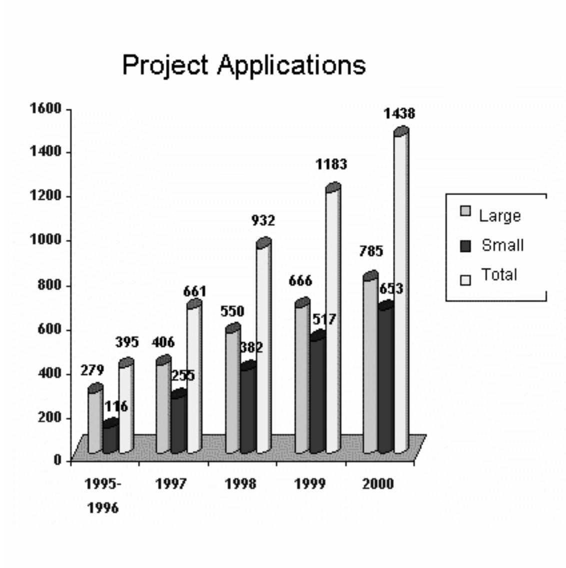


Table 6
The Dispersion of The R&D Projects
According to The Sectors (%)

Information and electronics engineering	24.4
Machinery Eng. Technology	25.6
Materials and metalurgy	17.9
Chemistry Engineering	14.4
Instrumentations-measures	5.8
Control eng.	1.9
Textile eng.	1.0
Industry eng.	2.1
Bio-technology	1.9
Aircraft	1.0
Agricalture	0.8
Foods Scieces	1.2
The Others	2.0

The Dispersion of Given R&D
Subsidies According to The
Firm's Scale (%)

LSE's	SME's
30	70

The Statistics on TTGV's R&D Subsidies

Chart 2 The Dispersion of R&D Projects

According to The Firm's Scale (%)

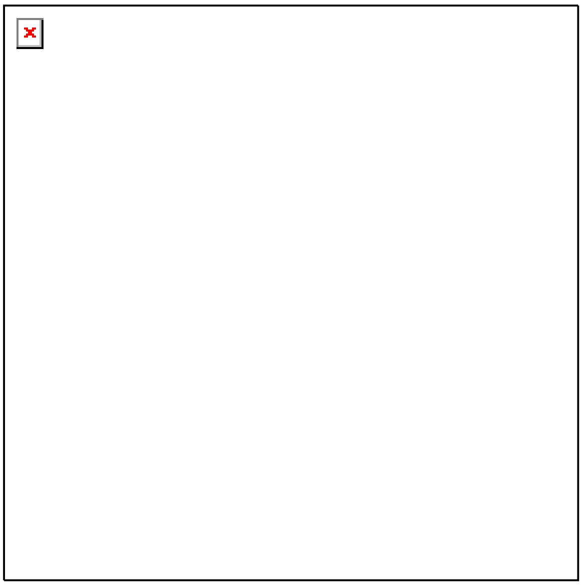


Chart 3 The Dispersion of Given R&D Subsidies

According to The Firm's Scale (%)

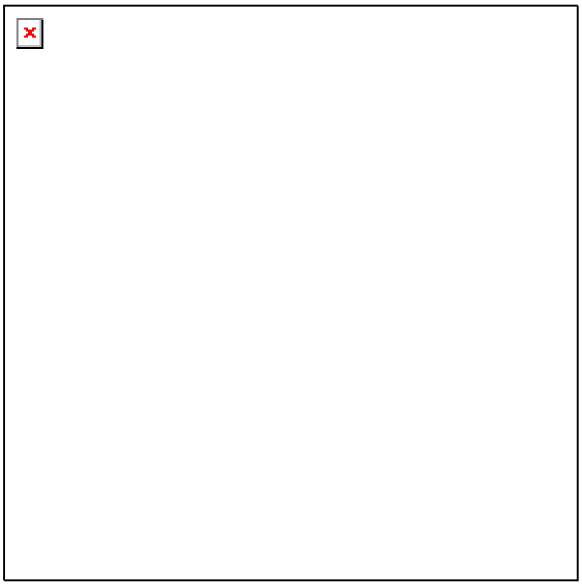


Chart 4 The Dispersion of The R&D Projects

According to The Sectors (%)

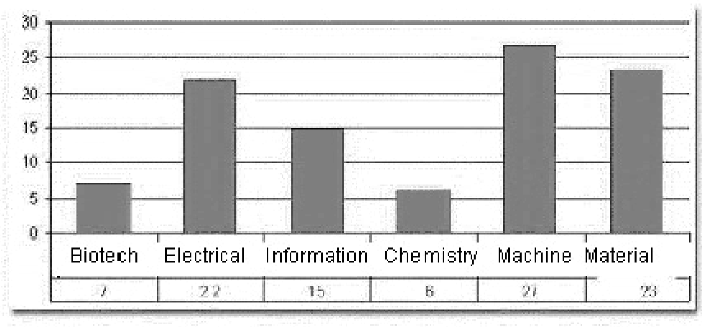


Chart 5 The Dispersion of Given R&D Subsidies

According to The Sectors (%)

