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ABSTRACT

Establishment of Science Parks in the Federal Region of Kurdistan*

New growth models consider the role of technology in production. The link between product flows and information flows in international trade suggests 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. However, 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 production capacity and capability of the labour force to achieve a sustainable knowledge based economic development in the long-run. This essay proposes establishment of Science Parks in the Federal Region of Kurdistan and discusses necessary conditions for such investment to become fruitful and with expected impacts on the region's economic development.

JEL Classification: D83, O10, O14

Keywords: science parks, economic development, information technology, industrialization

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1. Introduction

Global inequalities in access to communication technologies, which is an integral subset of the globalization process and labelled as Global Digital Divide (GDD)[1], call for increased investment in infrastructure and human resources. Accumulation of investments in information technologies enhances a knowledge base for developing countries reducing the digital divide. The globalization process has progressed such that a global knowledge and information society is emerging in many parts of the world. Knowledge and information become increasingly significant factors in production and services provision. Leapfrogging in the use of the state-of-art technologies is possible. Access to digital technology for developing countries is a challenge and also an opportunity in the new century.

The United Nations Development Programme (UNDP) recognized that investment in infrastructure[2] contributes to growth, human development, inflow of foreign direct investment (FDI) and technology transfer. In 2001 UNDP released its Human Development Report with focus on technology and development. A technology achievement index (TAI) was published ranking 72 countries in creation and use of technologies including information and communication technology (ICT). The components of the index included: measure of technology creation, diffusion of recent innovations, diffusion of old innovations, and human skills. In another report Digital Opportunity Initiative (DOI), nations can use ICT in several ways: ICT as a production factor, as an industrial production sector, and as a socioeconomic development enabler.

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 revolution and emerging industry in the newly industrialized countries 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

[1] Other forms of divides include: financial, knowledge, confidence, opportunity, poverty, income inequality, etc.

[2] Development infrastructure include: education, technology support, skill training, physical infrastructure like highways, airports, sea ports, water and electric utilities, development banking services, job market training programmes, development institutions and organizations, etc.

economic growth and development of welfare of societies. Thus, establishment of Science and Technology Parks promotes inflow of foreign direct investment, technology transfer, research and development (R&D) and overall economic growth, affecting digital divide. Science Parks and their achievements can also be used to soften the negative effects of economic globalization. A Technology Park strategy focused on export market can produce economic growth, improve balance of payments, and reduce dependence on traditional commodity exports. However, depending on conditions, Science Parks might also have little impact on the development of infrastructure and general economic development of the host country.[3]

China as a latecomer with significant investment in Science Parks, since 1991 the State Council has successively authorized the establishment of 53 Science Parks. In August 1998, National High and New Technology Industrial Development Plan of China (Torch Plan)[4] was launched. Science Parks were clearly included as an important element of the Torch Plan, and it developed rapidly. Following the introduction of a series of measures related to the construction of these parks, they have been developing rapidly, attracting worldwide attention and contributing to a unique development path of industrialization in China. Science and Development Network[5] reports that, China is to build 30 new Science and Technology Parks increasing its stock to more than 80 parks. For analysis of development and performance of Chinese Science Parks see Zheng and Heshmati (2007).

Chinese Science Parks are built on the condition of intellectual integration of capital, skills and technology in an open environment. Mainly supported by domestic infrastructure and foreign technology, capital and management style, they maximize the potential transformation from technical achievement to actual productivity through full absorption of the overseas advanced technology resources. With such effective transformation and absorption characteristics, these parks and the process of their development and conduct serves as a good model for development of Science Parks in other developing countries and regions.

This note aims to propose establishment of Science Parks in Kurdistan. Science Parks are a new phenomenon and especially in developing countries. There is no literature on

[3] For descriptive analysis of Science Parks in a number of countries see Jussawalla and Taylor (2003).

