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by

Shandre M. Thangavelu and Hu Guangzhou

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Lessons from "Benchmark" Countries: Korea & Ireland

Shandre M. Thangavelu[1] and Hu Guangzhou[2]
Singapore Centre for Applied and Policy Economics (SCAPE)
Department of Economics
National University of Singapore

[1] Singapore Centre for Applied and Policy Economics and Department of Economics. Email: ecssmt@nus.edu.sg
[2] Corresponding email:ecshua@nus.edu.sg
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1. Introduction

Rapid global technological changes have resulted in an increase in the demand for workers with higher education. Not only is this trend identified in OECD countries, but it is also observable in most East Asian countries. In response to the intensification of competition caused by the emergence of China and India, many East Asian countries have to restructure their economies to produce more skilled- and capital-intensive goods to remain globally competitive. This shift in the industrial structure has greatly increased the demand for skilled labor, creating significant skills shortages and mismatches as the workforce try to upgrade their skills level to meet the demand. The problem of skills shortages and mismatches is especially acute in Malaysia as indicated by the Investment Climate Survey Report by the World Bank in 2005 (ICSR 2005).

The objective of the paper is to study the problem of skills shortages and mismatches in the Malaysian economy. By making reference to policies adopted by the best-practice countries of Ireland and Korea, the paper suggests various institutional and policy levers that could address the skills shortage problem in Malaysia. Both Ireland and Korea are open economies that have successfully tackled the skills shortage problem faced by their economies and have adjusted their industrial structures to produce higher value-added activities.

2. Structural Changes and the Importance of a Skilled Workforce

As competition to attract foreign direct investment has intensified in the Asian region with the emergence of China and India, the more advanced developing countries in East and Southeast Asia are restructuring their economies towards more technology- and innovation-intensive production to sustain their global competitiveness. To maintain competitiveness in export markets and to attract foreign multinational corporations, these countries must increase their overall human capital in terms of the available skilled workforce and boost their indigenous knowledge capital through R&D investments.

The key fundamentals of an innovation-based economy are driven by human capital and the innovation system. Human capital is itself determined by factors such as the general education level of the labor force, the level of technology-specific skills acquired by the workers and the adoption of globally competitive educational policy in the domestic economy. The innovation system of the economy is driven by the level of research and development, the adoption of policies that are conducive to national innovation, and also by the level of infrastructure investments in new technologies. The effects of human capital and innovation systems are not mutually exclusive. There are strong complementarities between human capital development and innovation systems, which are determined by the absorptive capacity of the domestic economy in terms of its human capital and the level of innovation and technological developments in the economy. In addition, innovation systems are also

determined by the institutional regulatory framework such as the educational institutions, financial support for private sector innovative activities such as venture capital markets, infrastructure investments such as technology hubs, and intellectual property rights framework in terms of patents and copyrights.

Besides global forces, the sustainable growth in the economy is also determined by the balanced growth in both human capital development and innovation systems. The lack of human capital and indigenous technology will impede structural changes of the domestic industrial structure to higher value-added activities, and thus create an acute shortage of skills.

3. Structural Changes in the Investment Climate in Malaysia

Malaysia's economy has been growing at an annual real rate of 6.6 percent for the past three decades. The strong economic performance, however, is attributable mainly to physical capital accumulation and less to total factor productivity growth (TFPG). In fact, the contribution by TFP growth to per capita growth has been declining over the past two decades, where the contribution of TFP growth to per capita GDP growth dropped from 30 percent for the period 1960 – 1980 to 12.5 percent for the period 1980 – 2000 (ICSR 2005). Also, Malaysia has lagged behind Korea, Singapore and Thailand in terms of both labor productivity growth and TFP growth.

The Investment Climate Survey Report produced by the World Bank in 2005 (ICSR 2005) had highlighted three major concerns of firms operating in Malaysia: 1) shortages of skilled labor, 2) regulatory burdens and 3) macroeconomic uncertainty. The report also pointed out that the weak innovation capabilities of Malaysian firms were hindering the country's productivity growth.

