

Heshmati, Almas

Working Paper

A model for industrial development of the federal region of Kurdistan: science and technology policy, instruments and institutions

IZA Discussion Papers, No. 3213

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Heshmati, Almas (2007) : A model for industrial development of the federal region of Kurdistan: science and technology policy, instruments and institutions, IZA Discussion Papers, No. 3213, Institute for the Study of Labor (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/35201>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

IZA DP No. 3213

**A Model for Industrial Development of the Federal
Region of Kurdistan: Science and Technology Policy,
Instruments and Institutions**

Almas Heshmati

December 2007

A Model for Industrial Development of the Federal Region of Kurdistan: Science and Technology Policy, Instruments and Institutions

Almas Heshmati

*University of Kurdistan Hawler,
HIEPR and IZA*

Discussion Paper No. 3213
December 2007

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

Any opinions expressed here are those of the author(s) and not those of the institute. Research disseminated by IZA may include views on policy, but the institute itself takes no institutional policy positions.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit company supported by Deutsche Post World Net. The center is associated with the University of Bonn and offers a stimulating research environment through its research networks, research support, and visitors and doctoral programs. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

A Model for Industrial Development of the Federal Region of Kurdistan: Science and Technology Policy, Instruments and Institutions*

This report introduces two of the most successful industrial development models of the modern time – the Japanese as a leader and the South Korean as its follower. The objective is to review the industrialization process in these two economies which have served as a model for development in many newly industrialized economies. The experience gained from a review of the two models is used to investigate the current industrial development in the Federal Kurdistan Region. In particular the focus is initially on the identification of the current policy and institutions in the region. The conditions, potential and pitfalls are investigated and the resources available in the region and those needed are quantified and the gap estimated. Based on experience gained and available information, the strategy for development is designed and an optimal model for industrialization of the Kurdistan region is proposed. Major steps to be taken during the industrialization process are identified and described in detail. Discussion of the of the possible industrial policy instruments to improve security and self-sufficiency is followed by a presentation of infrastructure organizations and their cooperation to implement the industrialization policy. Industrial policy here involves the regional government's use of its authority and resources to administer policies that address the needs of specific sectors, industries or corporations with the aim of raising their survival, productivity and competitiveness.

JEL Classification: H54, L52, L78, O14, O20, O25

Keywords: industrial development, industrialization process, industrial policy, infrastructure, Kurdistan

Corresponding author:

Almas Heshmati
University of Kurdistan Hawler
30 metri Zaniary
Hawler
The Federal Region of Kurdistan
Iraq
E-mail: Heshmati@snu.ac.kr

* With thanks to Rhona Davis for comments on and improvement of the English text.

CONTENTS

Abbreviations

1. INTRODUCTION

2. THE PATH OF JAPANESE INDUSTRIALIZATION

2.1 Japanese Industrial Policy as a Model for Development

2.2 Industrial Policy Instruments for High Technology

2.3 MITI and the Japanese Industrial Organization

2.4 Japanese Experience in Technology

3. THE PATH OF KOREAN INDUSTRIALIZATION

3.1 The Path of Korea's Modernization

3.2 Korea's Changing Environment

3.3 Shifting Strategies of Korea

3.4 Strategic Positioning for Korea's Future Economy

4. OTHER MODELS FOR DEVELOPMENT

5. AN INDUSTRIAL DEVELOPMENT MODEL OF THE KURDISTAN REGION

5.1 The Current Industrial Policy and Institutions

5.2 Conditions and infrastructures

5.2.1 National Health Service

5.2.2 Science and Technology Parks

5.2.3 The Region's Technology Policy

5.2.4 The Labour Market Policy of the Region

5.2.5 The Skilled Labour Force

5.2.6 The Current Labour Market Situation

5.2.7 Capital and Investment Risks

5.2.8 Promotion of Local Production

5.2.9 The Economic Development Plan

5.2.10 Structural Changes

5.2.11 Globalization and Development

5.3 A model and strategy for development and industrialization

- 5.3.1 The follower strategy for development
- 5.3.2 The KRG's leadership in development
- 5.3.3 The blend of industrialization policy
- 5.3.4 The drivers of economic growth
- 5.3.5 The role of the ministry of science and technology
- 5.3.6 The changing environment
- 5.3.7 Policy to build indigenous technology base
- 5.3.8 The post-invasion period
- 5.3.9 Strategy for the future economy

6. SUMMARY AND CONCLUSIONS

REFERENCES

ABBREVIATIONS

DNA	Deoxyribonucleic acid
EIA	Erbil International Airport
EPB	(Korean) Economic Planning Board
FDI	Foreign Direct Investment
FILP	(Japanese) Fiscal Investment and Loan Programs
FKII	Federation of Korean Information Industries
FRK	Federal Regional of Kurdistan
G7	Group of Seven Countries
GDP	Gross Domestic Products
GFL	Government Founded Laboratories
GNP	Gross National Products
KAIST	Korean Advanced Institute of Science and Technology
KIST	Korean Institute for Science and Technology
KRG	Kurdistan Regional Government
KSF	Korea Science Foundation
LDP	(Japanese) Liberal Democratic Party
LG	Korean LG Corporation
MIC	Ministry of Information and Communication
MITI	(Japanese) Ministry of International Trade and Industry
MOST	(Korean) Ministry of Science and Technology
M.Sc.	Master of Sciences
NIE	Newly Industrialized Economies
OECD	Organization for Economic Cooperation and Development
Ph.D.	Doctoral Degree
R&D	Research and Development
S&T	Science and Technology
SME	Small and Medium Enterprises
TBI	Technology Based Industries
TSI	Technology Support Institutions
UK	United Kingdom
USA	United States of America
WTO	World Trade Organization
WWII	World War II

1. INTRODUCTION

This essay introduces two of the most successful industrial development models of modern time. These include Japan as a leader and Korea as a follower. The objective is to review the industrialization process in these two economies which serve as models for development in many newly industrialized economies. Based on the experience gained from these two countries, an optimal industrialization model for the Federal Region of Kurdistan is proposed.

Industrial policy here involves the regional government's use of its authority and resources to administer policies that address the needs of specific sectors, industries or corporations with the aim of raising their survival, productivity and competitiveness. Industrial policy focuses on specific industrial targets but yet is an integrated part of the macroeconomic policy which focuses on the whole region's economy. Industrial policy customs policy instruments to fit the priorities and needs of individual industries in the region. The goals may differ over time and be multi-objective like full employment, import restriction and technology and skill upgrading. The policy instruments are tax incentives, R&D subsidies, import restrictions and employment programmes.

This study is conducted in a number of steps. First, as an introduction, the characteristics of Japan's political economy are described and Japanese industrial policy as a model for economic development is reviewed. The major steps taken during the industrialization process are identified and described in detail. The review proceeds by a discussion of Japan's comprehensive industrial policy instruments of high technology and then is followed by a presentation of infrastructure organizations and their cooperation in implementing industrialization policy. Finally, the Japanese experience in technology during the pre-war and post-war periods, channels of technology transfer and conditions of technological development are analyzed.

In reviewing the process of industrialization in Korea, the focus is on the general path of Korea's modernization. The conception of Korea's new innovation-based strategy rests on four kind of analysis: anticipated trends in innovation and changes in global economic environment; reflecting on past experience with S&T policy and institutional development; reassessing the current capacity, structure and policy; and analyzing the successes and failures of other nations with similar goals. We describe Korea's environment and its implications for science, technology and innovation policy by summarizing the development from the 1960s to 1990s. In parallel scientific and technological resources for innovation including primary institutions for developing the personal and the basic technical knowledge are evaluated. The changing environment is discussed and its impacts reflected in the shifting strategies of Korea and the country's positioning for the future economy. A number of other models for an innovation based development strategy are also reviewed. These include Sweden, Finland, Switzerland,

Netherlands, Taiwan and Brazil. Other non-reviewed examples are China, some sectors in India, Singapore and Malaysia.

The experience gained from a review of the models described above is used to investigate current industrial development in the Kurdistan Region. In particular the focus is initially on the identification of the current policy and institutions in the region. The conditions, potential and pitfalls are investigated. The resources available and those needed are quantified and the gap estimated. Finally, the strategy for development is designed and an optimal model for industrialization is proposed. The model builds on regional and international linkages and an infrastructure relying on information technology and communication networks. It elaborates also with suggestions on organizational arrangements for government and investment policies.

2. THE PATH OF JAPANESE INDUSTRIALIZATION²

This section is a description of the path of Japanese industrialization. The characteristics of Japan's political economy and industrial policy as a model for economic development are reviewed. The review involves the major steps taken during the industrialization process, formation of infrastructure organizations and industrial policy instruments are identified and described in detail. Finally, the country's experience in technology during the pre- and post-war periods, channels of technology transfer and conditions of technological development are analyzed.

2.1 Japanese Industrial Policy as a Model for Development

Japan is a model for development in many newly industrialized economies (NIE). In Okimoto (1989) it is stated that 'Japan, incorporated' is often used to characterize Japan's political economy, with reliance on centralized planning and administrative guidance for control and wide state intervention. The Ministry of International Trade and Industry (MITI) serves as the headquarters for Japan Incorporated. Since the market mechanism does not generate outcomes that are always in the nation's best interests, the visible hands of the state are necessary. Areas of state intervention in general are left to the 'invisible hand'. According to Adam Smith, state intervention disrupts the mechanism of self-regulation built into market economies including the capacity to allocate labour and capital efficiently. Despite significant state intervention, the size of government in Japan, revenue and expenditure are very small. State ownership in key industries like steel, shipbuilding, railways, automobiles, aircrafts, electronics, telecommunication and banking is much smaller than in other market economies such

² Most parts of this chapter consist of a brief review of Okimoto (1989). Only aspects of general character and suitable for this report are discussed here.

as France and Italy. Indicators of government intervention in countries like the USA are regulatory control in areas of occupational safety and health, affirmative action, export control of dual technology, national security, defence contracts and antitrust. The minimalist nature of the Japanese state is not in agreement with the perception of the role of Japan Incorporated. The nature of interventions differs from that of other industrialized countries.

Most studies of Japan's industrial policy express the impression that it is coherent, effective and far-sighted, error free and costless. However, they focus only on the success of steel, automobiles, electrical power generation and shipbuilding, but not on petrochemicals, wholesales, retail distribution and aerospace. Concept of coherence is often overstated. Not enough effort is made to differentiate policies across industrial sectors or in countries. Many errors are attributed to inefficiencies in Japan's industrial policy such as agriculture, livestock, land prices, food processing, coal, defence production, health services, retail distribution, segments of the financial services and software. The nature of the relationship between the Liberal Democratic Party (LDP), bureaucracy, and industry explains the combination of efficiency and inefficiency. Interest groups have gained significant voice both in and outside the domain of MITI. Industrial policy measures including sectoral targeting, investment guidelines, industrial restructuring, regulatory controls, antirecession sanctioned cartels used by MITI might have created distortions, which sometimes used a countermeasure to offset or to correct for the negative after-effects like measure of excessive investment or export expansion – and countermeasure of trade balance.

The definition of industrial policy involves government's use of its authority and resources to administer policies that address the needs of specific sectors, industries or companies with the aim of raising the productivity of factor inputs. Macroeconomic policy focuses on the whole economy, while industrial policy is on specific targets. Industrial policy customises policy instruments to fit differing priorities and the needs of individual industries. The goals in countries differ, such as full employment, catch up and protection. The goals might be multi-objectives like full import restriction and upgrading of technology. The policy instruments are tax incentives, R&D subsidies, import restrictions, etc. Externalities are the economic costs of adverse social consequences of market failure to anticipate the secondary effects of policy interventions. Environmental pollution and collective good or public good phenomenon where companies free ride basic research financed by tax are two examples of externalities.

Countries like Japan and USA differ in their perceptions of market failure and market shortcomings like imperfect information, public goods, private and foreign interests. Capital and labour are also organized differently in industrialized countries. The

Japanese labour market is less mobile, seniority-oriented, has in-company training and life time employment. MITI, through extra markets institutions, inter-corporate stockholdings, close bank-business ties, and subcontracting network, affects market outcomes. MITI's interventions include allocation of subsidies to sectors, protection of infant industry, sector targeted investment guidelines, export promotions, etc. Unlike in Japan, the US industrial policy targets the entire economy rather than produces a differential set of policies for solving problems of specific sectors. Thus, Japanese policy institutions are better in sectoral fine-tuning.

One decisive strategy shaping Japanese industrial policy as a latecomer was to industrialize as fast as possible to catch up with or overtake the leading power of the West. From the start, it was the Western colonization and foreign domination, but in the post the war the industrial strategy of conversion to military power changed to economic prosperity for its own sake. In order to industrialize in a short time, government intervened by drawing up a series of medium-range plans, mobilizing scarce resources, responding to the needs of individual sectors, facilitating foreign trade. In the 1950s and 1960s Japan's intervention included establishing sectoral priorities, mobilizing resources, protection of infant industry, guidance on investment, organizing antirecession cartels, allocation of foreign exchange credits, regulating technological flows, controlling FDI, administrative guidance, and publishing white papers on future industrial structure. From the 1970s attention was turned to trade liberalization to bring down the walls of infant industry protection. The key success in Japan's heavy manufacturing as a route to industrial catch-up was in achieving large economies of scale, improving process technology and investment in new capacity and better process technology. Free access to overseas markets multiplied the returns to scale. Firms were able to import foreign technology on a massive scale. From mid-1970 Japan was structurally transformed from energy-intensive heavy manufacturing to knowledge-intensive information and transformed from latecomer to pioneer.

The International aspect of Japanese industrial policy has many dimensions. Firstly, economic security is of fundamental importance because of the lack of raw materials, its geographic location and the trauma of the post-war experience. The desire for economic security is manifested in the procurement of raw materials, the level of international interdependence, access to export markets and foreign technology, and the overall industrial structure. They may lead to trade-offs between security and efficiency. Secondly, Japan is the second largest economy with a strong impact on financial markets and capital flows, yet a perception of vulnerability persists. Changes in international money and foreign exchange markets have substantial effects on Japan's domestic economy. Thirdly, the adoption of centralized industrial policy distorts the circulation of vital information by upward flow of information being choked off. Collective interests take priority over those of individuals, and producers over

consumers.

There are a number of hypotheses for the adoption of a centralized industrial policy. Firstly, excessive competition is often cited as a factor behind the dynamism of Japan's private sector, but also gives rise to excess plant capacity, dumping pricing, low profits and distortions in capital and labour allocations, the high fixed cost of permanent employment and heavy debt financing. The root cause can be traced to industrial policy, that by different measures stimulated overinvestment in plant capacity leading to excessive capital investment and excessive competition. Secondly, specialists in Japanese management ascribe the cause of excessive competition to the market share maximization strategy adopted by Japanese corporations. This theory suggests that for Japanese companies market share is its top strategic priority. Thirdly, with falling average costs of production, profit is maximized by expanding output and market share.

The Japanese government considers the market mechanism (technological innovation, rises in productivity, motivation to hard work, material well-being, socioeconomic infrastructure, and democracy) to be the main engine of economic growth and industrial development. MITI's 1981-2000 objectives were: shifting industrial structure from energy-intensive to knowledge-intensive technology, creation of a stable business environment, reaching state of the art high tech R&D, improving efficiency and productivity, improving the quality of life, ensuring economic security, and the integration of Japan's economy into the international economic system. MITI's market performing methods of intervention are based on the concept of the industrial life cycle as a basis for determining the appropriate level of state intervention. Here government intervenes in early and late stages in the industrial life cycle, in the opposite direction to the level of growth in demand. In a characterization of Japanese and USA policy, the USA is found to be more active in national security, antitrust, and protection of declining industries, while Japanese policy is oriented towards development, world competitiveness, efficiency, flexible adaptation, and the pursuit of national interests.

2.2 Industrial Policy Instruments for High Technology

US companies dominated during the last quarter of the twentieth century the high tech field: semiconductor, computers, aerospace, telecommunications, new material, and biotechnology. Most innovative breakthroughs gave birth to new US industries: microprocessor, digital switching equipment, fibre optic, nuclear fission, DNA. Leading companies are Americans: IBM, AT&T, and Boeing. Until the late 1960s American companies also still dominated the old-line manufacturing including: steel, automobiles, colour TVs. In 1970 Japanese took over the role in automobile, steel, and consumer electronics which resulted in the US losing its sense of security. High technology became the last bastion of US corporative advantage. But even here Japan made

progress (semiconductor) and took a large share of the market in the 1980s. Parts of the success can be attributed to MITI industrial policy for high technology by industrial targeting, infant industry protection, control over FDI, access to cheaper capital, excessive competition, R&D subsidies and dumping prices. Although small, innovative and market driven firms in Silicon Valley, operating without government support and protection, have survived in competition against Japan. Japanese industrial policy is given credit for the effective formula of combining: restraint, selective intervention, and respect for the discipline of market forces.

In the rest of this section Okimoto examines the concrete policy measures that MITI choose to administrate. High technology differs from smokestack industry, but they share some characteristics like the upgrading of process technology and continuous improvement. The two, however, differ by the scope of technological change, uncertainties, risks, the cost of R&D, the length of product life cycles, and the structure of industrial organization. Semiconductor companies spend 20% of their revenue on R&D, old lines industries only 3%. The US industrial structure has benefited from a heterogeneous structure, the Japanese from vertical integration and less innovation. For firms to meet challenging functional requirements, government requisites must be met to create a supportive business environment to achieve world competitiveness in high technology. Sound macroeconomic policies (low inflation, stable exchange rates, and sound fiscal management) are essential to the creation of healthy high tech sectors. Government must find ways to support basic research. R&D can be promoted by tax incentives, organizing cooperative projects and transferring technology. Public education and vocational training are state responsibilities. Government can also play a role in international trade. The Japanese government has felt the responsibility for: demand stimulation, technology push, and trade mediation enhancing industries competitiveness.