[4] See http://www.most.gov.cn/eng/newsletters/1998/t20041125_17520.htm

[5] Available at http://www.scidev.net/News/ on October 18, 2006.

these parks developed and therefore empirical evaluation of Technology Parks is rare. However, there is sufficient information on the process of establishment of such parks, their operation, performance and possible impacts on economic growth and development. This note has a number of messages to deliver. It views Science Parks as an important element of the new economic policy in the region. It discusses the importance of parks to the Kurdistan economic growth and suggests policy recommendations on establishment of new institutions to enhance the parks performance and their contribution to overall economic growth.

2. Science and Technology Parks

According to the International Association of Science Parks (IASP) official definition, a Science Park[6] 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, R&D 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 Science Parks have played a key role in attracting foreign direct investment and in the flow of investment finances to productive activities and in transfer of management, skills, knowledge and technology to host countries.

The concept of Science Parks originated back in the late 1950s. The Science Parks are usually based around universities and interact continuously with them. The idea is to provide an infrastructure of technical, logistic, administrative help that a young firm needs as it struggles to gain a foothold for its product in an increasingly competitive market (Guy, 1996). The first Science Park was established in Stanford, California, USA, in the 1950s followed by the Cambridge Science Park, Cambridge, UK, and

[6] The IASP definition is based on experiences of Science/Technology Parks in the 63 countries and it ensure the global character of its definition. The IASP definition of “Science Park” encompasses other terms and expressions such as “Technology Park”, “Technopolis”, “Technopole”, “Technology Precinct”, “Research Park”, “IT Park” etc. Although there may be certain differences between them, they share many goals, elements and methodology and therefore come under the remit of this definition. The idea with Science Parks is to provide an infrastructure of technical, logistic and administrative help to young firms to gain a foothold for their products in a competitive market. (IASP International Board, 6 February 2002).

Sophia Antipolis, France, in the late 1960s. In many European countries it was not until the 1980s and 1990s that significant numbers of Science Parks were established (Storey and Tether, 1998).

In Asia, Singapore is one of the early pioneers in developing Science Parks. The idea of a Science and Technology Park was officially proposed in September 1979, when the Ministry of Trade and Industry convened a meeting to discuss the development of such a park with the relevant authorities. Singapore Science Park[7] is now one of the Asia Pacific's most prestigious parks which addresses R&D and technology. Its provides the ideal location and working environment for an exclusive community of a staff of over 8,000 people working for more than 250 multinational corporations (MNCs), local companies, and research organizations.[8]

India is quickly emerging as one of leaders in the field of software engineering and Web-based (outsourcing) services. More and more multinational companies are outsourcing their software requirements to India to retain their competitive advantage. In 1987, the Ministry of Communication and Information Technology (MCIT) through its Software Development Division stepped in and established the Software Technology Parks India (STPI)[9] in June 1990. The communication and information technology sector is a s significant contributor to the export sector and GDP of India.

In China, the Torch Plan was initially approved in 1984 to promote the development of science and education and transform laboratory projects into commercial products thus improving China's competitiveness in the international market. The government saw it as an inevitable step in facing the challenge. In addition, Science Parks accomplished intensive information gathering and concentrated financial and technological strength. After fifteen years of development, Science Parks in China have grown into a large enterprise. By 2000, there were 53 Science Parks in the country, housing 16,000 companies and employing 1.84 million employees. The growing size of Science Parks is an indication of their success and positive impact on economic development. There are plans to build 30 more parks.

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[7] For basic information about Science Parks in Singapore and their development see http://www.sciencepark.com.sg/home/index.asp

[8] Jussawalla and Taylor (2003) present a collection of comprehensive studies analyzing information technology parks of the Asia Pacific and their implication for the digital divide with focus on parks located in China, Malaysia, India, Singapore, Taiwan and Hawaii.