The skills shortage problem specifically relates to deficiencies in the areas of English language skills, ICT skills, and professional and technical skills. One of the causes of the problem could be traced to the Malaysia's tertiary education system. The enrolment and completion rates for higher education of the country are substantially lower when compared to countries with the same level of income. The ICSR 2005 highlighted that 70 percent of the managers surveyed had identified the insufficient supply of university graduates as the main cause of skills shortage. As a result, diploma holders were often used in jobs better suited for graduates. This mismatch between education and skills required by the labour market was reflected by the fact that 14 percent of workers did not have the relevant education background for their work (ICSR 2005). The problem was further aggravated by university students not choosing the fields of study that were of relevance to the industries and the low incidence of training among firms, notwithstanding the fact that Malaysia possesses a good skills-development infrastructure. Finally, the strict regulations and controls on importing foreign skilled labor have further exacerbated the country's skills-shortage problem.

The ICSR 2005 also pointed out the lack of innovative readiness among the Malaysian firms. The lack of innovative readiness stemmed from 1) a lack of commitment to technology-based development, 2) a weak educational system, 3) a

weak policy to attract foreign investment, 4) a lack of capability to produce technology-intensive products, 5) a lack of scientific and engineering manpower and 6) a weak R&D relationship between industries and tertiary institutions.

4. Structural Changes and Economic Growth: Ireland, Korea, and Malaysia

4.1 Beveridge Curve Analysis

The comparative analyse of the skills shortages in Ireland, Korea and Malaysia was undertaken with a Beveridge Curve. Analysing the unemployment and vacancy relationship in the labour market (the Beveridge Curve) can reveal essential information about the flexibility and the current state of the labour market due to cyclical and structural changes in the domestic economy[3]. The negatively sloped relationship between unemployment rate and vacancy rate, known as the unemployment-vacancy (*u*-*v*) curve or Beveridge curve, highlights that in an imperfectly competitive market, the matching of demand for, and supply of labour at given wages is impeded by imperfect information and structural differences with respect to qualifications, region or occupation[4].

The secular stability of the Beveridge curve is essential in determining its usefulness in distinguishing between Keynesian causes of unemployment on the one hand and structural and frictional unemployment on the other. Since the curve is independent of the business cycle, movements along the curve can be interpreted as changes in factors that generate Keynesian unemployment, while shifts in the Beveridge curve rightwards can be regarded as due increases in structural discrepancies and frictions causing additional unemployment. The *u*-*v* curve could also shift due to industrial mismatch. The structural composition of demand for labour reinforced by limited substitutability of skills between industries is expected to shift the *u*-*v* curve outwards.

The position of the Beveridge Curve from the origin could also reveal important information on the current state of the labour market. For example, there will be high level of mismatch and skill shortages when both vacancy and unemployment rates are both very high and the Beveridge curve is located at the north-west quadrant in the unemployment-vacancy diagram (see Figure 1). Conversely, there is high level of efficient in the matching technology if the curve shifts towards the origin and the workforce is able to meet the vacancies and job requirements of the firms. The economy is also experiencing high level of efficiency and job creation when the Beveridge Curve is located at the north-east quadrant, where the economy is experiencing high vacancy and job creation with low unemployment. In this case, the economy is creating more jobs than that could be taken up by the workforce and most of the unemployment will be frictional in nature. The structural and skill mismatches are likely to be observable when the Beveridge Curve is located at the South-East quadrant where the unemployment rate is higher than vacancy rate. In this case, there

[3] Empirical studies on the existence of Beveridge Curve for the US and UK economy are provided by Blanchard and Diamond (1988) and Jackman et. et (1989) respectively. Recent evidence of the Berveridge Curve for East Asia is given by Teo, Thangavelu, and Quah (2005) and Tse, Leung and Chan (2002).