The policy instruments, with respect to the development of Japans high technology sector, are grouped into three categories: technology push, other facilitating measures, and demand pull. Unlike the US, Japan concentrates on commercial (non-defence) R&D. The cost effectiveness of R&D is important. Defence-related R&D had little spill-over relative to the size of R&D before WWII, but changed after it. Commercial R&D has increased resulting in new industries: semiconductors, computers, supercomputers, telecom and others. In order to be at the frontier of innovation, Japan's government managed to improve the synergic relation between corporations, universities and government by successfully organizing a series of national research projects. The focus has been on basic and pre-commercial technologies. The common characteristics of the projects include the development of pre-commercial prototype products, long gestation periods, high uncertainties and risks, heavy capital outlays, economies of scale in research and projects with commercial utility across an array of industries. A key

functional requisite of high technology is sustained high levels of capital investment. As part of its technology push policy the Japanese government made low cost capital available through the Fiscal Investment and Loan Program (FILP). Government subsidies for national projects are grouped into two periods: the era of catch-up 1970-79 and the period of development 1980-90. The USA and European governments also subsidize research. Japan's subsidy programs are not abnormal but more effective.

Among other policy instruments worth mentioning are tax policies, antitrust and administrative guidance. Tax policy is the most readily available instrument offering special encouragement to priority industries, through zero-sum reallocation, with no negative effects on budget. In the US tax policies include: tax provision to high tech related R&D, capital gains, investment credit, accelerated depreciation allowances, all of which are unevenly distributed among sectors. In Japan tax policy is more evenly distributed with less preferential treatment among industrial sectors and less distortion. Unlike in the US, antitrust is not considered as part of Japan's industrial policy tools. In Japan national projects are not limited to single companies and the level of market concentration is low, cooperation and collaboration in research are not restricted. Administrative guidance is a unique Japanese industrial instrument. It is in the form of informal guidance by MITI and other ministries to specific industries to avoid short term problems that threaten to harm collective interest. It is an important tool as fine-tuning during high-speed growth. Conditions for effective guidance and industry location played an important role.

Demand pull is given greater weight than demand push. Because of small military expenditure demand pull is limited in Japan. The available instruments included home market protection, buy-national programs, export promotion, import protection, and aggregate demand policies. They might have distortion and negative long term effects. Home market protection against foreign competition and through the imposition of formal import duties, quotas, restriction of FDI, and non-tariff barriers are among other instruments used. Companies helped in preventing takeovers through stock-securing manoeuvres, and limited sales of foreign-made intermediate goods in Japan.

In sum the Japanese industrial policy instruments for high technology, that is MITI prescription for industrial policy, are fairly standard. The formula can be broken down into three elements: technology push, demand pull, and other facilitating measures. The emphasis, however, has been placed on: technology push, national research projects, R&D subsidies, support for basic research, and technology diffusion. All other countries have used these policy measures but are less successful. MITI's success is attributed to altering the mix of successful old-line industrial policy instruments that fit the functional requisites of high technology. MITI managed to fine-tune market intervention to match the circumstances and goals of specific industries. The absence of certain policy instruments in Japanese industrial policy, such as large defence procurement

which extensive state ownership of corporate stocks, state investment in new venture activities, elsewhere resulted in economic inefficiency and political pitfalls. Unlike in France and the USA, Japan did not target one or two national champions (prestige projects like French Concorde, US missile defence in space with limited commercial value) to support, but rather allowed competition among firms to enhance their international competitiveness, efficiency and commercial opportunities. Another selection omission in Japanese policy is refusal of support to textile, steel and automobile producers in the form of protection against foreign imports. The excess plant capacity in depressed sectors has been scrapped. The analysis suggests that that policy measures in themselves are not the sole factors determining the success or failure of industrial policy. The selection of sound measures may be necessary but not sufficient conditions for an effective industrial policy. Effectiveness depends on the characteristics of the market organization and the structure of political institutions and the tradition of close government-business relations to solve rather than create problems.

2.3 MITI and the Japanese Industrial Organization

This section is an analysis of the Japanese industrial organization and relations between MITI and business. Okimoto focuses on organizational characteristics that make MITI effective. A number of factors explain why the interaction of Japanese industrial organization with MITI has been constructive. MITI's power is explained by the ruling LDP. It has permitted MITI to oversee the operation of manufacturing and service sectors. Another reason for MITI's power is the quality of its higher civil servants coming from the cream of the college crop passing the Higher Civil Servant Examination. A third factor is the comprehensiveness of its administrative jurisdiction and the cohesiveness of MITI's internal organization. MITI has managed to transform a near-monopoly of authority into an effective tool for industrial policy. MITI's effectiveness depends on its capacity to work in harmony with the private sector and its internal structure and dynamism of the private sector and distinctive features of Japanese industrial organizations.

The factors facilitating MITI's task include: the efficiency and competitiveness of the private sector, enterprise unions and the weakness of organized labour, a single minded focus on Japanese corporations, subcontracting and subsidiary networks, keiretsu grouping, inter-corporate stockholdings, high market concentration, highly leverages corporate financing, close bank-business relations, and intermediate public-private sector organizations. Unlike in Europe the labour in Japan is organized vertically within companies, not horizontally across companies, with little influence on the political decision making or representation on corporate boards. The capacity of labour and

management to deal with each other has led to job security, generous income rises and a low level of strikes, avoiding inflation-unemployment problems, and MITI's ability to reduce surplus plant capacity. Another feature of the Japanese private enterprise is to stick to their core businesses within a single clearly defined industry in which they were established. The career-long employment labour market explains the lack of mobility of labour and interest for diversification of business activities. The industrial organization is characterized by the small presence of foreign manufacturers in Japan making MITI's role easy.

Japan's dual structure economy consisted of a small number of large parent corporations connected to a honeycomb of small and medium-sized subcontractors and subsidiaries with close ties involving equity ownership, transfer of technology and business transactions. The subcontracting system offers advantages in the form of cost reductions, semi-customized production and flexibility to ride through business cycles by shifting the risk of demand fluctuations. The large networks create favourable conditions for administration of the industrial policy. The Japanese industrial groupings of Keiretsu bring companies together in loose affiliation based on: pre-war conglomerates, financial ties, or vertical integration. The Keiretsu membership means extensive stockholdings, reliance on the main keiretsu bank, and extensive business transactions. The costs of Keiretsu are in the form of high concentration, antitrust and collusion. It is rather difficult for foreign firms to acquire Japanese companies, and lower cost not sufficient for market penetration, the risk of excess capacity, overproduction, and excessive competition exists. Signs of change are in the form of shift in R&D from large to smaller firms and increased intra-Keiretsu competition. Another is the financial deregulation following the ballooning secondary market for deficit covering and foreign pressure to lift financial controls.

In the US and UK, with their highly developed financial market state, is constraint in intervention, but in France and Japan where capital is channelled through banks the state can influence the financial operation of the economy by rationing the credit supply to banks. The state share of industrial financing in Japan has been falling and the private sector increasing. MITI has still a strong position in allocation of credits in an environment where industries cooperate. MITI draws on a combination of resources: superior information, economic logic, long term vision, mediation and coordination capacity, to safeguard collective and national interests.

The multiple access point of MITI to the marketplace include: subcontracting channels of vertical communication via networks, horizontal forms through keiretsu groupings, big corporation leaders, industrial associations, inter-corporate stockholdings, funds in fiscal investment and loan programs, public financial institutions, determination of the interest rate, high bank dependency and favourable policies, banks influence on private corporations, powerful trading companies, and public corporations. Despite multiple

access points, the Japanese state has exercised self-restraint. The evidence is: a high level of market competition, an effective organizational mechanism, private sector capacity, and the low cost of unnecessary interventions. The intermediate organization linking public and private sectors together is an important factor in explaining Japan's capacity for government-business coordination. Formal and informal networks served as policy networks. There are 112 quasi-governmental and thousands of quasi-nongovernmental and mixed public-private intermediate organizations playing a role in the Japanese economy.

The secrets of the comparative effectiveness of Japanese industrial policy are found in the characteristics of its industrial organization and government-business cooperation. Three spheres of ties have been analyzed: (i) bureaucratic institutions, especially MITI and regulated financial systems, (ii) the weakness of organized labour, subcontracting and Keiretsu, (iii) intermediate organizations like public corporations, industrial associations, business federations, and informal networks. These work as pillars of the dual administrative structure supporting interventions when necessary. Characteristics shared with other countries include: strong central bureaucracy (France, UK), extensive financial regulations (France), blurred boundaries between public and private sectors (Germany), and high market concentration (Italy, France). Distinctively Japanese characteristics include: MITI and its internal organization, Capital market, Labour, the mutual dependence of state and society, far-reaching inter-penetration of market and organization, society and values, and interaction and combination of the above. The blend of all the characteristics creates the dynamic, interactive chemistry of the whole that makes the Japanese political economy distinctive.

In summary, the assessment pointed out that in general the impact of industrial policy on economic performance has been mixed. There might be short term gains from policy, but also long term economic inefficiency. This applies to Japan as well but mostly politicized sectors outside MITI's jurisdiction (agriculture and food processing). Policy instruments of demand pull and technology push do not differ from those of other countries, but the mix differs. Japan, in achieving its high technology goals, emphasized technology push through mechanisms like administering national research projects and less on direct demand pull through public procurements. MITI's strong organization, capacity, administrative power and network made its influence and policy strategy possible. In comparative perspective, MITI industrial policy has emerged from a distinctive set of regime characteristics including: a long period of LDP domination, the weakness of labour based political parties, and a low defence burden. The characteristics above were necessary but not sufficient conditions for the Japanese success in its industrial policy. Structural and socio-cultural factors must be included in the analysis, in particular, the Japanese industrial organization, distinctive societal characteristics, and the Japanese cultural values.

2.4 Japanese Experience in Technology³

Minami et al. (1995) studied the economic growth, industrialization and technological progress of Japan. The process is divided into a number of periods. During the Pre-War period Japan went through a transition period in 1868-1886, and thereafter commenced modern economic growth. In the pre-war period it had relatively high economic growth and low population growth. Growth in GNP 1889-1938 was 3.2% and growth in population only 1.1%. The high level and acceleration in growth is explained by steady technological progress and capital accumulation by an increasing trend in its investment rate. The engine of the growth in the Japanese economy is: investment activities accompanied by technological progress borrowed from the West which contributed to expanding production capacity and demand for capital goods using new technologies. The economic growth changed the structure of the economy. From 1888 to 1938 the GDP share of the primary sector decreased from 41.5% to 15.9%, and the share of manufacturing, construction and public utilities increased from 58.5% to 84.1%.

During the Post-War period, the reconstruction of the economy lasted from 1945 until 1955 and thereafter economic growth began to surge. In the 1960s the annual investment rate, R&D investment, adaptation of imported technologies and technological progress was high and the growth rate was close to 10%. From 1955 to 1970 the primary sector share of GDP declined from 16.7% to 5.9% and the non-primary share increased from 83.3% to 94.1%. The rate of growth in heavy manufacturing was 15.1% in 1956-1970. At the end of the 1960s there was a decline in the rate of technical progress and in its growth rate to 3-5% until 1990. Japan's growth performance was accounted for by two factors of rapid technological progress in manufacturing due to increased R&D spending, 3% of GDP, and high levels of investment, 30.4% in 1987-1991 (18% US). Between 1970 and 1987 the structure of industry changed further. The GDP share of the non-primary sector increased from 94.1% to 97.2% but was a more service-oriented economy. After 1970 there was a rapid growth in Japan's FDI and transfer of its technology. The GDP share of FDI reached 1.63% in 1990 (US 0.61%).

Channels for the transfer of (imported) technologies are: FDI, licensing, consultancy, technical agreements, turnkey plants and projects contracts, reverse engineering, flows of public technological information, person-embodied transfer, and trade in capital goods. Licensing and technical agreements and reverse engineering are the most important sources of technology transfer. During the pre-war period Japan had a large population and low capital intensive production technology. Western technology was

³ This section is a brief review of Minami et al. (1995). Only aspects of general character suitable for this report are discussed here.

capital intensive and labour saving. The imported technology had to be adopted. Serious efforts were made to modify and adjust the original designs to adopt it to the Japanese economic condition. Multi-shift working practice was used to lower the unit capital cost. Government gave financial support to training in the application of technologies and the development of the capital goods sector. During the pre-war period R&D activities were mainly in agriculture and industrial development projects. Japan, in its trade in technology, has been a net exporter of technology to developing countries, but a net importer from developed countries. The life time employment and on-the-job-training has resulted in the storage of knowledge and learning-by-doing with positive returns.

The conditions for Technological Development include several factors that have contributed to Japan's success in technology and its technological development. Firstly, human resources: the growing number of innovative entrepreneurs to experiment and take risks, engineers and technicians to adopt for local use and high-quality workers are indispensable elements in Japan's technological development. Japan invested in the supply of engineers and scientists with a close interaction between product designers and production engineers. The number of engineers increased from 118000 in 1965 to 505000 in 1991 – the highest rate per capita. Secondly, information networks: the governments played an important role in collecting information on technology and disseminating it to subsidiary enterprises. Such a role has gradually been taken over by private firms, where firms send their top engineers abroad to investigate promising technologies. Domestic exhibitions were promoted to enhance product quality, know-how and the diffusion of technological information. The formation of enterprise groups with well-developed sub-contracting systems played a role in the diffusion of information and the development of Japan's industrial organizations. Thirdly, the role of government: government has contributed to the infrastructure for technological development and policies supportive of technology. The infrastructure included the education system, human capital, information, and transportation networks. Fourthly, Japanese technology is in transition where the international and domestic circumstances for technical progress are changing. These changes and the globalization of the economy might adversely affect Japan's technological development.

Concluding reflections on lessons from the Japanese experience are as follows. Firstly, technological progress and high levels of investment has been integral parts of the process of economic development in Japan involving the acquisition of foreign technology, adaptation and improvement, and development of its own competitive technologies. Secondly, the successful transfer of technology requires the technological capability of the receiving firms. Government played a role in facilitating the process of accumulating human capital and providing institutional infrastructure to master transferred technologies. Thirdly, incremental, adaptive innovation: the process of learning and assimilating foreign technology (catch up) is a long and active process.

Technological development in Japan focused on adaptive innovation with an incremental improvement and modification of borrowed technology. Fourthly, in emphasising the application of technologies, Japan has been successful in translating market data into a product concept demanded by consumers. Fifthly, Japan's inter-firm collaboration on sharing technological resources and information made technology transfer within industry easier between large and small subcontractors. Sixthly, government support, in the form of the establishment of a strong technological base and the promotion of entrepreneurial initiatives to develop and apply new technologies, has been crucial. Finally, in the new era, technological change is fast and product life cycle shorter. Direct negotiation between entrepreneurs with minimal bureaucratic intervention is a prerequisite for the transfer of technology.

3. THE PATH OF KOREAN INDUSTRIALIZATION⁴

In this section the process of industrialization in Korea is reviewed. The focus is on the general path of Korea's modernization and the concept of Korea's new innovation-based strategy. We describe Korea's environment and its implications for science, technology and innovation policy by summarizing the development in the post-war period. In parallel scientific, technological and primary institutions and resources for innovation are evaluated. The changing environment is discussed and its impacts reflected in the shifting strategies.

3.1 The Path of Korea's Modernization

Branscomb and Kim (1996) present a comprehensive collection that addresses the importance of Korean innovation and its roots in the scientific and technological capacities of the country to realize a vision of Korean growth and development. It is an assessment of the assets, institutions, and policies needed to master an innovation-based development strategy. The collection is the product of a cooperative agreement between several Science and Technology Policy and universities. The collection consists of several parts including: an overview of challenges at the Turning Point, the path of modernization, Korea's international environment, the innovation triangle, shifting strategies, the promotion of the culture of science and innovation, the role of universities, public laboratories and examples of development models. The importance and needs of public laboratories is further emphasized in Choi and Lee (1996).

The conception of Korea's new innovation-based strategy must rest on four kinds of analysis: (i) anticipated trends in innovation, the state of science and engineering,

⁴ Most parts of this chapter consist of a brief review of the collection by Branscomb and Kim (1996). Only aspects of general character suitable for this report are discussed here.

changes in the global economic environment, (ii) reflecting on past experience with S&T policy and institutional development, (iii) reassessing the current capacity, structure and policy, and (iv) analyzing the successes and failures of other nations with similar goals. Part I of this collection examines Korea's environment and its implications for science, technology and innovation policy by summarizing developments from 1960s to 1980s. Part II evaluates Korean scientific and technological resources for innovation including primary institutions for developing personal and basic technical knowledge. Part III looks at other national models like Japan, to draw lessons for charting its own future. Other examples are Sweden, Switzerland, Netherlands, Taiwan and Brazil. Part IV builds on an innovation-based model based on strong international linkages and a more mature infrastructure relying on info technology and communication networks. Part V presents the conclusions on a comprehensive, integrated, technology based innovation strategy suggesting organizational arrangements for the government and investment policies.