[9] For information on Indian software technology parks see http://www.stpi.in/

Results from a survey of an on-line questionnaire conducted by IASP, sampling 94 Science/Technology Parks, showed that a majority of the currently existing Science and Technology Parks in the world were created during the nineties. However, it is interesting to notice that 18% of the existing Science Parks have been launched in the first 2 years of the new century, which confirms that Science/Technology Parks are a growing phenomenon in modern times. Science Parks differ by size and technology specialization. Large Science Parks occupy a land area of more 100 hectares, while the smallest parks require less than 20 hectares. The majority of existing parks are of a small size.

3. Evidence on the Contributions of Science Parks

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, the expected goal has not been achieved in a satisfactory level. One main reason is limited availability of data and adequate methodologies have not yet been developed. Currently there are no systematic reviews of the Science Parks related methodologies addressed in the literature. The main motivation for the small number of existing studies has been to examine whether the established Science Parks have achieved their goal, as stated in the above definition, or if they merely constitute prestigious real estate developments.

Neoclassical economic growth models (Solow's) relied on investment in capital goods to generate high capital/output ratios. Such investment strategy in practice has resulted in increased debt for developing countries and unbalanced economic growth. In Boumol's model manufacturing is technologically advanced productive and service sector labour intensive and stagnant sectors. A third sector, such as broadcasting and data processing, uses a combination of both human capital and technology factors. Probably we need a new growth model such that it does not fail to consider the role of technology. The link between product flows and information flows in international trade suggests investment in information technology (IT) as a leading factor in the developing countries growth. Information is treated as public goods and a key factor in the development of the socioeconomic system like that in East Asia. Several studies establish relationships between technology applications, capital formation and economic

growth. Therefore the study of IT Parks becomes relevant to the investment policies that are directed towards a rapid economic development.

In several developing countries, during recent decades of new industrial technology policy, market reforms and organizational change, an impressive development is observed. However, despite impressive achievements it is rather difficult to determine with confidence to what extent this economic achievement stems from its technological advancement. If such development is purely a result of low labour cost, the issue of sustainability of economic growth in the long-term is subject to scrutiny. Below we review a number of such studies evaluating the establishment, operation and performance of Science Parks.

There is evidence that participants of the recent wave of globalization have gained significantly by growing faster than those not participating (Heshmati, 2006a). Globalization did not have the expected negative effects on income distribution and inequality (Heshmati, 2006b). In a number of recent studies the positive effects of Science Parks on productivity growth (Zheng and Heshmati, 2007), the positive effects of information and communication technology investment and democratization on the inflow of foreign direct investment (Addison and Heshmati (2004) and Gholami, Tom-Lee and Heshmati, 2006) and positive relationship between productivity growth and innovation (Lööf and Heshmati, 2006) and the dynamism and recent developments in the Chinese economy (Heshmati, 2007) are investigated.

Castells and Hall (1994) found that Science Parks provide an important resource network for new technology-based enterprises. They listed three motivations for establishing Science Parks: reindustrialization, regional development, and synergy creation. Empirical results show that Science Parks have been widely recognized for its importance especially to the development of high-tech industries. The firms located in Science Parks are more likely linked with a local university than off-park firms which promote university-industry cooperation on commercialization and transfer of new technology. For example, the success of Silicon Valley has been the engine of prosperous development of information industry in the United States. The Korean strategy of investment in education, information and communication technology resulted in successful creation of a strong technology base for entry of corporations like Samsung and LG.

Link and Scott (2003) modelled the growth of a Science Park once established, finding

significant effects on growth from the proximity to universities and other resources. According to Chan and Lau (2005), to meet the needs of technology firms during their stages of development, Science Parks' services and support should be prioritized in accordance with the development process of the technology firms. Meanwhile Hansson, Husted and Vestergaard (2005) came up with the conclusion that the new role of Science Parks might be to cater for the development of the social capital necessary for enabling and facilitating entrepreneurship operating in networks.