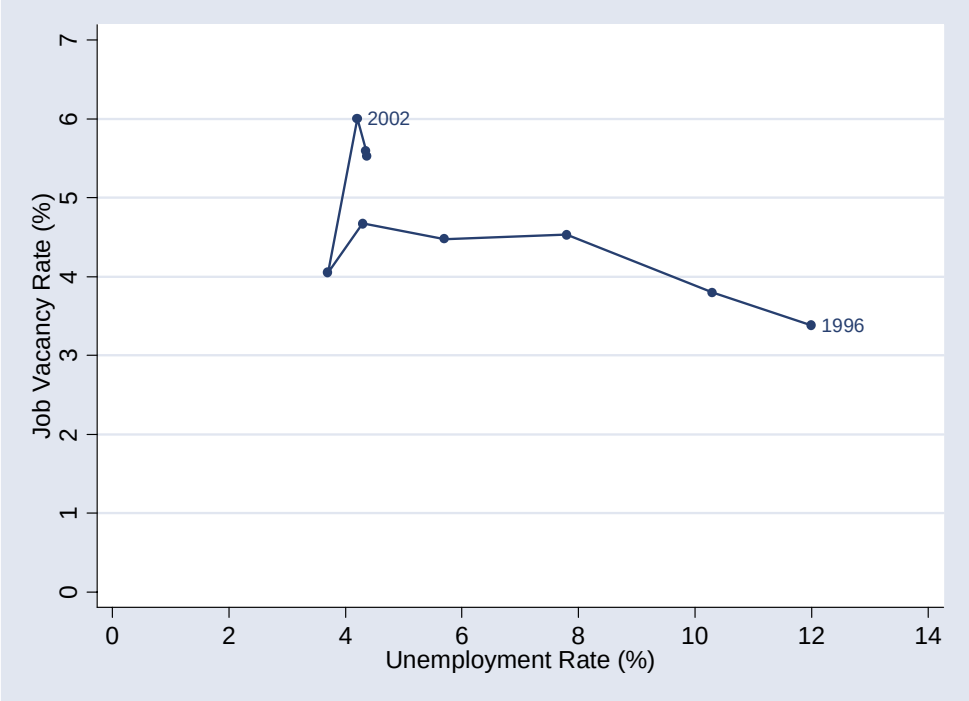
[4] U = (unemployed / (labour employed + unemployed))*100, V = (vacancies / (labour employed + vacancies))*100

are jobs available but the workers are not able to match the job created with their skills and thus are structural unemployed.

The Beveridge Curves for Ireland, Korea and Malaysia are given in Figures 1, 2, and 3 respectively. The Beveridge Curves for Ireland and Korea tend to show significant upward movement along the curve with significant drop in unemployment rate and improvements in vacancy rate after the 1997 Asian crisis.

The Beveridge Curve for Ireland is given in Figure 1. The Beveridge Curve for Ireland shows that the country was experiencing some mismatch problems in the mid-1990s where the unemployment rate was higher than the vacancy rate. By 2004, there is a subsequent movement along the Beveridge Curve that allowed the economy to experience lower unemployment with high vacancy rate, thereby indicating that Ireland has successfully overcome the mismatch and skills-shortage problems in its labor market in the early 1990s.

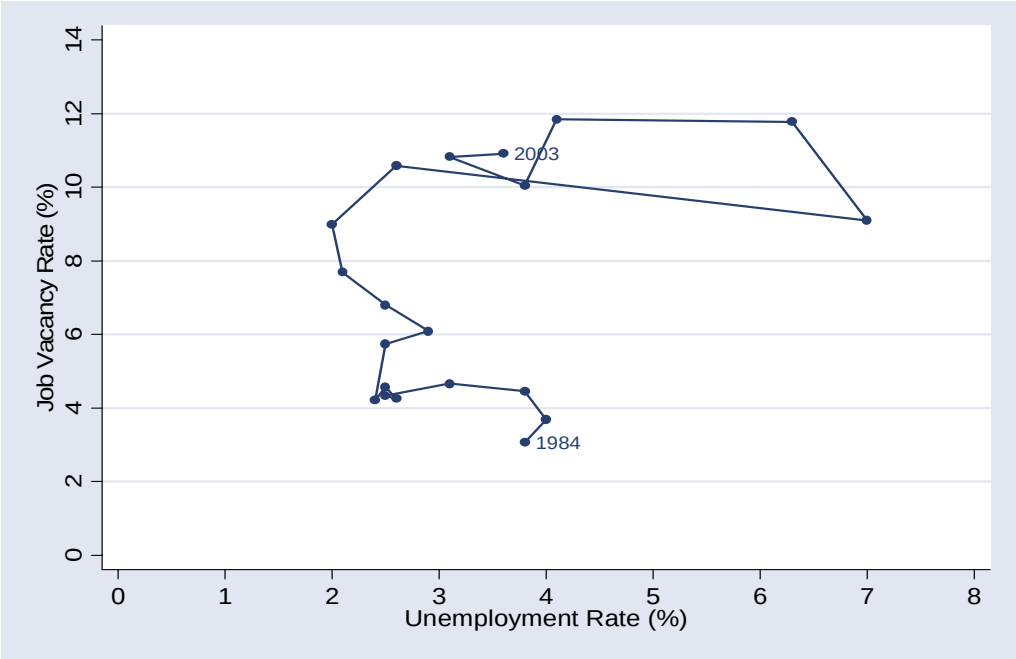
Figure 1: Beveridge Curve of Ireland (1996 - 2004)