In the view of Branscomb and Choi (1996a, 1996b) Korea is committed to technology-based innovation as the primary source of its economic and social development in the new millennium. The policies, institutions and talents face transformation to realize the goals of bringing the nation's economic and social development to the level of the members of the G7 group early in the 21st century. In the early 1990s Korea was ranked differently by its competitiveness (18), trade (11), basic science (25), and science and technology capacity (13). However, the rapid growth in GDP/capita from \$300 in 1955 to more than \$15,000 in 2005 been a source of admiration. Positive factors to the changes in development strategy are: cheap and disciplined labour, nationally managed allocation of capital, imported technology and tools, and imported higher education in science and engineering, and the emergence of a more democratic political system creating conditions for creativity, entrepreneurship, efficiency and competition. The difficulties are continuous high dependence on foreign institutions for the education of its scientific and technical leadership, an economy skewed toward large corporations, dependence on the import of technology (20% of R&D) and tools to implement them. SMEs are weak compared to competitors like the Taiwanese. Korea's government still has a heavy hand in guiding the economy.

Science-based innovation and innovation-based strategy for development has become a path to development. The challenges are: (i) the high standard pace of competitive progress, (ii) Science has become a more managed process by improved education and cooperation, (iii) Science leads to new products and industries and (iv) Science reduces the risk of making mistakes, (v) the industrial ecology is acknowledged to minimize waste, (vi) the tools of industrial economics are growing more complex, (vii) customer satisfaction requires integrated product and services as competitive advantage, and (viii) the level of technical and information infrastructure is another challenge. The

components of the national capability necessary for a science-based innovation are: (i) intellectual and human capital including well-supported research-based universities as a primary source of S&T, (ii) Economic and business capital including a strong transportation, financial and information infrastructure, market-oriented national industrial policy, managerial culture, firm alliances for technology access, (iii) an innovation friendly culture and respect for technicians, and (iv) social capital with a strong capacity for S&T policy analysis, institutional and political maturity, political leadership to support common public-private interests.

In his study of the path to modernization of Korea, Choi (1996) states that, during 1962-1992 the GNP increased on average with 9% per year. The per capita GNP grew from \$87 to \$6,749. Export volume increased from \$40 million to \$66,500 million. The export share of manufacturing increased from 14.3% to 96%. Korea has become a member of the Newly Industrialized Economies (NIEs). This chapter reviews the policies of S&T pursued by successive governments in this period divided according to the eras of the presidents: Park (1962-1979), Chun (1980-1987) and Roh (1988-1992).

The Park Chung-Hee era, 1962-1979: The military regime of General Park seized power, with economic recovery and development as the first priority. The government initiated the first five-year plan (1962-1966) for economic development. The plan lacked a clear development strategy, until the export-oriented strategy was established. The second five-year (1967-1971) plan was also based on import substitution, the promotion of export and import of capital, technology and raw material produced by low cost labour. The policy was successful at the time of expanding international trade. Investment in S&T increased in the form of: the establishment of the Ministry of Science and Technology (MOST), the Economic Planning Board (EPB), the Korean Institute for Science and Technology (KIST), and other government funded research institutes. Korea Advanced Institute of Science (KAIST) special graduate school in science and engineering in 1971 was established. Many privileges were provided to the students and faculty members to facilitate the return of Koreans from abroad. In 1972 the fledgling democracy was replaced by dictatorship. More activist industrial policy was implemented with emphasis on heavy and chemical industries and considered steel, petroleum, shipbuilding, machinery, mining and electronics as strategic industries to upgrade the industrial structure and to strengthen the defence capacity. Provision of exemption to such industries and support to expand the import of industrial technologies was promoted. Gradually by 1978 various forms of restriction on the importation of technology as part of the liberalization process were removed.

The Chun Doo-Hwan era, 1980-1987: In October 1979, following the assassination of President Park, the leadership was seized by General Chun. The Committee for National Security Planning was established with political, social and S&T reforms. The economy was adversely affected by inflation, the oil crisis, increased international protectionism,

and concentration of economic power. The focus was directed to international competitiveness. Policies for technology development were developed including: tax incentives, preferential financing, the expansion of exemptions for researchers from military services, the provision of venture capital, the adoption of technology credit guarantee system, concentrated support for SME firms, and support for formation of R&D consortia for industrial development. These resulted in the establishment of private research institutes increasing civilian investment in technological development. The import of foreign technology and FDI was liberalized. Despite an expansion in skill capacity, the supply was insufficient to meet the quantitative and qualitative demands of the 1980s. The policy resulted in an increase in investment in S&T. There was an opportunity of taking advantage of 3 lows (low oil price, low inflation and a low exchange rate) in the mid 1980s and a trade surplus to improve innovation and human capital development.

The Roh Tae-Woo era, 1988-1992: In his election campaign he promised to increase investment in S&T to 3% of GNP by 1991 and gradually to 5% as a target. It was welcomed by the S&T community. The increased internal demand for political and social reforms and the external demand for openness led to a decline in manufacturing competitiveness. New directions for S&T policies were announced in 1990 with the goal of Korea developing to the level of the group of seven (G7). The symbolic highly advanced national project (G7 project) was launched in 1992. There were several specialized R&D projects with an emphasis on fusion between S&T and building capabilities for innovation, which promoted basic research. Growing demand for technical infrastructure was not met by Daejeon science town alone. Construction of additional five towns in Pusan, Taegu, Chonju, Kangneung, and Kwanju was planned and implemented which might have affected the strong development of the information technology industry in Korea. The policy was in general successful in the short-term and mid-term perspective.

In summary, Branscomb and Choi's evaluation of the past 30 years is as follows. The export-oriented growth strategy is responsible for the fattening of the chaebol due to focus on capital-intensive and high-tech intensive industries contributing to weakening SMEs and technological fragility. The industry is highly dependent on Japanese intermediate and capital material, investment in human capital is small and has quality problems, the importance of an information infrastructure to stimulate innovation and productivity is not fully realized. Government investment in S&T is small and not accumulating sufficiently. The consistency, coherence, and credibility of science, technology and innovation policies are important problems to be solved as soon as possible by the government. The rapid turnover in ministers of S&T suggests inconsistency and the declining credibility of the government. Changes in economy, trade and international conditions suggest a more decentralized S&T policy, more direct,

more demand-oriented industrial development policy for Korea.

3.2 Koreas Changing Environment

The new International Environment of the Korean manufacturing is overviewed by Kim and Kim (1996). The competitive and collaborative environment has changed. Korea has been a member of OECD since 1996. The followership strategy is changed. Some segments need to develop and implement leadership strategies like in semiconductors. Kim and Kim deal with the international environment and are of the view that Korea must face these changes. Five categories of the changing international environment facing Korea are: (i) the economic liberalization of many developing countries, (ii) the resurgence of national technological capabilities, (iii) a shift from international trade and multilateralism to regionalism and bilateralism, (iv) the increasing need for regulatory harmonization between countries as a global economy, and (v) increasing political uncertainties in the North East Asian region. In East Asia, Japan is an economic superpower, China has successfully engineered the shift from a centrally-planned economic system to a quasi-market based system maintaining the political system intact. Vietnam and Laos are transforming their economies. Korea faces new tariffs and quantitative restrictions and regimes, new environment and health regulations, needs to update its technology-related regulatory frameworks and must protect welfare while complying with the demands from other nations. Since 1987 Korea has agreed to protect Intellectual Property Rights. The linkages between trade and environment and between trade and labour standards are highly contentious items in bilateral trade negotiations. Regional trade agreements influence more than 50% of world trade, affecting the relocation of production from non-members to members.

Among the changes that Korea faces 4 patterns stand out: (i) an increase in FDI to developing countries in general and those to Korea in particular, (ii) a growing trend in intra-East Asian FDI flows, (iii) the increasing importance of overseas Chinese as a source of intra-East Asian FDI flows, and (iv) the importance of China as the main destination of such capital flow. Japan is the largest investor in South East Asia. Korea's FDI outflow is to China and Vietnam. Increasing wages in Korea and the elimination of regulations are the factors causing outflow of FDI. Increased protection of intellectual property should lead to more innovations and increased economic activity including trade, FDI and flows of technology. It provides incentives for Korea to invest resources in technological innovation. A weak protection practice weakens access to foreign technologies and deters local innovation. Industrial standards are important for 4 reasons: (i) an increasingly integrated world market threatening national control, (ii) an increased awareness among countries about their competitiveness, (iii) the growth of competition within information industries and (iv) an increase in environmental

concerns.

In their conclusions Kim and Kim state that Korea is chasing a moving target, in achieving the G7 goal. The international environment is changing as well. The new trading system is in the favour of Korea. The opening up of China, Vietnam and other Asian states to Korean investment and strategic alliances and the continuous inflow of technology from industrialized countries are positive elements. The problem is that some sectors advance more rapidly than others. Policy should place more emphasis on building a strong technological base for indigenous economic development, on creating conditions for high innovation rate, and on lower bureaucratic controls.

In a related study Kim and Lee (1996) study the innovation triangle discussing the stimulation of innovation in private and public enterprises. For each car made 30% and for each notebook 70% of total technology cost is paid out in royalties to the foreign producers.⁵ The R&D investment for Koreans big three automobile (Hyundai, Kia and Daewoo) is low, only 6.2% of the US big three and 10.7% of the Japanese big three. The Korean cost competitiveness vis-a-vis Chinese and South East Asian competitors is declining. Although, the combined assault from the cost, quality and brand-name ends of the product has not squeezed Korean firms out of the global market, firms can no more count on support for trade agreement reasons. Technology is the only way to restore Korea's competitiveness. This chapter explores how competitiveness can be improved through understanding the innovation triangle: the interplay between technology, market conditions and government policy. The conclusion is that the role of market competition as the primary driver of technological innovation should be emphasized as a response to growing liberalization and global trade.

There are five phases that a country must undergo to improve their technological infrastructure: (i) the import and implementation of foreign technologies (know-what), (ii) assimilation and reverse engineering (know-how), (iii) modifying technology to local and international needs (know-why), (iv) increased R&D investment, cooperation and development of technology capability, (v) a deepening of firms' R&D and carrying out collaborative and strategic research with foreign technology support institutions (TSI). Government must determine the technology development status before it forms policy to stimulate innovation. The innovation triangle of technology push (technological pressure on the firms), market pull (firms strategic intension to meet market competition) and government policies (incentive and support policies to firms to develop technological capabilities) are important to TSI/Government-Firm relationships and innovativeness. A gradual transition from proactive to reactive support is such that

⁵ The situation in several industrial sectors has changed in recent years. An example is the information and telecommunication sector where Korean multinational corporations such as LG and Samsung have developed their own technology and have had exceptional growth and success both in the national and international markets.

the policy first promotes growth by direct intervention to promote technological capabilities, innovation and self-sufficient competitiveness and then subsidies and import barriers are taken away. A successful combination of supply-demand policy instruments are needed to create or shift comparative advantages to create a niche for the domestic economy.

Korean firms developed a standardized formula under protection from superior foreign competition to acquire the technology they needed. After adaptation and improvement of foreign technology, firms develop their own products and move on to innovation. Korean companies are globally competitive in product management. The combination of adverse environmental factors with cost increasing effects have meant that Korean firms need a new competitive advantage based on technology enabling them to make radical innovations.

Kim and Lee as general policy recommendations suggest recapping the primary principles of a reactive policy regime to focus on competition and liberalization. A reactive policy regime should eliminate tax and other financial subsidies, promote exports, and other types of innovation which promote technology. Cooperation and the sharing of information must be promoted by promoting strategic alliances with domestic and international competitors. Another measure is the reduction of bureaucratic red tape and regulations. Regulation in the financial system should be reduced. Interest rates are controlled and differential rates are used to promote policy goals. The state can promote R&D by making it fully tax deductible and providing low interest financing and simplifying the oppressive regulations in the form of paper work and complicated application procedures. Alternative investment vehicles that are speculative and no-productive (real estate) are discouraged. Intellectual property rights must be better enforced to allow the appropriation of R&D efforts. The government should continue its role as a market for new products and services to reduce the market risk for R&D. The risks facing firms are associated with development and the market. Another measure is to try to manipulate the fierce competition among triad companies to gain strategic advantages in acquiring the technology they need and to take advantage of undercapitalized, small, or venture capital-financed triad companies to buy or to take control of small, but technologically sophisticated firms abroad. In sum, the government should not do for firms what they should do for themselves. The government should direct its efforts to promote R&D activities.

3.3 Shifting Strategies of Korea

Analyzed the shifting strategies of Korea from cost advantage to superior values is presented in Kim K-D. (1996). From the 1960s until now the development strategy has worked. Korea is facing domestic and foreign competition. This chapter reviews the

development strategy since the 1980s. It describes an alternative strategy that shifts from factor and investment-driven development to an innovation-based economy, discusses internal and external obstacles and examines how the new strategy affects specific industries. The economic development is divided into three periods: (i) 1962-72 periods of export-led growth strategy, (ii) 1973-1981 periods of heavy and chemical industry drives, and (iii) 1982-1992 periods of stabilization and liberalization to promote competition and efficiency. The pre-crisis 1993-1997 and the post-crisis 1998 onwards are two additional development periods. In sum, since the 1980s, Korea has rapidly modernized its industrial structure by promoting capital investment and technology development and a policy to adjust towards high value-added and technology intensive products. Government interventions have been reduced, the economy has become more liberal and open. Technology intensive industries have become more important. Increased wages have deteriorated the firms' competitiveness.

The recent years of changes have led to the search for a new strategy. Korean firms are usually small relative to the world market and rely on foreign technology. The combination of increased unit labour cost and exchange rate exceeded the labour productivity undermining international competitiveness. The vicious spiral of wage and living expenses is linked to housing costs. The new strategy should be centered on the acceleration of innovation to increase productivity and to give competitive advantage. This will depend on the capability in development of S&T. There is a shift in policy from factor-driven and investment-driven development to a more innovation-driven economy. Promotion of S&T innovation and cooperation between SMEs and large firms will strengthen competitiveness and growth. R&D investment may narrow the gap in labour productivity compared to Japanese manufacturing. The growth strategy of firms should include: technology development, globalization and diversification. In sum Korean firms must develop their own sources of technology through R&D investment, SMEs and alliances.

Park and Kim (1996) have reviewed the history of S&T development and identified problems to be addressed, to gain awareness of the importance of technological innovation and how to promote an innovative culture. Two features are identified: the internal development of S&T was not strongly encouraged, and the lack of contact with western thinking until the 17th century, when China and Japan were favoured. Korea had capacity for innovations but its capacity developed in printing, astronomy, medicine and warship building. The introduction of western science and technologies into Korea was later and indirect. There were no science and engineering departments at Seoul National University until 1941. After the liberation in 1945, modern S&T had to be built from scratch. The government influenced S&T through education, employment and funding. Public awareness about the value of science and technical innovation rather than reforms has increased. The new environment would demand continuous innovation for

Korea's survival. The Korea Science Foundation (KSF) was established in 1967 to focus on cultivating scientific interests among young people. In 1993 four studies were commissioned: plans to promote S&T culture, how to develop young people's value, the historical heritage focusing on S&T, and how to publicize scientists from Korean history. International cooperation was enhanced. In sum neither government, industry, nor the nation as whole has provided an all-out effort to support the development of a scientific and innovative culture. Measures to cultivate an innovative culture are being taken.

In a third study Kim Y-G. (1996) suggests that Korea must depend on its universities as a major source for ideas and trained workers in building an innovation-based economy. The research universities maintain high academic standards but their research capabilities are more limited. Efforts are made to improve university-industry collaboration. In Korea more resources were spent on basic education. Since the 1960s the need for advanced degrees has been recognized. In 1969 only 600 graduate students were enrolled. The M.Sc. and Ph.D. degrees granted increased to 7,502 in 1985. In 1987 there were more than 150 4-year colleges and universities in Korea with total enrolment of more than 100,000 students. From 1965-1985 enrolment increased in undergraduate science and engineering programs from 46,000 to 376,000 and in graduate programs from 900 to 18,000. The expenditure share of research spent at universities was low. The reasons were that the scientists were mainly trained in the US with a focus on basic research and the Korean hierarchical scholarly activity traditions. Gradually industry-university relationship in the form of links and consortia were expanded. The education system has undergone reforms to enhance intellectual capabilities. As industry becomes more active in applied research universities should focus on basic research. The goal was to increase national R&D investment to 4-5% of GDP.

As private research capacity has increased, Lee (1996) reassesses the research capabilities of Korea's public funded laboratories. The public laboratories are national and public testing laboratories, and laboratories affiliated with public enterprises, and government funded laboratories. Increased private investment and performance put pressure on government funded laboratories' (GFL) productivity and efficiency. In response to criticism in 1989 the government gave the administrative Reform Investigation Committee the mandate to oversee the efficiency of the laboratories. The recommendations for increasing innovation from GFLs in response to three basic problems are: to clarify the roles and functions of the laboratories, to define the degree of autonomy necessary for GFLs to innovate efficiently and their relationship to the industry, and to reform the National Administrative System of laboratories to improve internal innovation management, productivity and efficiency. GFLs should be governed.

3.4 Strategic Positioning for Korea's Future Economy

Choi and Branscomb (1996) suggest a new technology-based innovation model for Korea. The Korean S&T policy should be far more than promoting S&T. It should be an efficient policy of innovation and diffusion and of structural policy character. S&T should be integrated with all areas of national policy. Porter suggests that six items determine the national competitive advantages. These include factor conditions, demand conditions, related support conditions, firm strategies and structure, chance events and government. These must be addressed in the Korean national S&T policy. The policy actions for TBI should include incremental and radical innovations. The government role in encouraging TBIs is to suggest the objectives and visions of national development, build upon the national consensus, and establish the basic directions and paradigms for TBIs. After the initial goals and strategies are established, the government should construct a national system of innovation that best suits conditions for Korea to create opportunities to innovate, to strengthen capacities to innovate and to form an environment for innovation. There are three generalized patterns that characterize most western industrial economies: a mission-oriented strategy (US, UK, France), a diffusion-oriented strategy (Germany, Sweden, Switzerland), and a combined strategy (Japan). A dualistic policy and hybrid strategy for Korea is suggested: mission-oriented for the advanced sector and diffusion-oriented for the backward sector.