Lee and Yang (2000) analyzed that as the first hi-tech industry development benchmarking model in Taiwan, it has been appreciated that state support and human resources are the most essential factors in Hsinchu Science Park's (HSP)[10] performance, and the electronics information related industries have contributed mutually through improved management strengths. The authors show HSP's characteristics which have served as a model for establishment of other latecomer Science Parks in Taiwan.

Siegel, Westhead and Wright (2003), analyzed whether university Science Parks are alleged to stimulate technological spill-over. No empirical evidence on the impacts of these facilities on research productivity has been previously available. The authors examine whether companies located on University Science Parks in the United Kingdom had higher research productivity than observationally equivalent firms not located on a University Science Park. The preliminary results appeared to be consistent with the spill-over and productivity hypothesis and robust to the use of alternative procedures to assess relative productivity of parks.

In another related study, Hansson et al. (2005) described that several studies had concluded that Science Parks tended to fail in attracting and developing high-tech companies and had therefore not fulfilled their expected role as catalysts of regional economic growth. Based on two in-depth case studies of Science Parks in Denmark and the UK, they introduced and discussed alternative mediating roles for Science Parks in the science–industry technology relationship. The conclusion was that the new role of Science Parks might be to cater for the development of the social capital necessary for enabling and facilitating entrepreneurship in networks.

Lai and Shyu (2005) in their study have aimed to explore the innovation capacity in two different Science Parks across the Taiwan's Strait. In both Taiwan and Mainland considerable resources are being devoted to Science Parks as policy instruments aimed

[10] See http://en.wikipedia.org/wiki/Hsinchu_Science_Park

at promoting R&D-based as well as innovation activities. They found differences in determinants for innovation capacity between the two parks such as the basic research infrastructure, sophisticated and demanding local customer base, and the presence of clusters instead of isolated industries.

Chen, Wu and Lin (2006) also found that Science Parks have been widely recognized for their importance to the development of high-tech industries. However, as the space availability is limited, selection of firms with better efficiency and/or growth potential in specific high-tech industries to get into the Science Parks has become a critical issue for the Taiwan government. Accordingly, the authors analyze comparative performances of the six high-tech industries currently developed at Taiwan's Hsinchu Science Park. In addition, individual output/input ratio analysis was performed to examine the differences on individual productivity items between the efficient and inefficient industries. The results of these analyses provided policy implications for Taiwan technology development policy.

Fukugawa (2006) in his study investigated the value-added contributions of Science Parks to new technology-based firms (NTBFs). In particular, they focused on whether on-park NTBFs were likely to establish knowledge linkage, represented as joint research, with local higher education institutes (HEIs). They showed that on-park NTBFs exhibit a higher propensity to engage in joint research with research institutes. However, no significant difference was found between Science Parks and other types of property-based initiatives to establish localized HEI linkage.

Performance measurement of Science Parks (SP) calls for more rigorous approaches. The work of Bigliardi et al. (2005) was aimed at providing a sound and theory-grounded methodological framework to the measurement of Science Parks' performance. Based on the analysis of four Italian case studies, the empirical findings partly lent support to previous research and partly added new elements of discussion to the debate. Results show that the evaluation criteria should be aligned with Science Parks, actual mission, major stakeholders commitment, regional economic conditions, legal forms, nature of the scientific competence available within research centres and Science Parks' life-cycle stages.

In general, the above 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.

4. Science Parks in Newly Industrialized and Developing Countries

Countries differ in their behaviour with regards to development and investment intensities and infrastructure build-ups aimed at an IT based growth and development strategy. In addition to the country specific differences, the market forces by themselves will not help to bridge the divide without any government intervention. Thus, government targeted sector specific support and interventions are necessary conditions for a technology based growth and development strategy. For instance the Singapore government in 1993 had monopoly over telecoms and provided high quality service at low cost and attracted FDI, while in Malaysia telecoms were privatized in the early 1980s. The Malaysian telecoms did not benefit domestic digital divide and it did not spread to other regions of the country, but the semiconductor industry became a major supplier in the global markets.