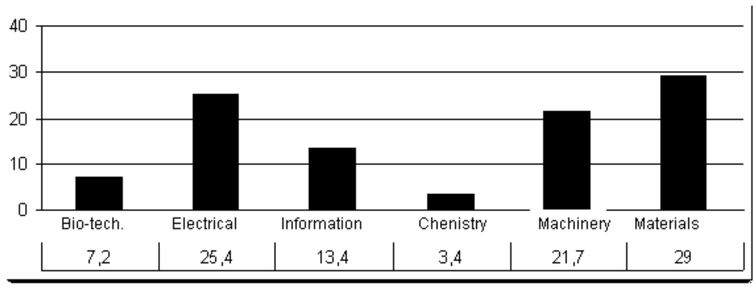


Chart 6 Annual R&D Expenditures in Subsidised Firm's

(USA $) (%)

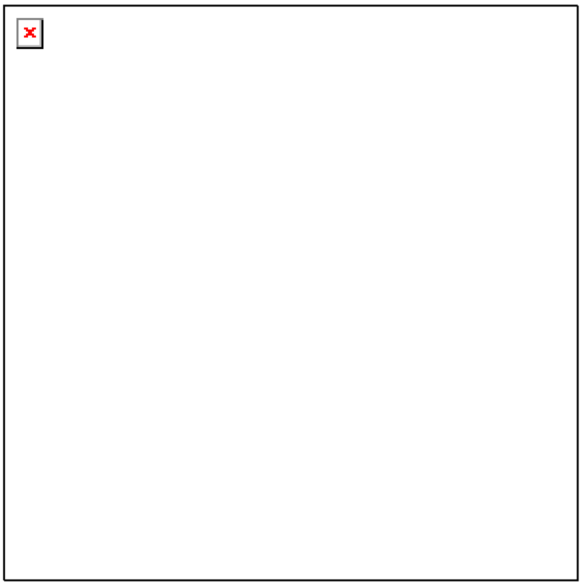
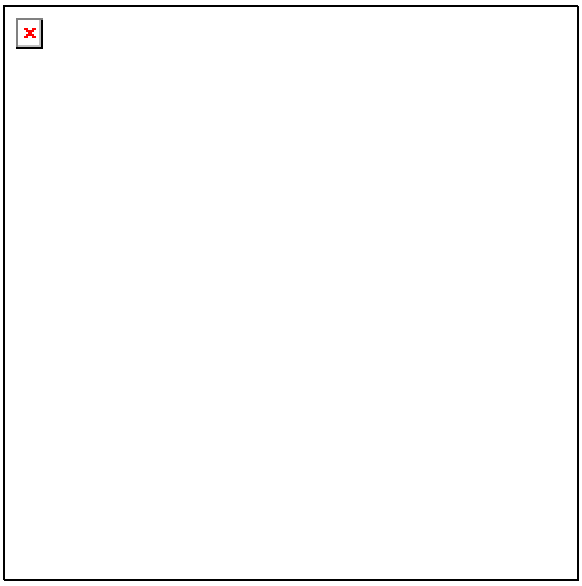


Chart 7 Number of R&D Personels in Subsidised Firm's (%)



APPENDIX III

Table 7. Indicators of R&D expenditure in selected OECD countries in 1999

	R&D expenditure	Proportion of R&D expenditure in OECD area	GDP share of R&D expenditure	Business enterprises' proportion of R&D expenditure	Percentage of R&D expenditure financed by government***
	USD million (PPP)	**%**	**%**	**%**	**%**
EU	157,641	28.3	1.9	64.7	34.5
Germany	47,574	8.5	2.4	69.8	32.5
France	29,240	5.2	2.2	63.2	36.9
United Kingdom	25,463	4.6	1.9	67.8	27.9
Italy	13,830	2.5	1.0	52.8	51.3
Netherlands	8,395	1.5	2.1	56.4	35.7
Sweden	7,756	1.4	3.8	75.1	24.5
Spain	6,375	1.1	0.9	52.0	40.8
Belgium	5,025	0.9	2.0	71.6	23.2
Finland	3,752	0.7	3.2	68.2	29.2
Austria	3,646	0.7	1.8	63.6*	39.7
Denmark	2,969	0.5	2.1	63.4	32.6
Portugal	1,269	0.2	0.8	22.7	69.7
Ireland**	1,084	0.2	1.4	73.1	22.2
Greece	1,084	0.2	0.7	28.5	48.7
Other OECD countries					
United States	244,699	43.9	2.7	74.7	28.8
Japan	95,085	17.0	2.9	70.7	19.5
South Korea	18,543	3.3	2.5	71.4	24.9
Canada	14,727	2.6	1.8	57.0	32.3
Australia*	6,842	1.2	1.5	45.6	47.4
Mexico	3,301	0.6	0.4	27.2	65.3
Turkey	**2,636**	**0.5**	**0.6**	**38.0**	**47.7**
Poland	2,496	0.4	0.8	41.3	58.5
Norway	2,140	0.4	1.7	56.0	42.5
Czech Republic	1,751	0.3	1.3	62.9	42.6
Hungary	776	0.1	0.7	40.2	53.2
Slovakia	402	0.1	0.7	62.6	47.9
Iceland	170	0.0	2.3	46.7	41.2
OECD total	**557,683**	**100.0**	**2.2**	**69.3**	**29.6**

Part of data preliminary or estimates
* Data from 1998 ** Data from 1997 *** Proportion of public administration in R&D funding of universities, research institutes and business enterprises. Does not include public loans.
Source: OECD, *Main Science and Technology Indicators,* OECD**,** Volume 2001/2