Chung and Branscomb (1996) analyzed technological transfer and international cooperation. The Korean economy, with its strong export orientation, fostered rapid acquisition of technological capability, globalizing it and laying foundations for changes in the external economic environment. It exposed domestic producers to international competition and gave the opportunity to cooperate with foreign firms. During 1962-1990 Korea obtained 6,944 licenses for imported technologies as a result of policy liberalization. FDI was restricted by government policy. Following the liberalization, FDI increased. The dependency on Japan and the US for trade and technology makes Korea vulnerable. Technological alliances among firms across borders increased. Korea faces a new international order (trade) and institutions. Chaebols globalization efforts signify a shift in Korean economic policy. The effects of the WTO system on the Korean economy differ by industries and the nature of their external relations. Korea has to decide where it stands between the developed or developing world.⁶ The new policy from 1994 in response to changed international environment placed top policy priority on globalizing the national economy. The elements of the new policy are gaining competitive advantage, raising innovative creativity, playing an active role in international cooperation, and changing its role as a latecomer in S&T. In recent studies it is found that technology valuation, organizations and cooperation between

⁶ The rapid and strong development of several industrial sectors in Korea, including information and communication technology, computer, automobile and steel industries, suggest that Korea has chosen to belong to the developed nations and compete on high tech technologies and high value products and services at a global level.

universities and corporations are important to the commercialization and transfer of technology (Heshmati, Sohn and Kim, 2007).

Lee and Branscomb (1996) studied Korean information technology, its status and policy implications. Information technology started to build up in the early 1980s. Its rapid growth will have strong effects on the Korean industrial and capability development. The information industry consists of: hardware, telecommunication services, computing services and enhanced communications sub-sectors. The industry growth rate of exports was very high. Government has been responsive in its policy to the importance of the information industry. The ministry of information and communication (MIC) industry policy objectives were to create an information society, promote its strategic development, strengthen industry competitiveness, enhance R&D, promote new media, and to improve Korea's global information infrastructure. A research team from the Federation of Korean Information Industries (FKII) undertook a deep analysis of the industry. The information industry is found to be a key strategic, national industry for the new century. Government and business must cooperate and refrain from negative competition practices. In order to enjoy the success and benefits of the new information age, efforts should be made towards advancing the information industry and information society. Korea enjoys full connectivity and the successful multinational corporations like LG and Samsung are a result of Korea's information technology policy.

Choi (1996), in a summary of the path of industrialization of Korea, presents the following conclusions on the road to innovation-led Korea. It is accepted that science-based technology and technology-induced innovation will derive future industrial competitiveness. A national system of innovation supports industrial productivity and growth, welfare and security. S&T capabilities determine the nation's capacity for innovation and development. S&T must be integrated in the structural policy. Increased international competition and new global technology and economic order offer special challenges as well as opportunities for Korea's industrial development. A National Forum on scientific and technological goals must be established to enhance innovation commitment. The globalization of economic and technological activities offers both challenges and opportunities requiring a higher technical competitiveness. The limited domestic resources can be strengthened by strategic alliances, the establishment of subsidiaries and joint ventures, the openness of the Korean market and the security of intellectual property rights.

In short Choi suggests that Korea must adopt a multi-channel knowledge acquisition approach in obtaining new technology from external sources. This involves: increased investment in education to correct for insufficient and inappropriate past investments and to minimize state control and interventions in the administration of universities; expanding the supply of skilled workers and vocational training; and introducing more science and technology in basic education. Other measure include expanding public and

private R&D investments, to give priority to the improvement of conditions for SME R&D activities, to open the domestic market and to make FDI friendly. Competition and cooperation should be harmonized. A high rate of productivity can be achieved in order to profit from innovation. Priority should be given to the information industry. In different ways interest should be fostered in S&T. Administrative bureaucracy and intellectual property rights are a source of concerns for foreign firms in Korea. In order to keep up with the new challenges of global competition, a shift is required involving product innovation capabilities, strengthening capability and the financing of SMEs, and selective liberalization of imports and FDI. The OECD experts came to conclusion that Korea continues to pursue a high-risk, high-growth strategy.

4. OTHER MODELS FOR DEVELOPMENT

Branscomb (1996a) investigates several measures and models that are available to Korea to evaluate alternative strategies for technology-based development. Japan, which developed by leveraging technology from abroad and expanded and exploited its indigenous technical capability to the point of the US and Europe, is a model for developing countries in Asia and a model for Korean S&T policy. Korean S&T development owes a joint debt to Japan and the US. Many Korean institutions are patterned after Japanese models. The Korean rapid development owes much to technology from major Japanese firms in return for high-performance low cost labour. Industrial similarities make the two countries competitors in foreign markets. In the post-war both countries employed an export-oriented policy. The technology policy involved control of FDI, license agreements, access to foreign exchange, and market access for foreign firms. Some differences between Korea and Japan are mainly in the timing of the government S&T structure and institution setups. Korea is still developing its infrastructure to support its industrialized economy.

Branscomb (1996b) suggests that Korea and Taiwan had similar circumstances. They had roots in similar histories, size and culture. Both were occupied by Japan, liberated in WWII, with a low GDP per capita. Both focused on development as a prerequisite to security. Both pursued an economic strategy in which S&T played a major role. Japan became a model for a rapid, export-oriented development strategy, collaborator and competitor. In both countries human development resource was highly valued. There are major differences in economic policy, politics, and institutional development which influence private decisions. The dynamics of SME in Taiwan is more pronounced than in Korea. The focus in Korea is on a national market, rather than the international one in Taiwan. The pattern of export growth in Taiwan was cantered in the SMEs. Taiwan has been more receptive to FDI, especially from Chinese businessmen. Taiwan's SMEs are exploiting the opening up of the mainland. Both countries are evaluating their technical

infrastructure and human resources to keep SMEs strong and competitive. Heshmati (2001) finds growth of micro and small firms important to employment and regional development in Sweden. As expected, growth is negatively related to the age and size of firms. Small and young firms grew faster than large and old firms.

In their review of other innovation-based developments, Branscomb and Ergas (1996) discuss the contrasting models of Brazil and small European countries.⁷ Brazil is a case outside Asia with a strong tradition of industrial policy but is larger and rich in resources. Examples of smaller nations, which are no longer resource-rich in Europe are Sweden, Finland, Switzerland, Netherlands and Belgium. This study examines the value of these five country models for charting Korea's future.⁸ Brazil suffered from political instability and was less inhospitable to FDI and less protective to domestic small service firms. After 1973 it failed in reforms, debt increased, investment reduced, the outflow of capital increased, there was a reliance on domestic resources, and a concentration of capability in institutions rather than in the productive sector. Brazil needs to build technical capability in private sector linked to intellectual resources at universities and institutes. Wages in the small European countries are much higher (\$25) than in US (\$15) and Mexico (\$2). Korea suffers from weakness of social capital in using human and physical capital. In Europe there is a clearly identified function for dealing with S&T and the organization of human capital is different, SMEs play a strong role as the infrastructure for large firms. The industry associations serve provide worker training, industrial extension services, standard settings, and export promotion. Governments provide policy not authority.

5. AN INDUSTRIAL DEVELOPMENT MODEL OF THE KURDISTAN REGION

5.1 The Current Industrial Policy and Institutions

Currently there are no significant studies conducted that describe the general structure or specific sectors of the industries operating in the Federal Region of Kurdistan. This is mainly due to lack of firm register and data on investment and its sources and allocations. However, the KRG is making serious efforts in this direction by financing various public projects to develop industry, although, these projects are mainly in the

⁷ The Lisbon Development Strategy of Europe is compared with the development in the US, Japan and Korea (Heshmati and Oh, 2006). The collected volume edited by Heshmati and Tusch (2007) also investigates globalization, the EU's Lisbon process and the structure of global inequality. The emphasis is among others on the leadership in technology. Lee and Heshmati (2007) elaborate on the micro evidence on dynamics of industrial evolution in the manufacturing industries in Japan and Korea. Heshmati, Sohn and Kim (2007) analyzed recent trends in commercialization and transfer of technology to newly industrialized economies such as China, India, Korea and Vietnam and their impacts on economic growth in these countries.

⁸ Other models for development in developing countries include Singapore, Malaysia, China and some industrial and service sectors in India.

area of service industries. A number of areas where intensive investment programs are in progress are in construction, energy, communication, transportation, food, aviation, media and other service industries targeting foremost household consumption. For more details see the KRG website at: <http://www.krg.org/>.

Air traffic is the most effective means to connect the Kurdistan region with the outside world. Currently there are several Kurdish charter operators which operate between Hawler and several capital cities in Europe and the Middle East. However, there is disparity in the unacceptably high prices charged by the airlines and the poor quality of their services. One can easily see that the objectives of these companies are short term maximization of profit rather than gradually to build up their businesses. They should learn the basics in the business and make investment in training their employees to provide service with high quality. A negligence of this aspect of their operation will certainly soon lead to their exit from the competitive market. Austrian Airlines, as the first regular western airline, has recently started operating the Hawler-Vienna route and it offers connections to other destinations as well. The Royal Jordanian Airline is another scheduled carrier.

The Austrian Airline entry to the market is a significant connection. In addition to high quality service it provides greater opportunities for foreign investors in their efforts to set up business in the region. In this process Hawler serves as the northern gateway to the rest of Iraq. KRG is spending \$300 million on upgrading the Erbil International Airport (EIA). This investment program together with other programs in progress in the area of surface transportation is aimed at transforming the city of Hawler to an important transportation hub in the region, enhancing trade and development in the entire region. It brings the Kurds closer to Europe and passengers are saved from humiliation at the Turkish border and the inhuman checking-in procedure at the Atrosh charter Airlines. The high capacity of the new terminal which is planned to be completed by October 2007 will increase the airport capacity from 166,000 in 2006 to 2.7 millions passengers. With its ideal location and low landing charges it is aimed that EIA will play a strategic role in civil aviation and development in the FRK. The policy makers see Dubai's economic progress and development as a model and wish to strengthen economic ties by forming joint ventures between Dubai and the Kurdistan region.

Currently, there is no tourist industry developed in the FRK. For the neighbouring country Turkey and other countries in the region like Lebanon, tourism is one main source of income and employment for a large share of their populations. The main attractions for tourists in Kurdistan as landlocked area are the mountainous scenery, caves and the archaeological remains. Plans are also under way in cooperation with foreign investors to build a ski resort. It is part of a bigger plan to link tourism in Kurdistan, including the Kurdish areas in the Northeast of Turkey and the Northwest of

Iran. Good business opportunities involving homecoming Kurds from various European cities increases the likelihood of the success of these plans. The KRG tourism promotion programs and religious tolerance in the region are among other factors which help in the development of the tourism industry and encourage Europeans to promote travel to Kurdistan.

Kurdistan, as the only part of Iraq not being entrenched in chaos and danger, enjoys peace and prosperity and is ready for the development of its business relations with the outside world. Its two well functioning airports in Hawler and Suleimany and improving banking sector and other infrastructures is conducive to international investment. The region passed an investment law in July 2006 (KRG, 2006a). The areas of investment include: manufacturing, agriculture, services, health, science and technology, communication and transportation, banks, infrastructure, free zones, education and any other relevant projects. The law regulates in detail the treatment of foreign investors concerning the allocation of land plots, different forms of (tax) exemptions, legal guarantees and investors' obligations. The local organization or investment authority and licensing and arbitration issues are also described in great detail. The law among others allows full ownership and repatriation of profits and it provides necessary incentives and protection to attract international investment to the region. The priorities of the region highlighted by the KRG are: the extension and improvement of the roads, housing, capacity expansion in energy, development of tourism, mining and oil related sectors.

As an outcome of the progressive development in the FRK, the World Economic Forum (WEF) selected PM Nechirvan Barzani to join the young global leaders in 2007. WEF is an international non-profit organization of 416 young global leaders representing 90 countries. The global network is expected to confront and tackle global challenges through knowledge sharing, fresh and strategic thinking from global leaders and also innovative international solutions based on global collaboration. The members are selected among young leaders from around the world for their professional accomplishments, commitment to society and potential, contribution to shaping the future of the world and the global common good. In short the network is a community of extraordinary young world leaders who jointly address global challenges and devote their knowledge, time and energy to work collectively towards a better future. One main task is their engagement in the 2030 initiative to understand the current and future trends, risks and opportunities both at national and global levels to formulate a positive vision and to put forward strategies to translate them into action.

The unfair situation in the past and present with respect to oil in the region has been a source of disagreement between the KRG and the central Iraqi government. The Kurds have so far been systematically kept away from the oil business regardless of activity level. The recent years the shortage of oil supplies have led to speculation that the KRG

wishes to be authorized to sign oil contracts and to build refineries in the region. Therefore, the status of Iraqi federal oil law is a significant factor in the development of the Kurdistan Region. The draft law is not finalized yet as there are disagreements and it is a major source of concern for the KRG. The cooperative petroleum act draft (KRG, 2006b), that the KRG is in agreement with, allows the KRG to negotiate and to sign new oil contracts within the region and the receipt of its share of Iraq's overall revenue to be guaranteed and regulated by law. Furthermore, the KRG shall be the authority to review its own previously signed contracts and further changes to the draft must require the KRG's consent. The important and yet incomplete associated laws are: the revenue sharing law, the Iraq National Oil Company chapter law and a law defining the oil ministry's new role which needs to be drafted and agreed upon. A sound petroleum policy seems not only crucial to development in Kurdistan but also a key factor to peace and stability in Iraq. Resolving the status of Kirkuk is an integrated part of such a policy and any solution must account for realities on the ground.

Lack of data does not allow a picture of the service industry including education, health, transportation, communication and household utilities which, despite low quality and coverage of services, have grown rapidly in recent years. Data has been collected mainly covering 2003 and partially 2004 at the governorate level. However, the data is not publicly available and subsequently not accessible to be used in this study. Even if available, it would not have provided information about the development of different indicators over time, but would have allowed comparison among different governorates. The data cover population, housing and infrastructure, health, education, labour force, household income and wealth, industries, construction and rehabilitation, economy and trade, agriculture, transport and communication, and rural administration. Distribution of population and firms by governorate is certainly changing, depending on the security and economic development conditions in the governorate. The distribution of indicators is expected to be highly skewed in favour of Hawler and Suleimany cities.

5.2 Conditions and infrastructure

A new industrial technology policy and participation in the globalization process must be accompanied by market reforms, organizational change and comprehensive investment in human resources and other development infrastructures to raise the production capacity and capability of the labour force to achieve sustainable knowledge-based economic development in the long-run. Global inequalities in access to communication technologies, which is an integral subset of the globalization process and labelled as global digital divide call for increased investment in infrastructure and human resources. This section presents views about various resources that are available, set in relation to those needed for economic and industrial development programs.

It should be noted that the discussions in this report are very general in nature and not necessarily based on statistics and facts. Currently there is no long-term economic plan and in addition the flow of financial resources is highly irregular and subject to major uncertainty. The important question in this regard is what would be appropriate to propose as steps to take and policy measures to adopt for the region? It should be noted that such policy measures are proposed, although absolutely no statistics in whatever form are available, which makes it rather difficult, if not impossible to be accurate in recommendations. The critical situation is an embarrassment for the statistician and the Bureau of Statistics which has obviously failed in doing its duty.

5.2.1 National Health Service

In most countries a significant portion of public funds is allocated to the health and education sectors. These sectors are important contributors to employment, to the health of society and to the skill and ability of productive sources, which in turn promote economic growth and the development of the welfare system. Thus, the progress of any country is directly related to the health condition of its citizens. This means that a healthy citizen is a productive member of the society. Therefore, taking care of the health of the citizens is essential to form a modern and progressive society. In order to achieve the objective of having a healthy nation, it is necessary to establish a special health care system that will fit the purpose, in different ways is suitable to the society and functions smoothly at the lowest cost. It is to be mentioned that the proposed health service system here is aimed at all sectors of society regardless of location and background. The system differs in many aspects from the one that was previously used in Iraq which was applied only to the urban areas. The proposed system here will cover both urban and rural areas, in short all residents of the Kurdistan region.

A national health service is a system of health care which is funded by mandatory income taxes where every resident in the country is automatically a member and health care is free at the time of use. The system first appeared in the United Kingdom in 1948 and is sometimes called the Beveridge-Bevan model, after its founders. National health services now exist in many other countries, like Denmark, Finland, Ireland, Italy, Spain and Sweden. Heshmati and Darwesh (2007) proposed a comprehensive plan for the foundation of a National Health Service in the Federal Region of Kurdistan. The proposed plan is based on a modern system of national health service provision, derived from several national health plans currently practiced in several developing countries. The plan is designed such that it is suitable to be established under the present political, economic and social conditions of the Federal Region of Kurdistan.