Most of the developing countries have not benefited from the recent decades of technology development and therefore have not much infrastructure and incentives to offer to attract FDI and development of their IT sectors. One example of efforts is the non-for-profit organization of Grameen Telephone in Bangladesh which provides cell phone to businesses in villages to market their products. The founder Muhammad Yunus and Grameen Bank were awarded the 2006 Nobel Prize in Peace “for their efforts to create economic and social development from below”.[11] Following the general failure in aid programmes during the 60s and onwards, all G7 countries have reconsidered their aid strategy to increase aid to education and technology not as a replacement of traditional aid but as a vital and complementary development tool.

The Science Parks in Asia created digital dividend for their governments, people and businesses involved and indirectly help to bridge the divide between urban and rural areas, as well as reduce the global digital divide. It may not be possible to bridge that gap entirely in all level of these societies to provide equal access to technology by creating E-citizens in a cyber democracy. Singapore and Korea have currently almost full (phone and internet) connectivity. The goal with Science Parks is to enable small businesses to flourish in the IT revolution. The policy has been quite successful in these

[11] See http://nobelprize.org/nobel_prizes/peace/laureates/2006/index.html

countries. Below we present a short summary of the development process of Science Parks in Asia. More details on each park are found in Jussawalla and Taylor (2003).

China offers the second largest market for IT equipment and services. The telecom sector has been growing at the rate of 41.6% per annum since 1993. China through its trade related technology transfer, investment in infrastructure and technology upgrading was able to leapfrog from a communication system with Switches to Digital system skipping the Analogue stage of development. China's World Trade Organization (WTO) membership led to deregulation and eased access to international market, capital market and technology. Israel is another example of leapfrogging from a horticulture society to a high technology society bypassing traditional and heavy manufacturing stage of development. IT parks are set up and the market for semiconductors is rapidly growing providing outsourcing services to mainly Taiwanese producers and in an increasing rate to Korean, Japanese and European producers. It is not known whether the government manages to divide the gains in an equitable manner. Inequality is increasing between costal/non-costal regions, urban/rural sectors and poverty despite its declining trend is increasing in concentration in some North West regions. Digital Divide, though, is reducing in the society as connectivity rate is rapidly increasing.[12]

India reformed its telecommunication in 1999. Currently more than 200 of the fortune 1000 companies outsource their requirements to India. The IT industry contributed 2.87% to the GDP in 2002 and its share is continuously growing. Software companies in Bangalore[13] grow fast. India by investing in agriculture in the past missed out the manufacturing revolution, but now it is more adept in the services and technology sectors. Domestic demand for infrastructure is also increasing rapidly. IT is used to bridge the digital divide, but rural telephony penetration is less than 1%. Thus, the poverty reduction impact of technology has so far been negligent. In similarity with China inequality is increasing, absolute poverty decreasing but its concentration in some region is increasing.

Singapore is Asia's foremost knowledge economy. Its citizens received a state-of-art education and were at an early stage ready for participation in the global economy. It has a 4.4 million multi-ethnic population, living in 660 square km and hosts over 4000 MNC with large per capita volume of international trade. Telecommunication and

[12] For description of the Torch programme see http://www.chinatorch.gov.cn/eng/other/Mission.htm

[13] For detailed information on the development of the software-India Bangalore and Kalkata see http://www.tatvasoft.com/outsourcing/2006/01/software-india-bangalore-and-kolkata.html

information technology[14] are important factors to enhance investments. All households were connected to broadband before 2000. The electronics sector accounts for the majority of exports. The gross national income (GNI) per capita was $27,490 in 2005. The business climate, government support and development of human capital are important factors to the economic development in Singapore.