Korea also restructured its economy to higher value-added activities in the 1980s. An unemployment rate of nearly 4 percent with a vacancy rate of around 2 percent in Figure 2 for Korea was observed in 1984. The Korean labour market responded well to the structural changes in the domestic economy by moving up the curve until the Asian Crisis, reducing the unemployment to less than 3 percent with a vacancy rate of 10 percent in 1996. This indicates that there is strong job creation in the economy and tightness and excess demand in the job market. The impact of the Asian crisis suggests that there was a significant shift in the industrial structure with the unemployment increasing to nearly 7 percent for the Korean economy. Again, the

Korean labour market was able to respond successfully to the structural changes in the economy by moving up the new curve by reducing unemployment rate and achieving similar vacancy rates to the pre-crisis level of 1996.

Figure 2: Beveridge Curve for Korea (1984-2003)

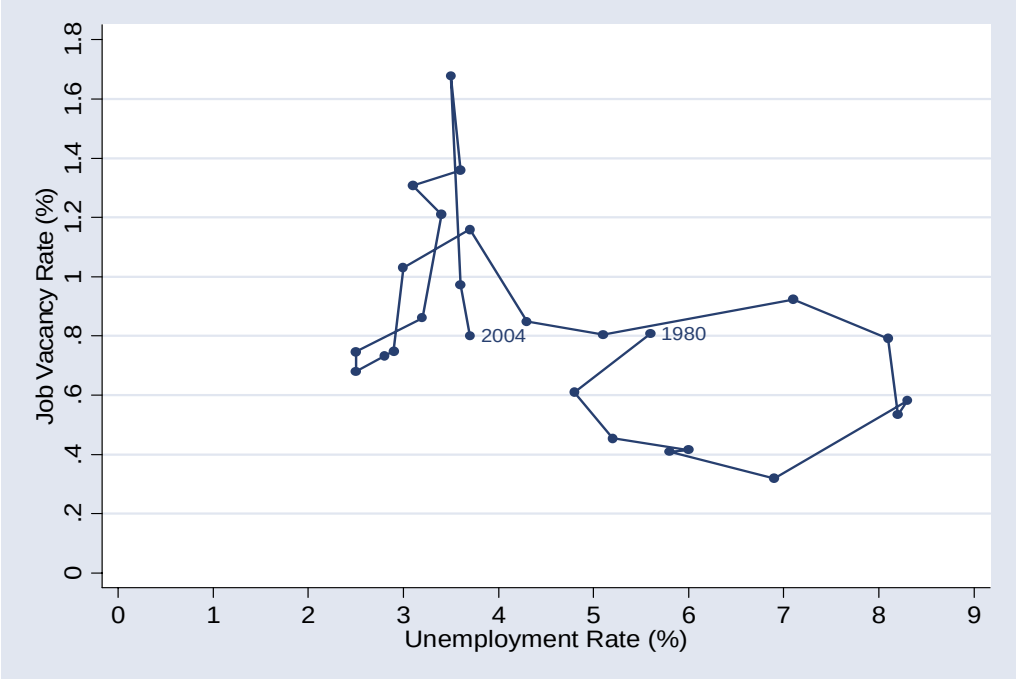


The Beveridge Curve for Malaysia in Figure 3 shows evidence of some mismatch problems in the mid-1980s when the economy was adjusting structurally to produce goods and services that were more labor- and capital-intensive. The Malaysian economy seems to have experienced a significant unemployment rate in the 1980s as unemployment rate exceeded 7 percent in the mid-1980s. This is again a significant period for the Malaysian economy as it structurally adjusted to higher value-added activities in labour and capital intensive production. This was reflected by the rising share of the manufacturing sector and the falling share of the agricultural sector, where the share of agriculture fell from 20 percent in 1980 to less than 10 percent in 2000. In contrast, the share of manufacturing increased from nearly 20 percent in 1980 to over 30 percent in 2000. This indicates that the demand for labour intensive and semi-skilled workforce for the manufacturing sector was supported by the inter-sectoral movement from the agricultural sector.