Nowadays the Health Services provision in Kurdistan directs their efforts through two different channels. The first channel is the Public Health Services which is supported by

the Regional Ministry of Health. As an organization this channel includes all the health centres and hospitals in both urban and rural areas. The second channel incorporates the Private Health Sector, which includes all the private hospitals, clinics, pharmacies and medical laboratories operating in the region. The proposed National Health Service is expected to be managed and directed by the Foundation for Providing National Health Service and in cooperation with the Regional Ministry of Health. The foundation is aimed at providing all kinds of Health Services to every citizen residing in the Federal Region of Kurdistan. The objective is that every citizen has the right to obtain all available kinds of medical treatment. Thus, the plan will facilitate the provision of health services in the region, such that through a mixture of public and private provider organizations, it provides health services on an equal basis to all citizens.

In order to cover the plan financially, at least partially, it is expected that every family or single person will have to pay a monthly fee to the foundation. The amount paid is determined in accordance and in proportion to the individual or household's income and standard of living. Thus, the system should be financed through memberships, personal fees and public sources. The objective is that the system will be self-financed in the long-run, however, in the short-run, it might receive financial support from the state in the form of investment in various infrastructures and subsidies of salaries and wages, services, medicine and equipment. The aim is to give good and equal services to the public regardless of their age, ethnicity, location, gender and level of education and income. Special attention will be made to specific groups including the poor, disabled, martyr families, mothers, widows and orphaned children. As part of the system and in keeping with the Millennium Development Goals, all children and women will have the right to have good health care.

Human resources in the form of doctors, dentists, nurses, pharmacists and other medical assistants will take part in the system according to their specialization. Establishing the foundation of the national health services in Kurdistan will play a major role in the country both socially and economically. The field work and mechanism of provision of health services to the public will be the responsibility of the Ministry of Health and its employees. Since the Foundation of Health Services has no health providing organization by itself, the Foundation will support the Ministry of Health financially and guide the Ministry in implementing the National Health Plan. The Foundation will also receive feedback from the practitioners with implications to revise the plan and its policy when necessary and applicable. In sum the mechanism is described below.

Heshmati and Darwesh (2007) suggest that a committee consisting of members with deep experience and knowledge about the health care planning, finances and management must be set up with the mission to investigate the establishment of the National Health Service in the Federal Region of Kurdistan. The committee's mandate should include the need and conditions for the reform of the current health care system,

the resources needed for establishment of the proposed services. In particular it should make estimation of the workforce, finances, financing activities, equipments, training, timeframe, organization and institutions required to get the system operating smoothly with desirable capacity and quality of care. Concerning financial issues, one important task for the committee is to investigate the mix of public and private finances of health services and methods of measurement and payments.

5.2.2 Science and Technology Parks

The Neoclassical economic growth models relied on investment in capital goods; in practice such investment strategy has resulted in increased debt for developing countries. In Boumol's model manufacturing is technologically advanced productive and service sector labour intensive and stagnant sectors. A third sector, information and communication, uses a mixture of both human capital and technology factors. New growth models consider the role of technology in production and investment in information technology as a leading sector in the developing countries' growth. Several studies establish relationships between technology applications, capital formation and economic growth. Therefore establishment of Science Parks is relevant to the investment policies directed towards a rapid economic development. Accumulation of investment in information technologies enhance a knowledge base for developing countries, it reduces the digital divide and also makes leapfrogging in the use of the state-of-the-art technologies possible.

Heshmati (2007b) proposes the establishment of Science Parks in the Federal Region of Kurdistan and discusses necessary conditions for such investment to become fruitful and with expected impact on the region's economic development. Involuntary participation in the globalization process and subsequent transformation of the society to a semi-information society has made knowledge and information increasingly significant factors in production and services in the region. Given the evidence on leapfrogging in the use of state-of-the-art information and telecommunication technologies, access to extended digital technology for Kurdistan is both a challenge as well as an opportunity. However, prior to a decision on the establishment of Science Parks, it is necessary to study in great detail the organization and operation of some Science Parks in East Asia and in particular those in China. The Chinese State and Science Parks have been very successful in building up the necessary infrastructure to attract direct foreign investment, foreign technology and management. This will allow us to have a clear picture of the human, financial, organizational and land resources required, policy options and problems faced.

According to the International Association official definition, a Science Park is an organization managed by specialized professionals, whose main aim is to increase the

wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To ensure these goals are met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, research and development institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities. In recent years, Parks have played a key role in attracting foreign direct investment and in the flow of investment finances to productive activities and in the transfer of management, skills, knowledge and technology to host countries.

Since the 1950s, Science or Technology Parks have played a fundamental role in the promotion of the economic transformation of newly industrialized economies. In addition, the parks have been crucial to the achievement of technological capability, technology transfer, cultivation of innovative high-tech enterprises and entrepreneurs, the gestation of new technological revolutions and emerging industry in the newly industrialized and many developing countries. Science Parks have become the impulse of the new economic development, an effective and important method by which a nation or a region realizes high and new technology industrialization, promotion of economic growth and development of welfare of societies. Thus, establishment of Science and Technology Parks promotes an inflow of foreign direct investment, technology transfer, research and development and overall economic growth. Science Parks and their achievements can also be used to soften the negative effects of globalization. A Technology Park strategy focused on the export market can produce economic growth, improve the balance of payments, and reduce dependence on traditional commodity exports.

For other determinants of inflow of foreign direct investment with emphasis on democratization and information and communication technology, Addison and Heshmati (2004) find that in addition to the positive effects of these indicators, wages, the inflation rate, industrialization and regional location affect the flow of investment. Gholami, Lee and Heshmati (2006) find that in developed countries, existing ICT infrastructure attracts FDI; a higher level of ICT investment leads to a higher level of FDI inflows. This suggests that ICT contributes to productivity and economic growth indirectly by attracting more FDI. But in developing countries the direction of causality goes instead from FDI to ICT. In developed countries an ICT capacity exists which causes inflow of FDI, while in developing countries the ICT capacity must be built up in order to attract FDI. The inflow of FDI causes further increases in ICT investment and production capacity building.

In the literature a number of questions are frequently asked that are linked to the motivation for the establishment of Science Parks. What are the contributions of Science Parks to economic growth? Many researchers have been involved in the study

of Science and Technology Parks, but so far due to limited data, the expected goal has not been achieved at a satisfactory level. In general, the existing studies describe the characteristics of Science Parks from different perspectives such as performance measurement, innovation capacity, cooperation and investment promotion. It seems that Science Parks attract investment, human capital and technology, and they significantly influence economic growth as well as research, development and innovation activities.

5.2.3 Regions Technology Policy

The Federal Region of Kurdistan, with a small population but rich natural resources, should employ a technology policy that promotes new economic activities and new markets to establish a manufacturing base for national and multinational corporations in the region. The implementation and success of such a policy requires building up capacity for Science and Technology, and the regional government should play a proactive role towards globalization, to establish necessary institutions, initiate policies and to invest in infrastructure to meet its priorities. The policy should aim at transforming the agriculture-based production structure to export-oriented manufacturing, and domestic-oriented services and information sectors. The establishment of Science Parks will serve as a base for many foreign and domestic forward looking companies. An Industrial Park will jump start this development process. The Park should be partially public owned and operated. It should gain experience and capital from some successful Technology Parks from the Asia region. It should rely on an effective utilization of local human and natural resources led growth strategy. The regional government should support the build up of various infrastructure development projects and public education and connectivity.

In order for the Industrial Park to be successful and develop into a high-tech sector, a number of policy reforms including the introduction of a science and technology program are required to facilitate the jump start of the region's technology sector. The Science and Technology program once initiated should have the objective of promoting the development of science, education, the commercialization of products and processes and increasing competition in the market and raising the competitiveness of firms in the Middle-East region. The Parks should be strongly supported in various ways by the regional government and also by the initial phase of special tax policy incentives and export-linked tax-relief programmes especially to multinational corporations and national SMEs. The aims of the proactive policy on Science Park development are: to increase the manufacturing share of GDP, to help in the economic transformation of the Federal Region, to attract joint venture capital and technology, to create employment opportunities, in particular for the young and newly educated workforce, to reduce the brain drain, and in sum to serve as a facilitator of the market economy. It is important

that the parks should be located outside major cities to make their administration practical and effective, but yet located near major universities and research institutes.

Concerning the process of the establishment of Science Parks a committee should be created to advise the government on problems of science and technology. The primary role of the committee or council should be to assist the Regional Government in promoting the development of the region's scientific and technological capabilities: issues related to training and utilization of manpower, research and development, and the establishment of relations with other scientific organizations and communities. The strategic plan areas should include among others: enhancing human resources through education and training; creating a climate conducive for investment in research and development; promoting the creation and access to soft and physical infrastructure; the creation of a science culture in corporation and academic societies; and the non-separation of science and technology.

The critical factors to the Park's successful operations are: location advantage concerning access to space and utilities at reasonable prices; a strong and supportive technology policy, well-functioning business markets; access to skilled labour and public and venture capital. Among other publicly provided incentive factors to mention are: taxation incentives; success of the policy and expansion approach; efficient administration services; emerging infrastructure problems; a vision of the future to attract new companies and strengthening the existing cluster effect. Success of the parks will be seen as a measure to transform the capacity of the region. The parks could also function like a hub for annual exhibition centres where international and national corporations display their services, products, processes and initiated development projects, as well as a job market place for newly graduated candidates.

5.2.4 Labour Market Policy of the Region

Currently there are no labour market statistics available that cover the Federal Region of Kurdistan. Lack of basic labour market statistics does not allow researchers to quantify the extent of unemployment in the region and to analyze its negative distribution and social and welfare effects. Unlike the rest of Iraq, in recent years the conditions have been optimal, so that the labour market could operate differently from those of the rest of the country. The main reason for the gap between the actual and potential outcome is the lack of qualified statisticians to collect and process data on a systematic basis. Despite significant resources allocated to the collection and processing of data since 2002, still almost no data, regardless of economic or social area, is available that can be used for research and policy analysis. This is an indication of the failure of the current system of data collection.

The section of any regional Bureau of Statistics specialized in the collection of labour

market statistics should collect information on a number of issues such as: analysis and prognosis about education and the labour market; the workplace environment, safety, accident and work absenteeism; wages and labour costs; employment and labour market participation; work hours; vacancy and unemployment rates, and several other location and region specific factors. These types and magnitudes of statistics collected covering all regions and in stratified form will enrich decision making and forecasts that result in optimal decision making and effective resource utilization.

Heshmati (2007a) presents a brief and descriptive analysis of the labour market conditions in the Federal Region of Kurdistan in general and those in the city of Hawler in particular. He explores a number of factors that very likely covariate and are considered as determinants of both the level and patterns of the labour market outcomes in the region. The list can be quite long, but the focus is on a few most important factors including: the mismatch of education and skills required in the job market; the low quality of education and insufficient to create new job opportunities; the high wage rate resulting in low relative labour productivity and competitiveness in the region; lowering capital investment, high risk and unknown prospects for future development; the high profitability of import and distribution compared to local production; and finally the absence of well-functioning labour market institutions, lack of statistics and active labour market policy measures to promote production and employment creation.

Heshmati, in the first step, describes each of the determinants of unemployment and establishes their possible causal relationships, their direction and possible effects. In the absence of local experience, reference is made to experience from neighbouring countries and case studies elsewhere. In the second step, he investigates the characteristics of the current labour market policy. Finally, a number of policy measures are proposed to reduce the rate of unemployment or to reduce the negative effects of unemployment and to promote skills, capability and development potential.

An active and effective labour market policy for the region should incorporate simultaneously a number of policy measures including elements or subsets of the following measures. The measures are not complete but might be sufficient in the short term to introduce major improvements in the functioning of the Kurdistan region's labour market. It should be noted that, an implementation of each measure prior to their recommendations requires careful investigation of their associated costs and effects and its comparison with alternative policy measures. The most urgent step to be taken is to set up a committee consisting of experts and representatives from labour market parts to investigate the labour market conditions and, based on this, to formulate a general labour market policy program as part of which, to recommend a selection of appropriate policy measures to the regional government. Care should be made in composition, skill and impartiality of the committee members and not to create unnecessary bureaucratic procedures.

There are not many labour market institutions established in Kurdistan working with a modern labour market and related issues. Heshmati (2007a) has listed a number of such institutions, the majority of which are of a national character and necessary to plan and implement active labour market policies and the following evaluations of their effectiveness. The list is far from complete for a modern state, but it shows the importance and types of organizations needed to be established. These institutions are necessary for reforming any labour market and transforming it to achieve optimal and efficient labour use. The institutions are divided into: primary and other labour market organizations, research and evaluation related institutes, supervisory authorities, trade and investment promotion agencies, welfare, education and job market-oriented training authorities.

5.2.5 The Skilled Labour Force

It is obvious that there is shortage of experts in every stage of decision-making and levels of organization and institutions in Kurdistan. Local higher education is not able to train experts in the different fields needed, who are capable of working professionally with advanced investigations and evaluations. There is a need to reform higher education to produce skilled graduates, who correspond to the human capital needed and to promote sustainable economic and social development. One could take advantage of the experience gained from the reform of education in several transition economies.

The higher education capacity in Kurdistan has also increased significantly in recent years. Particular attention should be paid to the job market for young university graduates. This category of job applicant is increasingly facing difficulties in entering the job market. The cause might be over-education of university graduates, lack of work experience, high expectations of the young generation, or recent years of rapid expansion, resulting in lower quality of education and lack of creativity of the new graduates in job creation. For an analysis of causes and measures and incentives one should look at experience from transition countries. The regional government should introduce a number of incentive measures. The existing student aid program might have affected the enrolment rate in higher education. The current unconditional student aid program could be improved by introducing elements of state-sponsored merit scholarships to promote and reward academic achievement to induce greater investment in human capital.

Given the shortage of a skilled workforce and experts, the main source of experts in the short term is the repatriation of Kurdish experts from industrialized countries. The regional government should be active in repatriating educated Kurds and involve them in the reconstruction and development programs. My personal experience suggests that there is the tendency in general for local Kurds in high positions not to be in favour of

getting advice from non-Iraqi Kurds who have returned to the Federal Region to support the unique opportunity that Kurds have been provided with to change their situation. It is a waste of valuable resources not to change such a discriminative attitude. It certainly has very negative effects on future repatriation efforts from the skilled first and second generation Kurds living abroad. In the migration literature, wage differentials are often cited as an important factor explaining skilled migration. Economic instability here and high salaries offered by the host country and life style preferences of individuals determine the intention of students and professionals not to return. The current situation with the increasing migration of university graduates and lack of active policies to repatriate Kurds are very harmful to the development of the region.

In addition to the reform of higher education, significant investment in human capital and creativity should be made to improve the individual and society's capability to create new jobs and to reduce unemployment. The process is long and it requires good planning and enormous resources to be invested in such programs. Fortunately, sufficient resources are already allocated to higher education. It is a matter of changes in preferences, attitudes, behaviours and reallocation of existing resources to more urgently needed types of education and training. More emphasis should be given to creativity at different levels and technology capability. Youth training and placement programs should be given a high priority to reverse the trend in outflow of young people from the region and the great loss of productive human capital. Several incentives and measures to promote a positive development such as wage subsidies, corporate tax deductions, credit guarantees and start up business programs should be introduced. The measures above are necessary but not sufficient to promote productivity growth, efficiency and outsourcing to develop manufacturing and services in the region. Comprehensive reviews of the performance and outsourcing literature are found in Heshmati (2003) and Heshmati and Pietola (2006).

5.2.6 Current Labour Market Situation

The new economy and globalization of economies not only requires access to skilled and able labour force, but also programs for continuous upgrading of their skills. The issue of matching education and skills required for the economy to function effectively is a very important element of an educational policy and system. The educational system is expected to prepare the workforce in a society for internal creation and external competition and to have the ability to exchange products and services under the framework of free competition and balanced trade relationships. The aim is to minimize the magnitude of mismatch. An extended mismatch will result in low competitiveness of the economy and increased unemployment and loss of welfare. Thus, policy makers and planners have a crucial role in the proper allocation of scarce resources. It is

important that the planners systematically study development at the global level and evaluate the local potential and ability to act in a global perspective. This will guide them in the quantification of human capital needed and its distribution, but also the identification of the weaknesses and strengths to be reflected in the allocation of resources and investment policies. Forecasts of the quantity of skills needed, allocation of resources and distribution of specializations is an important step to be taken.

The high dependency of the Kurdish society on foreign skilled labour during the recent years of boom in building up the infrastructure and reconstruction activities is a direct result of the low quality of education in Kurdistan. In my understanding the low quality is a result of a long period lacking resources, organizational changes, the low qualifications of teachers, lack of advanced teaching material, low language skills, rapid expansion of the capacity and probably even mismanagement of higher education. Since 2003 significant resources have been allocated to universities. It is desirable that the outcome of such investment is evaluated to quantify the effects and its distribution across different universities and institutes of higher as well as lower education.

The living conditions, insecurity and internationally non-competitive wages and salaries, non-transparency of the system, probably abuse of power and influence and general employment conditions might have affected the brain drain process and in parallel it has prevented repatriation of educated Kurds living abroad. The resulting education system produces graduates that are not well trained or creative and not sufficiently modern in technology upgrading to form a society with a high degree of self-sufficiency in a skilled and educated work force. These negative qualities of the workforce, together with low incentives and work morale are factors responsible for the fact that not enough jobs are created to absorb the young and graduated labour force. The negative development is shown in the recent increasing trend in the emigration of the young work force to Europe. Despite high risks, instead of investment in new businesses, they invest the family's savings in illegal migration. The quality of education and necessary training to acquire skills useful in practice are crucial determinants of job creation and welfare of the citizens. A decline in the quality of education generally leads to an increase in different forms of inequality such as opportunities, but foremost income inequality. For reviews of issues of inequality, its distribution and impacts see Heshmati (2006a, 2006c).