Unlike Singapore, the Taiwanese government's role in the Science Park is moderate. The government built a large foreign reserve together with low international loans which sheltered the country from the Asian crisis. Taiwan is the main producer of notebooks and China produced 36% of Taiwan's hardware. Changes were introduced in 1996-1997 in the protected telecommunication industry. The small and medium enterprises (SME) sector is minimal regulated and it contributes largely to the export sector. In 2001 Taiwan joined the WTO improving its competitiveness and the country wishes to join the Organization for Economic Cooperation and Development (OECD) to strengthen its high-tech exchanges with rest of the world.

Malaysia was the first attempt to replicate the US Silicon Valley model in a developing country environment. It invested heavily in human, physical and information technology infrastructures. Malaysia privatized the telecommunication sector and strong emphasis was placed on the expansion of the telecommunication infrastructure. The Multimedia Super Corridor (MSC)[15] is the flagship of Malaysia's vision 2020 for the digital economy. The MSC attracted FDI and venture capital. Development programmes and applications supported by the government are: electronic government (E-government), telemedicine, distance learning, E-learning, remote manufacturing, multimedia customer service, financial services, multipurpose smart cards, smart schools and several other functions.

5. Technology Policies of Science Parks in Kurdistan

5.A Basic Conditions to Establish Science Parks in Kurdistan

In general Science Parks can play an important role at any development environment. They are necessary to establish and develop an industry base with high and new technology, to accelerate skill and technology achievements and necessary

[14] See the website of Singapore Information Technology Federation http://www.sitf.org.sg/index.aspx

[15] See http://www.msc.com.my/

transformations, to implement a trade policy influenced by technology, to raise high and new technology enterprises and entrepreneurs, and to transform the traditional industry to modern style. Those Science Parks congregate technologies involved in electronics, information technology, biomedicine, new materials, advanced manufacturing technology, engineering, new energy and energy saving technologies, environmental protection and advanced agricultural technology. A Science Park should take each kind of technical enterprise incubator as a core activity. It should utilize the facilities and organizations in an effective way and provide services including research and development, information, financial resources, guarantees, appraisal, human resources, supports related to trade, law and international exchange to establish a well functioning infrastructure for technology transfer, radical and incremental technological innovation and commercialization incubating system.

The Federal Region of Kurdistan with a small population but rich natural resources, should promote new economic activities and new markets to establish a manufacturing base for national and MNC in the region. Implementation and successfulness of such 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 invest in infrastructure to meet its priorities. The policy should aim at transforming the agriculture based production structure to an export oriented manufacturing, and a domestic oriented services and information sectors. Establishment of Science Parks will serve as a R&D 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 connectivity. Shortage of high skilled labour is a limitation. A Science based Industrial Park placed in proximity of technology universities might be an effective way to promote local higher education and to lure foreign educated engineers and scientists to attract domestic and foreign investors. It can also serve as a favourite and safe location with necessary services for investors and a home for high-tech manufacturers, financial institutions and commercial services.

5.B Policy Reforms and Incentives to Jumpstart Technology Development

In order for the Industrial Park to be successful and develop into a high-tech sector, a number of policy reforms including introduction of a science and technology programme are required to facilitate a jump start of the region's technology sector. The Science and Technology programme once initiated should have the objective to promote the development of science, education, commercialization of products and processes and to increase competition in the market and raise the competitiveness of firms in the Middle-East region. The Parks should be strongly supported in various ways by the government and also by initial phase of special tax policy incentives and export-linked tax-relief programmes especially to MNC and national SMEs. In addition the state should provide services and adopt flexible measures such as free travel for enterprise representatives. Incubators also will be developed to provide opportunities to SMEs for their products and research abroad. The aims of the proactive policy on Science Park development are: to increase the manufacturing share of GDP, to help in the transformation of the Federal Region, to attract joint venture capital and technology, to create employment opportunities in particular for young and newly educated workforce, to reduce drain brain, and in sum to serve as a facilitator of the market economy. It is important that the park should be located outside major cities to make their administration practical and effective, but yet located near major universities and research institutes.