The country also responded well to the changes in the demand for skilled labor in the 1990s with falling unemployment and rising vacancy rates. We can observe that the Beveridge Curve for Malaysia has shifted to the North-East quadrant in the unemployment-vacancy diagram in Figure 3. The positive response of the labour market in the 1990s is reflected by the movement upwards along the Beveridge Curve.

But since the early 21st century, the vacancy rate has been falling significantly with the unemployment rate showing some gradual increases. This indicates a potential problem of structural unemployment and skills shortages in the domestic labor market. In fact, the vacancy rate is falling below 1 percent with unemployment rate marginally increasing to nearly 4 percent. The falling vacancy rate with rising unemployment rate indicates potential problems of structural unemployment and skill shortages in the Malaysian labour market. This shift in the Beveridge Curve is also in line with the structural changes in the Malaysian economy as it moves up the higher value-added activities to more skills, capital and technology intensive production.

Figure 3: Beveridge Curve for Malaysia (1980 – 2004)



4.2 Productivity Growth Comparison

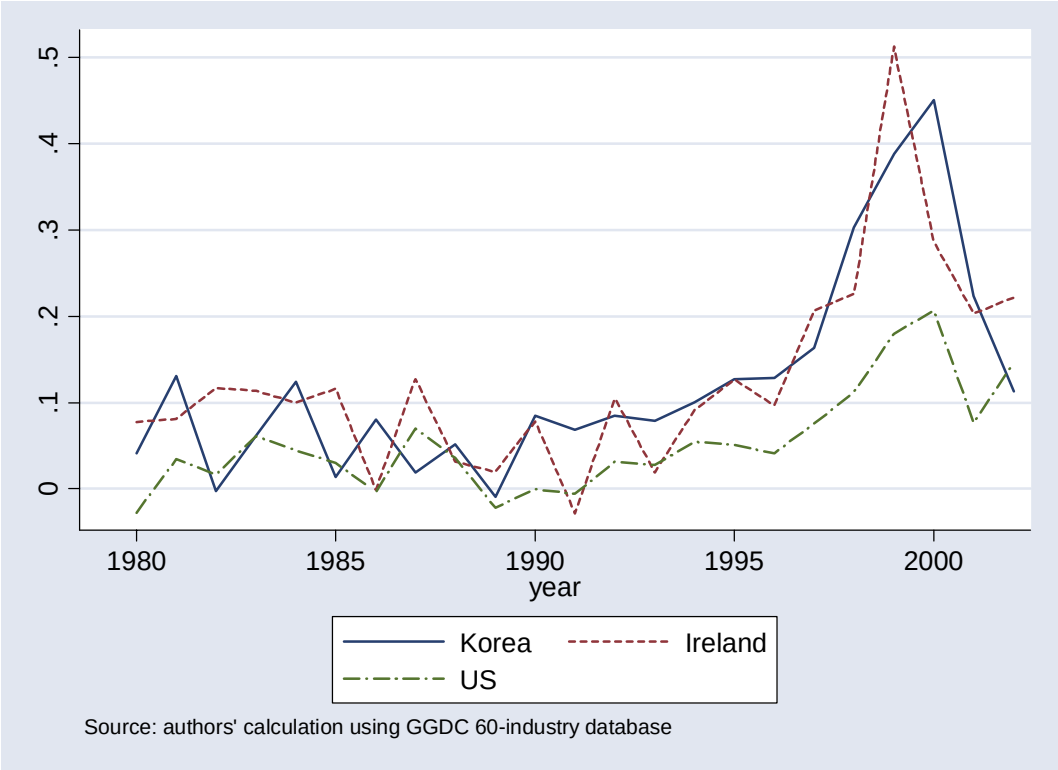
Malaysia has experienced a secular decline in labor productivity growth since the mid-1990s. Although both Korea and Malaysia were affected by the Asian financial crisis, Korea's TFP growth rebounded in a more robust and expeditious way than Malaysia's.