Labour productivity is very low for the reasons of low skilled labour, a corrupt employment system, low work morale and misplacement of the work force. Low labour productivity combined with high public employment rates and wages is one main source of the high inflation rate that has affected negatively the economic development and living conditions for the shrinking middle class of society. The level of wages should be determined by productivity of labour and such that it covers the normal living expenses for a normal sized family. Currently, the wage level is quite high and without

doubt in non-parity with the level of productivity or level of education of the labour force. There are several factors causing the rapid development of prices in general. Wages have increased dramatically as a result of the dollarization of the economy, affecting the prices of services produced locally and goods imported.

The low labour productivity and the high wage rate are the two main effective factors not only preventing an inflow of foreign direct investment to the region but also causing an outflow of domestic capital. They also make investment by domestic investors impossible as they might have better alternative investment opportunities elsewhere. The whole situation is very negative and weakens the prospect of the development of the financial market. The high labour costs and inflation rate steer investors away from the region. In recent months many main employers in the region are hiring foreign low skilled workers in services where the local labour force are not willing to take jobs, since they receive salaries from the public service for doing nothing. The generous public employment policy has resulted in misallocation of scarce public resources, a low pay off for education, massive laziness, high expectations, low work morale and the non-participation of many Kurds in the development of their economy.

Another factor causing increased wage levels is the informal employment procedure, which might not be open and determined in competition or by following some salary scale guidelines, rather it might be determined on an individual basis and affected by the way that employees are hired through recommendations from higher ranks. If this is true, it will create a job market that is an outcome of exchange of services among people in decision making positions and a matter of hiring relatives and friends who do not disclose unacceptable work practices at the public institutions. It will in turn create a corrupt system, harmful to the accountability of public institutions. Since job openings are available almost only in the public sector, wage setting might be a reflection of favouring relatives and friends, rather than the level of skills or education of the employees. In such a system, education is not a factor of qualification for job applications, rather than a degree to legitimize occupation of a job that the employee has no specific skills for.

5.2.7 Capital and Investment Risks

The low level of infrastructure and investment capacity results in a lower rate of actual capital investment than it could have been under normal conditions. The capital investment rate is low because of the outflow of capital from the region due to the lack of attractive investment opportunities to encourage capital investment in the region. Since investment programs with the magnitude observed in recent years in the Kurdistan region are a new phenomenon, there is little experience in the identification of investment opportunities and of factors determining a decision for investment. There

is a lack of necessary experience and efforts to improve upon the smooth functioning of the barely existing or incomplete financial market through regulations.

As mentioned previously the labour force is unskilled, it has a low level of education and the quality of education does not provide the labour force with the ability necessary to function in an environment with organized production by any international standard. The low level of the productivity of labour and the relatively high wage rate are two main factors that are preventing an inflow of foreign direct investment to the region as well as causing an outflow of domestic capital. The accumulated domestic capital is not a result of production activities, but originates from irregularities in public spending or profits from import and the distribution of goods. They also make investment by domestic investors impossible as these might have better alternative investment opportunities elsewhere or in the neighbouring countries. The existing situation is very negative to development programs and they weaken the prospect of the development of the financial market in the region. High labour costs, a non-productive labour force and a high inflation rate discourage potential investors from the region.

The geographic conditions, excess of money supply together with the recent 3 years of comprehensive public investment programs in infrastructure have led to relatively high returns on investment in the region. Despite good opportunities to make a profitable investment in Kurdistan, there are high risks associated with investment in Kurdistan which reduce the optimal level of investment. The risks are mainly related to the high and increasing inflation rate and the subsequent loss of basic investment capital. Another risk factor is the regional government's and the influential person's interventions in business relations. Direct or indirect participation of officials in decision making in publicly financed development projects is an inappropriate work practice in developed nations. Despite its positive effects in the creation of trust and security for investors, the mixture of politics and business is a cornerstone to the spread of corruption and the alliance is positively associated with the high level of tolerance of corruption. Over time it reaches such a level that the state loses public trust and it gradually undermines the stability and the power itself. Increasing incomes, an expanding population and growing urbanization have led to a high consumption rate, which in turn has minimized the risks associated with business in the region, including the storage of large quantities of imported commodities.

For several reasons the future business climate is to a large extent unknown to both public decision makers and the potential private investors. There is also a lack of clear regulations for the financial market in general and capital investments in particular. Under such circumstances the actors of the market behave very much with a short term perspective. Actors investing under certainty and on a long term basis are excluded from the market. Short run investment behaviour has several disadvantages for the region, among others: high return expectations and low investment in infrastructure,

organization, management and training. The transfer of return earnings abroad is an indication of discontinuity in investment plans. The overall cost to society will be high in the form of lost opportunities, high prices and lost tax revenues, no permanent job opportunities and little spill-over effects and technology and skill transfer from multinational corporations and foreign investors.

5.2.8 Promotion of Local Production

In the Middle-East in general, it is quite common that individual countries in the region import the same commodities for a long time period, without any serious efforts made to understand the nature of the product, to learn the skills to modify it for local needs, to produce it or, through different kinds of support and trade contracts, to facilitate transfer of the production and technology to the region. This situation of lack of incentives to learn about factors crucial to development is probably the main factor causing the reverse development in the region and explains well their backwardness in self-sufficiency, technology capability and in development efforts. Thus, the problem is not to be found in resource availability, but in the identification of needs, in finding solutions, in its inability in planning, in implementation, in evaluation, in learning by experience and in feedback.

Almost all domestic capital is used to import and distribute consumer goods. This behaviour has resulted in the systematic elimination of local production and development potential. Societies are created where hardly any regulations or incentives are found that promote local solutions. Public investment is not to enhance development, rather to facilitate and to support influential people's businesses or business linkages. The welfare of public and national interests is always traded for private interests. In order to reverse negative development, the policy should aim at enhancing the competitiveness of local production. In a short time serious damage is done to the way of thinking among individual Kurds. In my view a comprehensive educational program is needed to change the mind of the citizens, so that preferences are given to public and national interests.

In parallel with educational programs, emphasis should be on facilitating optimal conditions for trade and exchange with countries that are technologically preferred as trade partners. For instance, the presence of the Korean armed forces is not utilized to establish trade relations and the transfer of Korean advanced technology to Kurdistan. Local production might be inferior to imported goods, but the former has values that are not found in imported goods. Regulations of trade and the use of gained experiences from the past 50 years of import substitution policies should be taken into account in the design of trade policies in the region. The Chinese successfully implemented a policy of trading 'Market for Technology', which should provide an excellent example of a

successful policy of technology and skill transfer. For recent developments in the Chinese economy with focus on science parks, FDI, economic growth, trade and income inequality see Heshmati (2007c).

5.2.9 Economic Development Plan

Currently the regional government has no comprehensive economic development plan with a detailed description of each of the components of the economic policy, their interrelations, the objectives and policy measures to achieve its development goals. The irregular stream of financial resources is a binding constraint on the implementation of project ideas if ever they become known to the decision makers. The introduction of four to five year plans are necessary to have a clear picture of the flow of resources and their utilization in the achievement of targets. The conditions, targets and priorities might change due to many internal and external factors. These changes must be taken into account in the continuous process of modification of previously established goals and in the formation of new strategies.

Intensive research on the design of such comprehensive economic plans and strategies and their evaluation is needed to guide the government in its economic and social policy decision making and the implementation of its development and welfare policies. It is surprising that so far nothing has been written about the political economy of the Federal Region of Kurdistan or the political economy of a Kurdish state. The newly established Institute for Applied Economic and Policy Research should give the highest priority to the formulation of the political economy of the region and a series of comprehensive economic plans, the identification of important projects, the allocation of scarce resources, the quantification and flow of resources needed, investment in skills and ability, the evaluation of different development efforts, the building up of capacities at different institutions and the governance of the region and an evaluation of their performance.

For reasons most of which seem to be beyond the control of the regional government, the flow of financial resources is irregular, making long term decisions rather difficult. There is little evidence of any systematic cost benefit analysis conducted by the government to select projects that are socially preferable and give the largest net benefits. I would guess that currently projects are not financed in competition or based on a socially preferable selection mechanism, but are based on an arbitrary selection procedure, where decisions are influenced by trust between the public authorities and people proposing different projects to be implemented and as well as personal relations. Furthermore, the high dependency of the region on imported commodities has led to severe difficulties in making budget calculations that are realistic and close to the actual final budgeted project costs. The uncertainty and subsequent delays and excessive costs

are negative factors to development, resulting in frequent and significant over-use of scarce resources.

After the end of the war in Iraq, reconstruction of the massively destroyed public infrastructure and the heavy indebtedness of Iraq very likely will severely limit the availability of resources for development in the Federal Region of Kurdistan. The current and exceptional opportunity of peaceful governance and reconstruction in the region thus should be used in the best way to build up a strong and self-sufficient base for economic and social development in the Kurdistan region. An ineffective use of resources will generate not only public anger, but also dissatisfaction with the central government with the governance of the region and the management of resources, leading to an escalation of conflict between the central and regional levels of governance. Altogether, it will endanger all achievements made in the past few years in unique local self-governance. Intensive and specialized short evening and weekend training programs lasting two to three months should be organized for advisors in the regional government and public institutions. These kinds of training programs are a good complement to regular Master of Science programs given at regular universities to train researchers, investigators and evaluators to investigate finances, implementation and evaluation of different public development programs and their outcomes.

5.2.10 Structural Changes

In the above list, among the labour market institutions required to be established as soon as possible are: labour market offices, an equal opportunities authority, a board for youth affairs, institutes for labour market policy evaluation, a research institute for economic and policy analysis, a bureau of statistics, public adult education and authorities for skill and productivity, enhancing workplace training programs. Close cooperation between different institutions and the labour market parts is a prerequisite for the success of the labour market and different employment programs. However, there is a risk that the established institutions will result in a bureaucratic system which, combined with lack of experience in implementation of labour market policy, will develop into an expensive and complex project, binding most of the region's resources for only little use. A gradual and stepwise implementation in parallel with continuous evaluations at each step might be an effective strategy to save scarce resources and to avoid partial or complete project failures.

It is quite important that different ideas and proposals are collected in a systematic way by the labour market offices and institutions, and that researchers conduct cost benefit evaluations of project proposals and, based on these, recommend the most cost effective programs for the given number of jobs created. The approved and financed projects should be followed up and resources used should be checked by professional

accountants holding project leaders responsible for their decisions. This is a normal practice in other transparent systems that have been able to root out corruption and to create a society with officials and citizens assigned both rights and obligations where they also are held responsible for the consequences of their actions.

There should be official and centrally delegated guidelines for office hours and working time to promote professionalism, discipline, high work morale, and respect for authority - elements of a normal, well functioning and effective workplace and work conditions, which unfortunately are entirely missing in this part of the world. The system of multiple employment is a common practice where, instead of working, employees use their time to commute between different work places to register and to cash in their monthly salaries. In a situation where most of the labour force are public employees, it is very harmful to misuse scarce public resources allocated to such single labour market employment programs which take up more than 60% of the public budget. Resources in addition to welfare enhancing programs should be used as incentives in the most productive ways, not as it is currently, purely for consumption purposes. There should be clear regulations and an employment register to prevent abuse of the welfare system and development resources. Preferences in resource allocation should be given to measures that enhance training of labour, knowledge accumulation, enhanced ability, increased productivity and good performance.

Any measures to impose changes or to reform the existing system and organization should incorporate accountability and transparency of the system which are crucial to the transformation of each unit to a service provider organization. These are important tools to fight corruption and its negative effects on the work morale and discipline of the workforce. Skills, ability and efforts should be the key factors taken into account in getting a job and for the employees' promotion. Elements of corruption should be rooted out to save the new system under construction. Any postponement of efforts to eliminate corruption will be very costly in the future and it certainly endangers and undermines the entire political system. Destruction is always much faster and requires less effort than construction, which is costly and takes time and resources. Efforts in any form should be rewarded on a fair basis. A society run by business and inappropriate governance practices deter all sources of hope, jobs and the means of making a living for citizens. In particular, it eliminates all efforts made to achieve the Kurds' dreams. Thus, all efforts must be made to encourage the young generation to stay and to build up their society rather than become refugees and a burden to industrialized countries.

I would like to emphasize that it is still not too late to reverse the direction of the emigration flow by facilitating the employment of new high school and university graduates. Public resources should be used to create national security, to improve conditions and the ability of Kurds to resist any attacks against the unique opportunity and its achievements, to create productive jobs and welfare and not become a power

base for influential persons. The separation of public resources and investment, working duties and personal interests must be made. Many decision makers are sitting on too many chairs mixing work, business and personal relations in an obvious and biased way. There is no doubt that this affects their judgement in a biased and negative way to our chances of survival and achieving our goals. Through various regulations and instructions they should be made to understand the short and long term negative effects of such misconduct and abuse of power.

5.2.11 Globalization and Development

Globalisation has become the way to describe changes in the international economy and in world politics. Economists define it as the free movement of goods, services, labour and capital across borders. Globalisation is the result of reduced transportation and communication costs, lower trade barriers, faster communication, rising capital flows, increased competition, standardisation, and migration to mention a few key causal factors. The process has brought the developed economies closer together and made them more strongly interrelated. In the new era of growing integration of economies and societies, individuals and corporations reach around the world further, faster, and more economically than before. There is a large heterogeneity in the degree of the process of globalization over time and across countries and regions, as well as within countries across cohorts and skill groups. This heterogeneity causes disparity in development, especially with regard to negative effects such as rising inequality within and between countries. Societies like the Kurdistan region could take advantage of this unique opportunity and movement of capital, labour and technology in its development.

Globalisation has its roots in the second half of the eighteenth century. The period 1870-2000 is classified into (i) the first wave of globalisation 1870-1913, (ii) the de-globalisation period of 1913-50, (iii) the golden age of 1950-73, and (iv) the second wave of globalisation from 1973 onwards (see O'Rourke and Williamson 2000; O'Rourke 2001; Maddison 2001; Williamson 2002; World Bank 2002). Empirical evidence shows that during the first wave of globalisation, convergence in per capita income and real wages took place within the Atlantic economy. The de-globalisation period is characterized by a widening disparity between the richest and poorest regions as well as within the Atlantic economy. The golden age was a period of rapid growth, relative stability and declining inequality.

In recent years, research on the link between globalization and world inequality and poverty has been intense. Globalisation generally is expected to reduce poverty through faster growth in more integrated economies. Heshmati (2006b) investigates the usefulness of the two indices of globalisation to compare a large sample of industrialized, transition and developing countries on the basis of their integration in the

world economy. The two indices are based on the countries' economic integration, personal contact, technology transfer and political engagement. They are used to study the causal relationship between income inequality, poverty and globalisation. The results suggest that very little of the variance in inequality and poverty outcomes can be explained by the globalisation that operates through the four channels discussed above. Certain within-country factors such as institutions and a weak governance structure seem to explain much of the variance. Therefore, initial endowments and how countries integrate into the international economy determine the distributional effects of globalisation. Aggregate measures such as the Gini coefficient fail to capture many of the distributional shifts that result from the opening of trade and capital markets.

A vast amount of literature on various aspects of the recent wave of globalization is developing. Several special issues on globalization have been published in *Oxford Development Studies*, *Journal of World-Systems Research* and the *Journal of African Economies*. In addition, a number of books on the issue have been published. Dollar and Collier (2001) and the World Bank (2002) explore the relationship between globalisation, growth and poverty. Globalisation has other dimensions than just inequality and poverty. These produce different impacts and can be looked at from different perspectives such as: transaction costs, trade and FDI, appropriate governance to manage globalisation and the speed at which it must be pursued. From the perspective of promoting development, the performance and quality of governance explains variations in the impacts across countries. Building necessary institutions, governance and education are important preconditions to being part of the integration process.

Countries need a number of measures to reduce the negative impact of the rapid globalisation process. The geographical characteristics, institutional and political factors, economic policy and history can influence an individual country's capacity to globalize. Despite increased inequality, globalisation has improved access to new technologies and provides unique opportunities for poor countries to raise their incomes, but these countries differ in technology upgrading and skill accumulation. Despite the limitations of the existing literature, a majority of empirical studies conclude that the positive impacts of integration outweigh its negative effects. Heshmati investigates the relationship between inequality, poverty and globalisation (see Heshmati and Tausch, 2007). The results show that the globalisation index explains only 7-11 per cent of the variations in income inequality, and 9 per cent of poverty among the countries. The results provide weak evidence that globalisation reduces poverty. When controlling for regional heterogeneity, we find that the regional variable plays an important role in explaining the variation in inequality and poverty. This suggests that the variations among regions are a dominant factor in how poverty and inequality are affected by the four globalisation components.

5.3 A model and strategy for development and industrialization

5.3.1 The follower strategy for development

The Japanese industrial policy, as a model for industrial development, has showed the way to development to many followers. Some form of the 'Japan, incorporated' which is used to characterize Japan's political economy with reliance on a centralized planning and administrative guidance for control and wide state intervention is certainly a viable alternative. Although, the conditions in other countries are, for cultural reasons, quite different. Industrialization in South Korea as a follower of the Japanese model, which has been a source of admiration around the world, suggests that it is possible with limited resources to develop a nation and its industries in relatively short time, given that there is a carefully designed plan and a strong development-oriented leadership with a vision and which serves the national interest. The path of Korea's modernization and those of other newly industrialized countries like Taiwan, Singapore, Brazil and Singapore show the way on how to assess their own resources and development capacity and potential, how to formulate a development strategy, analysis trends and changes in the global economic environment, experience with S&T policy and the process of basic institutional development, structures and policy and analyze the successes and failures of those economies with similar development goals.