Establishment of Science Parks is a modern approach of ICT based economic development. The policy will include development to reduce inequality, to create conditions for a balanced development, to develop internal resources, to integrate in global economy, to have a strong government role, and to use available resources and R&D potential as a foundation for improvement of the living conditions and welfare of the citizens in the region. Foreign investment in form of wholly or joint venture ownership will play an essential role in the region's technology park's development, in its finances, in access to technology, in stock of technicians and expertise and in its operation. A Science Park creates an environment for technology transfer and attract FDI and further development. The reasons for FDIs significant role in the whole process are: investment scales due to high fixed costs, foreign companies bring in operation expertise, Kurds learn effective management, improving work environment effects, training is another positive effect of FDI inflows, research intensity and spill-over effect, and product quality promoted competition. In sum the high-tech parks are: major

contributors to the regions economy and impact: economic development, technology transfer, social structure with high value products and high-paying jobs, and human resources and talents are used more effectively.

5.C Challenges Facing the Science Parks

The possible challenges facing the parks could be: establishment of parks which do not attract sufficient domestic and foreign capital; high reliance on public funding from the government as the only initial source; cooperation vs competition in research and development is a good strategy to share information and common public resources; but legal protection for intellectual property is not adequate in this part of the world deterring corporations to invest in development of new products and processes; and the lack of development banks and a premature conditions for venture capital investment market is another serious constraint.

Once a decision is made and resources for the establishment of a Science Park is allocated, the main factors driving the future development of the parks include: strong and growing demand especially those for building up public infrastructure in the region; the policy should favour a number of key domestic corporations which should lead and drive the development process; the parks might drain capital and other resources from the capital market but contributing little to the economic growth making efficiency in resource utilization a precondition for establishment of Science Parks; the number of local companies growth and product localizations will be further reinforced by the adoption of a Western style management philosophy and practice in production; product life cycle and commercialization time will be shortened; and quality of products and services to be improved by for instance intensive on job training programmes.

During the pre-federal period, the regions economy was organized around agriculture and to some extent oil industries, manufacturing’s contribution was negligible. After the formation of the Federation, the diversification of the economy and searches for changes and business opportunities has become more intensive. Import of all kind of intermediate, production material and consumption goods has increased drastically. The Regional Government’s new economic policy has the objectives: to reduce inequality and poverty by increasing income and employment, building up productive infrastructures, and to increase security and self-sufficiency by promoting local production. However, in practice during a transition period it is hard to achieve such

objectives. In sum it is desired that the future policy should involve sustainable transformation of the agriculture and import dominated economy to a manufacturing based economy. In addition, the policy should contain sub-goals such as: to achieve development, security, mature democracy, a society characterized by high morals, scientific, united, caring and just, and in total a competitive economy. The essential elements of the policy reform to transform the economy should include: overview of the liberalized trade, a technology policy that is designed such that it promotes technology transfer, sound investment environment and financial policies, a gradual deregulation, with elements of active and selective investment promotion policies, rationalization and coordination policies to make resource utilization effective, promotion of SME to generate employment and entrepreneurship, emphasis on education and technology policies, and finally a sound health and environmental management.

A transformation of the economy should be through a process of gradual and controlled liberalization, encouragement of FDI, allowing establishment of protected industries, careful designed and legally investigated contractual relationship between national and MNC and the regional government concerning utilization of natural resource, and active creation of conditions for cooperation between domestic and international enterprises. It might turn out that, in the long run the economy emerge as an attractive outsourcing destination to companies in the region, in their attempts to utilize the Kurdistan regions human resources. Cost effectiveness, quality, high reliability and rapid delivery and state of art technologies might become precondition factors of competitive advantages.