The process of modernization in Korea followed the Japanese and new innovation-based strategy. The environment and its implications for science, technology and innovation policy and the building up of primary institutions facilitated such rapid development in the post war period. The impact of the changing international business environment was smoothly reflected in form shifting strategies. The path to Korea's modernization had its roots in the scientific and technological capacities of the country to realize the vision of Korean growth and development. It built up assets, institutions, and the policies needed to master an innovation-based development strategy. The development was a product of cooperative agreement between several S&T policy institutes, universities and the government. Korean scientific and technological resources for innovation, including primary institutions for developing the personal and basic technical knowledge, was heavily emphasised.

The process required a comprehensive, integrated, technology based innovation strategy suggesting organizational arrangements for the government and investment policies. Positive factors for a development strategy are cheap labour, the nationally managed allocation of capital, imported technology and tools, the emergence of a more democratic political system, creating conditions for creativity, entrepreneurship, efficiency and competition. The difficulties are a continuous high dependence on foreign institutions and on the import of technology and tools to implement them. The

components of the national capability are: intellectual and human capital at well supported universities; economic capital in the form of a strong transportation, financial and information infrastructure; and social capital with a strong capacity for policy analysis, institutional and political maturity, and the political leadership to support national interests.

5.3.2 The KRGs leadership to the development

The Kurdistan Regional Government (KRG) should authorize the Ministry of Science and Technology like the Japanese MITI to serve as the headquarters for the implementation of regional policy. State intervention should be used where the market mechanism does not generate outcomes that are always in the nation's best interests and where the visible hands of the state are necessary. The Federal Regional Government's (FRG) ownership in key sectors like education, energy, health, oil, mining and banking should be significant. At the same time, the minimalist nature of the federal government intervention should be applied to certain services like the provision of household utilities. The policy must be effective, far-sighted and less costly. Effort should be made to differentiate between policies across different sectors. Errors attributed to inefficiencies in previous policies, such as those in agriculture are to be avoided. Industrial policy should focus on targeting key sectors, investment promotion and guidelines, industrial development and restructuring, the introduction of necessary regulatory and environmental controls to prevent distortions and to minimize the investment risk and negative effects of such policies.

The strategy of industrial development in Kurdistan should be carefully designed based on the available human, financial and natural resources and should be heavily influenced by experience gained from newly industrialized economies in recent decades. The process of industrialization and the steps to be taken should follow a well designed and established economic and industrialization plan. The plan should involve carefully defined industrial policy where the deferral government uses its authority and manpower to administer the policies which address the needs of specific industrial sectors, industries or large corporations with the aim of raising their productivity. The aim should be the creation of employment opportunities, enhanced self-sufficiency, the creation of a strong industrial base, and raising firms' survival, productivity and competitiveness. The priorities for various reasons may differ over time but the aims are to be multi-objective, like high employment rate, effective import restriction, technology transfer and skill upgrading.

The federal government should have economic recovery and development as the first priority. Based on national account it should initiate the first five-year plan for economic development. The plan must have a clear development strategy. It should be based on

import substitution, the promotion of export and the import of technology-embodied capital, technology and raw material to be produced by relatively low cost labour. The policy will be successful at the time of the reconstruction of Iraq given labour productivity increases. Investment in S&T institutions and education programmes is a prerequisite. For instance, privileges should be provided to the students and faculty members to facilitate the repatriation of Kurds from abroad. This will enhance engineering education and upgrade the industrial structure and strengthen the defence capacity. The growing demand for technical infrastructure could to a large degree be met by the establishment of science parks in the region.

5.3.3 The blend of industrialization policy

The Federal Regional Government's policy should include a blend of macroeconomic, microeconomic and industrial policies. Macroeconomic policy focuses on the whole economy, microeconomic policy on firms and households and industrial policy on a specific industrial sector. Industrial policy customizes public policy instruments to fit differing priorities and the needs of individual industries. The goals might be multi-objective and differ over time. Policy instruments including some form of tax incentives, import duties, R&D subsidies, import restrictions, export promotion, start-ups support and employment programmes are among the most important policy measures. Such policies might have negative externalities that are the economic costs of the adverse social consequences of market failure. It is important to anticipate secondary effects of policy interventions. Measures are needed to counterbalance the certain negative effects of such policies. Among other related policies for technology development include: preferential financing, the expansion of exemptions for researchers from military service, the provision of venture capital, the adoption of a technology credit guarantee system, support for SME firms and laboratory support for R&D activities.

Kurdistan, as an underdeveloped nation, but with the potential to develop, should industrialize as fast as possible not only to catch up with neighbouring countries but also to bypass them. Such rapid development is a precondition for continuity in the enjoyment of the partial freedom it has gained. It should adopt an industrial strategy of self-sufficiency to improve defence and economic prosperity. To industrialize in a short time the federal government must draw up a series of economic plans and mobilize productive resources. Initially, the government should build up effective and service providing institutions, establishing sectoral priorities, mobilizing resources, protect infant industry, employ guidance on investment, organize anti-cartels, allocate credits, regulate technological flows, control FDI, provide administrative guidance, and publish reports on future industrial structure. Gradually, it should emphasise trade liberalization

to reduce the protection of infant industry. The traditional sequential multi-step transformation process of workshop-agriculture-manufacturing-service might not be optimal, but a path that involves the massive import of foreign technology to structurally transform the economy from a consumer society to a producer society with a little, but effective manufacturing that is strongly knowledge-intensive.

The many dimensions of industrial policy should include several elements such as: defence, economic and political security which are of fundamental importance because of the landlocked situation of the FRK, the safe shipment of the main source of government revenue – the oil, the geographic location and vulnerability and trauma of the past experience. The KRG desire for economic security must be manifested in the procurement of technology, a low level of dependence on its neighbours, access to export markets and foreign technology, and a strong overall industrial structure. There may be elements of trade-offs between security and efficiency which can be accepted under existing conditions. The policy might stimulate over-investment in plant capacity leading to excessive capital investment and ineffective resource utilization.

5.3.4 The drivers of economic growth

The federal government should identify the main engines of its economic growth to create a stable business environment, to improve efficiency and productivity, to improve welfare, to ensure economic security, and to integrate the economy into the MENA region's economy. Probably, the Japanese industrial policy of the effective formula of combining: restraint, selective intervention, and respect for the discipline of market forces are good guidelines for the federal government. Sound macroeconomic policies including low inflation, stable exchange rates, and sound fiscal management are essential to the creation of a healthy economy and attractive to both foreign and domestic investors.

Government must continue to support education and gradually also basic research. R&D can be promoted by tax incentives, organizing cooperative projects and the transfer of technology. Public education and vocational training must be the responsibility of state and an integrated part of its policy. Government can also play a role in regional trade and by demand stimulation and trade mediation enhance the firms' competitiveness. The government should improve the synergic relation between corporations, universities and government by organizing a series of national projects like those related to the oil industry. The focus has to be on basic oil-related technologies of national interest.

As part of its policy the federal government must make low cost capital available through public investment and different loan programs and credit guarantees. In particular, the government must subsidize national projects. Among general policy

instruments to mention are tax policies. Thus, the introduction of comprehensive firm and household taxation is urgent and necessary. Tax policy is the most easily available instrument offering encouragement to priority industries with no negative effects on the budget. It can also be more or less evenly distributed across firms and industries. Concerning demand promotion, the available instruments include home market protection, local production support, buy-local product programs, export promotion, import protection policies. They might have some distortion and negative long term effects. Home market protection against foreign competition and through the imposition of import duties, quotas, restrictions on FDI, and other forms of import barriers are among other instruments to be used.

Existing experience suggests that that policy measures such as those above in themselves are not the sole factors determining the success or failure of an industrial policy. The selection of necessary and sound measures may not be sufficient conditions for an effective industrial policy. The effectiveness will depend on the characteristics of the market organization, public institutions and the structure of political, educational and technological institutions and the close government-business-financial market relations being supportive and solving problems rather than creating problems in the form of bureaucracy, corruption and inefficiency.

5.3.5 The role of ministry of science and technology

Currently there is no Ministry of Science and Technology (MST) at the Federal Region of Kurdistan. Once established, the relationship between the MST and business will suggest that organizational characteristics are important in making policies effective. The MST interaction with business organizations must be constructive in overseeing the operation of the business and service sectors. Focus must be made on the quality of its higher civil servants by requiring them to pass some kind of higher civil servant examination. This requirement should be applied to all higher public rank employees. The MST must develop its administrative and jurisdiction powers by building its internal organization and transform its authority into an effective tool for implementation of its industrial policy. The MST's effectiveness will depend on its capacity to work in harmony with the private and public sectors, its internal structure and the dynamism of the private sector.

Private individuals, groups and political parties' interests are given more attention than national interests. In order to emphasize and to foster national interest, the formation of some form of mixed private-public business groups with close ties involving ownership, transfer of technology and business transactions seems to be necessary. Networks of firms will create favourable conditions for the MST for administration of industrial policy. The business group membership will mean extensive shareholdings, reliance on

a group bank and business transactions. The characteristics above are necessary but not sufficient conditions for the success of policies. Optimal structural and socio-cultural factors must be included in the analysis.

The high level and acceleration in growth in construction is explained by steady progress in oil production, in trade openness and in capital accumulation by an increasing trend in the investment rate. The engine of the growth in the economy is: investment activities accompanied by foreign technology which has contributed to expanding construction capacity. The transfer of technology and management is vital to the continuity of growth. The most important channels are: FDI, licensing, technical agreements, projects contracts, reverse engineering, person-embodied transfer of skill and trade in capital goods. Licensing and technical agreements and reverse engineering are the most important sources of technology transfer. For instance a multi-shift working practice can be used to lower the unit capital cost in construction. Government should financially support training in the application of technologies and the development of the capital goods sector.

The conditions for technological development include: (i) human resources in the form of an increased number of entrepreneurs, skilled workers, engineers and technicians to adopt imported technology for local use, (ii) public investment in information networks to collect information on technology and disseminate it to enterprises, (iii) the role of government in building up the necessary public infrastructure including the education system, human capital, information and transportation networks. These will help to facilitate technology absorption capacity, technological progress and high levels of investment as important parts of the process of economic development. The process involves the acquisition of foreign technology, adaptation and improvement, and the development of its own competitive technologies. The federal government must facilitate the process of accumulating human capital and providing an institutional infrastructure to master transferred technologies. The inter-firm collaboration on sharing technological resources and information will make technology transfer within industry easier between large and small subcontractors and between sectors.

5.3.6 The changing environment

The new business environment of the Kurdistan region since 1991 is a result of a unique situation offering both competition and collaboration. It offers the possibility to represent a new leadership and development strategy. The changes are positive to the Kurds and the KRG must face these changes with better preparation and show that its mission is not only to take care of current and local affairs but that it has a historical responsibility to shoulder the leadership of the Kurds as a nation and to build the necessary infrastructure to train future Kurdish leaders regardless of their origin and

ideology. In particular, leaders with the capacity and special skills in politics and international relations, planning and management, technology, finance and governance are to be trained in sufficient numbers at reputable schools.

The changes in environment are mainly manifested in: economic liberalization, the improvement in technological capabilities, a shift in relation from regional trade, the increasing need for harmonization of regional trade, increasing political freedom and cooperation among political parties, but also uncertainties in the region. Regional trade agreement are needed which will influence most of the trade relations affecting the employment situation. Among the changes facing the region are an increase in FDI in general, the increasing importance of Kurds from Europe and USA as a source of FDI and human capital inflows. The new banking also facilitates both capital inflows and also outflows. Increasing wages, low work morale and discipline and possible irregularities in business practices are the factors causing outflow of FDI and capital. Although, some outflow of capital finds investment abroad, it is not only more difficult but also less profitable. Such capital returns to the region as FDI inflow and possibly in the form of laundered money.

Gradually, the KRG has to agree and actively undertake the necessary guidelines and measures to protect intellectual property rights. Increased protection of intellectual property and security for investment is expected to lead to increased economic activity including trade, FDI and transfer of technology. A low level of protection weakens access to foreign technologies and deters local investment with R&D potential. In sum the national and international environment is changing rapidly. The new trade situation is favourable to development if local production is prioritized and protected and the human capital conditions are optimal. Opening up the market for a continuous and increased inflow of technology and capital from industrialized countries is a positive element of new development.

5.3.7 Policy to build indigenous technology base

Policymaker should provide general and specific incentives for all sectors to advance more rapidly and in harmony with each other. However, policy should place more emphasis on building a strong technological base for indigenous sources of economic development. The creation of conditions for low and smooth bureaucratic control is crucial for business development and performance. The role of market competition as the primary driver of development should be emphasized, but necessary regulatory controls in response to growing liberalization should not be neglected. Improvement in infrastructure must contain the phases of: import and application of foreign technologies, assimilation of technology, the modification of technology to the local needs, an increase in R&D investment, promotion of state-business-university cooperation,

development of technology capability, and investment in technology support institutions and infrastructure.

The process of industrialization involves many stages and shifting policies. A gradual transition from proactive to reactive support is to be employed. The process is such that the policy first promotes growth by direct intervention to promote technological capabilities, self-sufficiency and competitiveness and then different subsidies and import barriers are gradually removed. Development under protection from foreign competition also requires the acquisition of technology that local firms need to access and, after adaptation and improvement, firms develop their own or modified products and services.

Industrial policy must have the primary principles of focusing on competition, liberalization, cooperation, technology transfer, security and local development. A latter reactive policy regime should eliminate tax and other financial subsidies and promote export-oriented production technology. In order to save scarce public resources, cooperation and sharing resources and information must be encouraged by promoting strategic alliances among domestic and international corporations. Measures for fighting corruption and reducing the bureaucratic and unnecessary regulations should not be forgotten. Tie regulations in financial systems should be avoided, but sufficient control mechanisms are required. The state should promote R&D by making it fully tax deductible and provide low interest rate financing and simplified regulations by easing paper work and complicated application procedures.

Speculative and non-productive investment activities must be discouraged to avoid the waste of scarce resources, the concentration of investment and creation of bubbles, for instance, in the real estate market in major cities. The balance between supply and demand in order to obtain a controlled urbanization process is to be investigated and reported regularly. Seasonal forecasts about business cycles and an estimation of capacity required for provision of various household utilities and public services needs to be developed. The state must make sure that intellectual property rights are respected and continue its support for new products and services to reduce the market risk for new investment. In general the federal government should not do for firms what they are able to do for themselves using private funds.

5.3.8 The post-invasion period

The development strategy facing the KRG and the state of domestic and foreign competition in the market is changing, as conditions on the ground are continuously changing. This review of the development conditions and strategy shows major shifts since 2003 from reliance on local markets to an investment-driven development economy. The new internal and external obstacles affect the KRG strategy and

development of specific sectors. The economic development can be divided into pre and post invasion periods. The pre-invasion development period is characterized by a lack of resources in contrast to the post invasion period. The economy has rapidly modernized by the inflow of oil revenues and the promotion of capital investment and technology development. Government intervention is minimal and the economy has become liberal, open and the private sector has operated effectively given the circumstances. Increased wages, inflation and widening corruption have deteriorated local production development and competitiveness.

The recent three years of radical changes have led to the need to search for a new or modified strategy. Local firms are small relative to the rapidly growing market size and in order to develop they need to rely on foreign cooperation and technology. The combination of increased labour costs, the high inflation rate and low labour productivity have undermined the local firms' competitiveness. The vicious spiral of increased wages and living expenses is linked to the high public employment rate and comprehensive public investment programs. The new strategy should be centred on increasing productivity and providing competitive incentives and advantages. In sum the firms must develop their own sources of technology through investment and alliances. By looking at the development process, the KRG must identify problems to be addressed, to gain an awareness of the importance of technology transfer and technology development culture. The failure of the public employment program and the recent negative development in the form of the import of unskilled labour suggests that the task is rather difficult and need careful measures to correct past mistakes and to direct the future development.

Currently there is no modern S&T policy and institutions and such infrastructure must be built up from scratch. It can be influenced through education, employment and public funding. Focus must be on cultivating scientific interests among firms and young people. The necessary incentive measures to cultivate productive and innovative cultures are to be taken. International cooperation in all its dimensions also needs enhancing. Society must depend on its technology institutes and universities as a major source of ideas and trained workers in building a modern economy. The research universities have currently low academic standards and their research capabilities are very limited. This is manifested in the massive import of consumer goods and the Kurdish engineers' complete lack of ability to produce the simplest products locally.

Cooperation should not be limited to politics but also include education and technology areas. Serious efforts are needed to improve state-university-business collaboration to enhance local skill and production ability. The expenditure share of research spent at universities is very low. The higher education system must undergo reforms to enhance intellectual capabilities. The goal must be to increase investment in education and capability. The KRG must encourage private research capacity as well to reduce

publicly-funded research and laboratories. Increased private investment and improved performance will put pressure on the government-funded laboratories' productivity and efficiency.

5.3.9 Strategy for the future economy

The national development policy must aim to promote national competitive advantages. The policy should include input factor conditions, demand conditions, various support conditions, firm strategies and structure, as well as the landlocked condition of the Kurdistan region. These, in one form or another, are to be addressed in the national development policy. The federal government's role in encouraging firms and having a vision for national development should build upon a national consensus to establish the basic directions and paradigms for sustainable economic development. After the initial goals and strategies are established, the government should construct a system to create opportunities to strengthen capacities and to form the optimal environment to develop the economy.

The current strong import-oriented economy should be used to foster a rapid acquisition of technological capability to lay the foundation for radical changes in the internal economic environment. Domestic producers exposed to international competition and the opportunity to cooperate with foreign firms should be fully utilized. The liberal FDI should be used for technology and skill transfer in an effective way. The elements of new state policy involve gaining competitive advantage, raising cooperation creativity and playing an active role in international cooperation.

The recent years of intensive use of information technology ease technology transfer and cooperation. The information industry is found to be a key strategic factor for the industry and for the new economy. Government and business must cooperate to improve the connectivity and its utilization in the production of services. S&T capabilities determine the Kurds capacity for development and this factor must be strongly integrated in structural policy. Increased regional competition and globalization offer special challenges as well as opportunities for Kurds to develop their society. The globalization of economic and technological activities also offers both challenges and opportunities. It requires a higher technical competency and competitiveness. Limited domestic resources can be strengthened by joint ventures, openness of the market and enhanced security and profitability for foreign investment.

In short the KRG must adopt a multi-channel policy approach in obtaining new technology from external sources. Increased investment in education to correct for inappropriate past investment to promote competition among the universities and at the same time to minimize state control and intervention in the administration of universities are measures with high priority. Expanding the supply of skilled workers

and vocational training as part of the labour market policy are better measures than public employment programs. More science and technology needs to be introduced into basic education. Other measures include expanding public and private investment programs, giving priority to the improvement of conditions for SME, opening the domestic market and creating an FDI-friendly business environment.

Competition and cooperation at all levels need to be harmonized. Priority should be given to the information industry and its use, not only in communication and production, but also in the formation of E-government in provision of public services to firms and citizens. Labour costs, administrative bureaucracy and intellectual property rights are a source of concerns mostly for foreign firms. Kurdistan, with rich resources but a weak tradition of industrial policy and relatively high political instability and is less hospitable to FDI, needs careful policy and protective measure to support small domestic firms especially. The KRG must succeed in its different initiated reform programs, to reduce the outflow of capital, to increase the inflow of capital, to promote reliance on domestic resources, and to concentrate capability in institutions and in the productive sectors.

6. SUMMARY AND CONCLUSIONS

This report has introduced two of the most successful industrial development models of modern time, namely the Japanese as a leader and the South Korean as its follower. The path to Korea's modernization had its roots in the scientific and technological capacities of the country to realize Korea's development. Korea built up assets, institutions, and policies needed to master a technology and innovation-based development strategy. The development was a product of effective cooperative agreement between Science and Technology (S&T) institutes, universities and the government. As part of the policy, the primary institutions for developing personal and basic technical knowledge was heavily emphasised. Positive factors for the development strategy were cheap and disciplined labour, nationally managed capital allocation, imported technology, the emergence of a democratic political system, creating conditions for creativity, entrepreneurship, efficiency and competition. The national capability is a result of intellectual and human capital at universities; economic capital in the form of a strong infrastructure; and social capital with strong capacity for policy analysis, institutional and political maturity, and political leadership to support national interests.

The objective was to review the industrialization process in these two economies, which have served as a model for development in many newly industrialized economies. The experience gained and information available is then used to propose a strategy for development and an optimal model for the industrialization of the Kurdistan region. The current industrial development in the Federal Region of Kurdistan (FRK) is investigated

by focusing on the identification of the current policy and institutions in the region. The conditions, potential and pitfalls are investigated and the resources available in the region and those needed are estimated. Major steps to be taken during the industrialization process are identified and described in much detail. Discussion of the of the possible industrial policy instruments to improve security and self-sufficiency is followed by a presentation of infrastructure organizations and their cooperation in implementing the industrialization policy.

It is important to establish a Ministry of Science and Technology (MST). The Kurdistan Regional Government (KRG) should authorize the MST and Planning to serve as a headquarters for the planning and implementation of its technology-based development strategy. The government should have economic recovery and development as a priority. Based on national accounts it should initiate the first five-year plan for economic development. The plan must have a clear development strategy and be based on specific policies, such as import substitution and the promotion of export and import of technology-embodied capital. The policy will be successful at the time of the reconstruction of Iraq, given labour productivity increases. Comprehensive investment in S&T institutions, education and other infrastructures is a prerequisite for its success. Public ownership in key sectors should be significant, while the minimalist nature of intervention is preserved. Industrial policy should focus on key sectors, investment promotion, the introduction of regulations and environmental controls, and to minimize the investment risk and negative externalities. In addition it should also have multi-objectives including employment creation, self-sufficiency, a strong industrial base, and raising firms' survival and productivity.

The Federal Regional Government's policy should include a blend of macroeconomic, microeconomic and industrial policies. The many dimensions should include several elements such as: defence, economic and political security, which are fundamental because of the landlocked situation of the Federal Region of Kurdistan. The policy instruments in general, some forms of tax incentives, import duties, research and development (R&D) subsidies, import restrictions, export promotion, start-ups support and employment programmes are among important policy measures. Kurdistan as an underdeveloped nation, but with the potential to develop, should industrialize as fast as possible, not only to catch up with its neighbours. Such rapid development is a precondition for continuity in enjoying the partial freedom it has gained. It should adopt an industrial strategy of self-sufficiency in defence and economics. To industrialize in a short time, the federal government must draw up a series of economic plans and mobilize productive resources. Initially, the government should build up effective service providing institutions, mobilize resources, protect infant industry, allocate credits, regulate technology flows, provide administrative guidance and publish forecasts. The traditional sequential transformation of society might not be optimal, but

a path that involves the massive import of foreign technology to transform the economy structurally to an effective knowledge-intensive manufacturing economy.

The government must support education and gradually also basic research. R&D can be promoted by tax incentives, organizing cooperative projects and the transfer of technology. Vocational training must be the responsibility of state and an integrated part of its policy. The government should improve the synergic relation between corporations, universities and government by organizing a series of national projects with a focus on basic oil-related technologies of national interest. It should make low cost capital available through public investment and different loan programs and credit guarantees. The introduction of comprehensive firm and household taxation is urgent and necessary for a smooth flow of public revenues. Demand promotion policies are available instruments to protect the home market and local production. The selection of sound policy measures in themselves does not determine the success of the policy. The effectiveness will depend on the characteristics of the market organization, public institutions and the structure of political, educational and technological institutions. Public institutions should be supportive and solve rather than create problems in the form of bureaucracy, corruption and inefficiency.

The MST interaction with business organizations is important in making the policies effective and constructive in overseeing the operation of the business sector. Focus must be made on the quality of higher civil servants by passing some kind of higher civil servant examination. The MST must develop its administrative power by building its internal organization and transform its authority into an effective tool for implementing its industrial policy. The MST's effectiveness will depend on its capacity to work in harmony with the private sector. The private individuals, groups and parties' interests are given more attention than national interests. In order to foster national interest, the formation of some form of mixed private-public business groups seems to be necessary. Networks of firms will create favourable conditions for the MST to administer its industrial policy. The conditions for technological development include different types of skilled human resources, public investment in information networks, and the role of government in building up the necessary public infrastructure. Government should financially support training in the application of technologies and the development of a capital goods sector and promote the process of accumulating human capital and providing the institutional infrastructure to master transferred technologies. This will increase the technology absorption capacity, technological progress and high levels of investment.

The new business environment of the Kurdistan region since 1991 is the result of a unique situation. It offers the KRG the opportunity to represent a new leadership with a development strategy. The changes are positive and the leadership must face these changes with better preparation and show that its mission is not limited to taking care of

current and local affairs but that it has a historical responsibility to shoulder the leadership of the Kurds as a nation and to build the necessary infrastructure to train future Kurdish leaders regardless of their origin and ideology. In particular leaders with the capacity and special skills in politics and international relations, planning and management, technology, finance and governance are to be trained in sufficient numbers at reputable schools. New banking also facilitates both capital inflows and outflows. Increasing wages, low work morale and discipline of the labour force and possible irregularities in business practices are the factors causing the outflow of capital. However, some outflow of capital finds investment abroad not only more difficult, but also less profitable and returns to the region as foreign direct investment (FDI) inflow.

Policymakers should provide general and sector-specific incentives to advance more rapidly and place more emphasis on building a strong technological base for indigenous sources of economic development. The creation of conditions for low and smooth bureaucratic controls is crucial for business development. Investment in technology support institutions and infrastructure must contain all the phases of import, application, assimilation, and modification of technology for the local needs, and development of technology capability. The process of industrialization is shifting by first promoting growth by direct intervention to promoting technological capabilities, self-sufficiency and competitiveness and then different subsidies and import barriers are gradually removed. The measures for fighting corruption, reducing bureaucratic and unnecessary regulations should not be neglected. Tie regulations in the financial system should be avoided but sufficient control mechanisms are required. Speculative and non-productive investment activities must be discouraged to avoid wasting scarce resources, concentrations of investment and creation of bubbles, for instance in the real estate market in major cities. In general the government should not do for firms what they are able to do for themselves.

There was a major shift in reliance on local markets to an investment-driven development economy. The economic development can be divided into pre and post invasion periods strategy. The pre-invasion development period was characterized by a lack of resources in contrast to the post invasion period. The economy has been rapidly modernized by the inflow of oil revenues and the promotion of investment and technology development. The KRG's intervention is minimal and the economy has become liberal, open and the private sector is effectively operated, given the circumstances. However, increased wages, inflation and widening corruption have deteriorated the local production development and competitiveness. The recent three years of radical changes require the search for a new or modified strategy. The local firms are small relative to the rapidly growing market size and in order to develop they need to rely on foreign cooperation and technology. The combination of increased labour costs, the high inflation rate and low labour productivity have undermined the

local firms' competitiveness. The new strategy should be centred on the increasing productivity and to provide competitive incentives and advantages. The failure of the public employment program and the recent negative development in the form of the import of unskilled labour requires careful measures to correct past mistakes. The research universities have currently low academic standards and their research capabilities are very limited. This is manifested in the massive import of consumer goods and the Kurdish engineers' complete lack of ability to produce the simplest products locally. A reform of higher education is advised.

The national development policy must aim at promoting national competitive advantages. The vision for national development should build upon a national consensus to establish the basic directions and paradigms for sustainable economic development. After the initial goals and strategies are established, the government should construct a system to create the opportunities to strengthen capacities and to form an optimal environment to develop the economy. The current strong import-oriented economy and the opportunity for local firms to cooperate with foreign firms should be used to foster the rapid acquisition of technology and management capability. The recent years of the intensive use of information technology ease technology transfer and cooperation. The globalization of economic and technological activities also offers both challenges and opportunities requiring a higher technical competency and competitiveness.

KRG must adopt a multi-channel policy approach in obtaining new technology from external sources. Increased investment in education to correct for inappropriate past investments, to promote competition among the universities and to minimize state control and interventions in the administration of universities are measures with a high priority. Other measures include expanding public and private investment programs, to give priority to the improvement of conditions for small and medium enterprises (SME) and to create an FDI-friendly business environment. Priority should be given to the information industry and its use not only in communication and production but also in the formation of an E-government in the provision of public services to firms and citizens. The KRG must succeed in its different initiated reform programs, to reduce the outflow of capital, to increase the inflow of capital, to promote reliance on domestic resources, and to concentrate its capability in the key institutions and in the productive sectors.

REFERENCES

- Addison T. and A. Heshmati (2004), The New Global Determinants of FDI Flows to Developing Countries: The Impacts of ICT and Democratization, *Research in Banking and Finance* 4, 151-186.
- Branscomb L.M. (1996a), Japan: Model, Mentor, and Competitor, Chapter 9 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Branscomb L.M. (1996b), Taiwan: Innovation in SMEs, Chapter 10 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Branscomb L.M. and Y-H. Choi (1996a), A Framework for Discussing Korea's Techno-Economic Future, Chapter 1 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Branscomb L.M. and Y-H. Choi (1996b), The Next Stage: The Road to an Innovation-Led Korea, Chapter 15 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Branscomb L.M. and H. Ergas (1996), Contrasting Models: Brazil and Small European Countries, Chapter 11 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Branscomb L.M. and Y-H. Kim (1996), Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, Westport, Connecticut, London: Praeger.
- Choi Y-H. (1996), The Path to Modernization 1962-1992, Chapter 2 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Choi Y-H. and L.M. Branscomb (1996), A New Technology-Based Innovation Model: The Role of Government and National Strategy, Chapter 12 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Choi Y-H. and B-K. Lee (1996), The Importance and Needs of Public Laboratories, Chapter 8 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Chung S-C. and L.M. Branscomb (1996), Technological Transfer and International Cooperation, Chapter 13 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the*

Turning Point: Innovation-Based Strategies for Development, London: Praeger.

Gholami R., Tom Lee S-Y. and A. Heshmati (2006), The Causal Relationship Between Information and Communication Technology and Foreign Direct Investment, *The World Economy* 29(1), 43-62.

Heshmati A. (2001), On the Growth Micro and Small Firms: Evidence from Sweden, *Small Business Economics* 17(3), 213-228.

Heshmati A. (2003), Productivity Growth, Efficiency and Outsourcing in Manufacturing and Services, *Journal of Economic Surveys* 17(1), 79-112.

Heshmati A. (2006a), The World Distribution of Income and Income Inequality, *Journal of World Systems Research* 12(1), 60-107.

Heshmati A. (2006b), Measurement of a Multidimensional Index of Globalization, *Global Economy Journal* 6(2), Paper 1.

Heshmati A. (2006c), *Global Trends in Income Inequality*, Nova Science Publishers.

Heshmati A. (2007a), Labour Market Policy Options of the Kurdistan Regional Government, Hawler Institute for Economic and Policy Research, Hawler Policy Report No. 1.

Heshmati A. (2007b), A Proposal to Establish Sciences Parks in the Federal Region of Kurdistan, Hawler Institute for Economic and Policy Research, Hawler Policy Report No. 3.

Heshmati A. (2007c), Ed., *Recent Developments in the Chinese Economy: Analysis of Science Parks, FDI, Economic Growth, Bilateral Trade and Income Inequality*, Nova Science Publishers, forthcoming.

Heshmati A. and M. N. Darwesh (2007) A Proposal to Establish National Health Service in the Federal Region of Kurdistan, Hawler Institute for Economic and Policy Research, Hawler Policy Report No. 2.

Heshmati A. and J-E. Oh (2006), Alternative Composite Lisbon Development Strategy Indices: A Comparison of EU, USA, Japan and Korea, *The European Journal of Comparative Economics* 3(2), 133-170.

Heshmati A. and K. Pietola (2006), The Relationship between Corporate Competitiveness Strategy, Innovation, Increased Efficiency, Productivity Growth and Outsourcing, in P. Bararrar and R. Gervais, *Global Outsourcing Strategies: An International Reference on Effective Outsourcing Relationships*, Gower Publishing.

Heshmati A., Y-B. Sohn and Y-R. Kim (2006), Eds. *Commercialization and Transfer of Technology: Major Country Case Studies*, Nova Science Publishers, forthcoming.

Heshmati A. and A. Tausch (2007), Eds. *Roadmap to Bangalore? Globalization, the*

EU's Lisbon Process and the Structures of Global Inequality, Nova Science Publishers, forthcoming.

- Kim K-D. (1996), Shifting strategies: From cost advantage to superior value, Chapter 5 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Kim B-Y. and Y-K. Kim (1996), Korea's International Environment: Maintaining Competitive Advantage, Chapter 3 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Kim K-Y. and B-K. Lee (1996), The innovation triangle: stimulating innovation in private and public enterprises, Chapter 4 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Kim Y-G. (1996), Innovation and the Role of Korea's Universities, Chapter 7 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Kurdistan Regional Government (2006a), Law of Investment in Kurdistan Region – Iraq, KRG Law No. 4, July 2006: Downloadable at: <http://www.krg.org/>.
- Kurdistan Regional Government (2006b), Petroleum Act of the Kurdistan Region of Iraq, KRG September 2006: Downloadable at: <http://www.krg.org/>.
- Lee Y-T. and L.M. Branscomb (1996), Korean Information Technology: Status and Policy Implications, Chapter 14 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Lee J.D. and A. Heshmati (2007), Eds. *Micro-Evidence for the Dynamics of Industrial Evolution: The Case of the Manufacturing Industry in Japan and Korea*, Nova Science Publishers, forthcoming.
- Maddison, A. 2001. *The World Economy: A millennial perspective*, Development Centre Studies. Paris: OECD.
- Minami R., et al. (1995), *Acquiring, Adapting and Developing Technologies: Lessons from the Japanese Experiences*, London, UK: The Macmillan Press.
- Okimoto D.I. (1989), *Between MITI and the Market: Japanese Industrial Policy for High Technology*, Stanford, California: Stanford University Press.
- O'Rourke, K.H. 2001. *Globalization and Inequality: Historical Trends*, NBER 8339, Cambridge MA: NBER.

- O'Rourke, K.H., Williamson, J.G. 2000. *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy*. Cambridge MA: MIT Press.
- Park S-R. and H-S. Kim (1996), Promoting the culture of science and innovation, Chapter 6 in: L-M. Branscomb and Y-H. Kim, Eds. *Korea at the Turning Point: Innovation-Based Strategies for Development*, London: Praeger.
- Williamson, J.G. 2002. *Winners and Losers Over Two Centuries of Globalization. WIDER Annual Lecture 6*. Helsinki: UNU/WIDER.
- World Bank Development Research Group. 2002. *Globalization, Growth and Poverty: Building an Inclusive World Economy*. Washington DC: World Bank and Oxford University Press.