As part of a forward looking mindset state policy it is desired: through regulations and resources to link university to Science Parks and by exchange programmes where students and Kurdish professionals residing other countries are expected to bring back some of the culture of dynamic entrepreneurial and academic environment. The state must play a key role in public-private collaboration and the forces of globalization in the economic development. The state has been the main force of development of Science and Technological capacities. The causal relationship between investment in Science and Technology and economic growth is assumed but not fully proofed. Other factors important to the economic growth are: sustainable economic growth, proactive planning, the emphasis on IT, the role of Science Parks as location for R&D, the relationship between universities, corporations and government, increased globalization, the role of public interest groups and organizations. The small size of Kurdistan Region should guide the leaders to put emphasis on manpower development and human resource

development. Formation of Science Parks and public Science and Technology Institutes is a reflection and will be an outcome of this particular development policy and strategy.

5.D The Process of Establishment of Science Parks

A committee should be created to advise the government on problems of science and technology. The primary role of the 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 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 conductive climate for investment in research and development; promote creation and access to soft and physical infrastructure; creation of science culture in corporation and academic societies; and non-separation of science and technology.

In summary the policy should follow the Japanese model of development in promoting science and technology. The policy should not rely on free, unregulated market forces, but on carefully calculated and designed government policies to strengthen private incentives rather than to displace them. The model has been successfully adopted in Korea, Taiwan, Malaysia and Singapore in a much shorter time. China in similarity with Korea might be able to implement the model in less than 25 years. These economies used IT as integral part of a centrally planned economic growth strategy, where the state employed a model of aggressive effort in strengthening indigenous advanced technologies. The economic development emphasis shifted from labour intensive exports in 1960s to high technology and knowledge intensive industry in 1970s, 1980s and 1990s.

The critical factors to the Park's successful operations are: location advantage concerning access to spaces 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 problem; 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 transformation 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.

In this note I have proposed establishment of Science Parks in the Federal Region of Kurdistan and discussed briefly necessary conditions for such combined private-public cooperative investment to be fruitful and with expected impacts on the region's economic development. The Kurdistan region in recent years as a result of economic sanctions have participated involuntary in the globalization process. There is evidence that participants of recent wave of globalization have had a higher growth rate than their non-participant counterparts. Contrary to expectations, globalization did not have the expected negative effects on income inequality. Science Parks are found to have a positive effect on productivity growth. Investment in information and communication technology and innovation also positively affect the inflow of foreign direct investment and productivity growth.

Kurdish society has been rapidly transformed into a semi-information society where knowledge and information increasingly plays a significant role in production and services in the region. Experience shows that leapfrogging in the use of state-of-art information and telecommunication technologies is a possibility. Thus, access to extended digital technology for Kurdistan is both a challenge as well as an opportunity for rapid development. However, prior to a decision on establishment of Science Parks, it is required to study in great details the organization and operation of some Science Parks in East Asia and in particular those in China. This will allow the decision makers to have a clear picture of the human, financial, organizational, and land resources required, policy options and possible problems faced and their remedies.

6. Summary

Neoclassical economic growth models have relied on investment in capital goods; in practice such investment strategy has resulted in increased debt for developing countries and unbalanced economic growth. 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. The link between product flows and information flows in international trade suggests

investment in information technology as a leading sector in the developing countries growth. Information is treated as a key factor to the development of their socioeconomic system. 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. However, 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 production capacity and capability of the labour force to achieve a sustainable knowledge based economic development in the long-run.

This essay proposes establishment of Science Parks in the Federal Region of Kurdistan and discusses necessary conditions for such investment to become fruitful and with expected impacts 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. There is limited evidence that leapfrogging in the use of state-of-art information and telecommunication technologies has been possible. Thus, access to extended digital technology for Kurdistan is both a challenge as well as an opportunity. However, prior to a decision on establishment of Science Parks, it is required 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 necessary infrastructure to attract direct foreign investment, technology and management. This will allow us to have a clear picture of the human, financial, organizational and land resources required, policy options available, possible problems faced and their optimal solutions.

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