We seek to understand structural changes in the Irish and Korean manufacturing sectors and their implications for productivity growth by analyzing productivity performance at the industry level. We use a data set the Groningen Growth and Development Centre has assembled from the OECD's STAN database[5]. It comprises data for 60 industries that span the entire economy of OECD countries. We focus on the manufacturing sector, i.e., two-digit industries from 15 to 37 (ISIC rev 3).

[5] More information about the data set can be found at http://www.ggdc.net/dseries/60-industry.html.

We classify the manufacturing industries into four sectors according to the degree of technological sophistication: low-technology, medium-low-technology, medium-high-technology, and high-technology. Our classification is based on the OECD definition of the four sectors[6].

Figure 4: Labour Productivity Growth



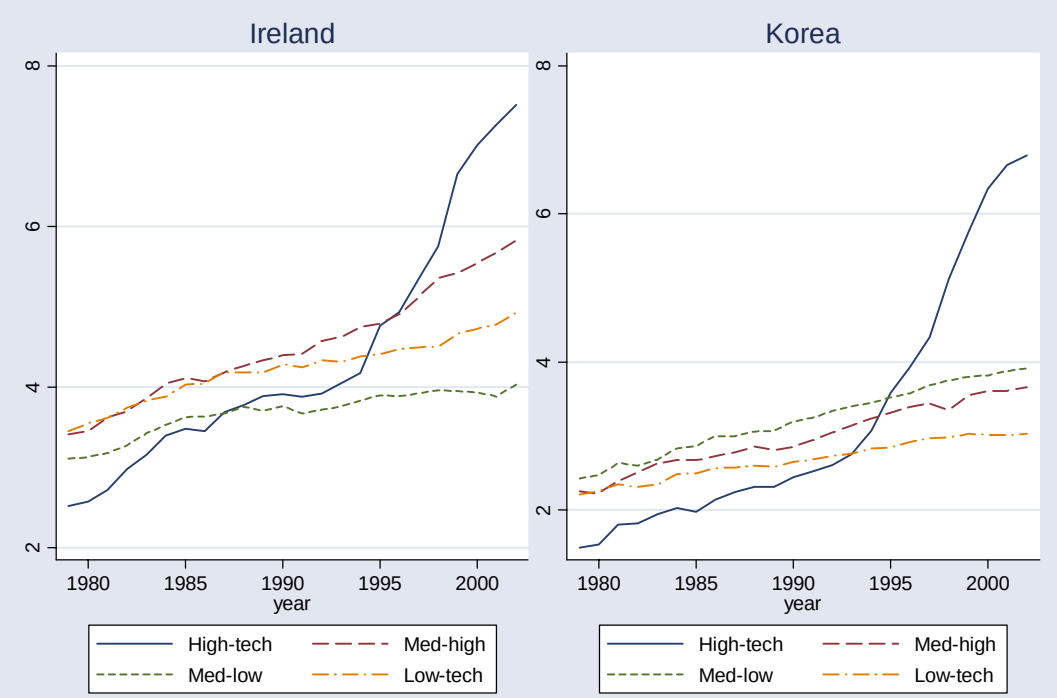
Source: authors' calculation using GGDC 60-industry database

The ability to move from a low technology economy to a high technology one is the inevitable path to sustained economic prosperity. Ireland and Korea have developed strong manufacturing industries. This is reflected in the two countries' manufacturing labor productivity growth, which has out-performed that of the US (see Figure 4).

Analyses of industry-level data given in Figure 5 show that the high-tech sector commanded the lowest labor productivity in both economies in the late 1970s, while the low-tech sector had the highest and the second highest labor productivity in Ireland and Korea, respectively. But in 1995, labor productivity in the high-tech sector overtook the other three sectors.

[6] http://www1.oecd.org/publications/e-book/92-2003-04-1-7294/annex-1.htm

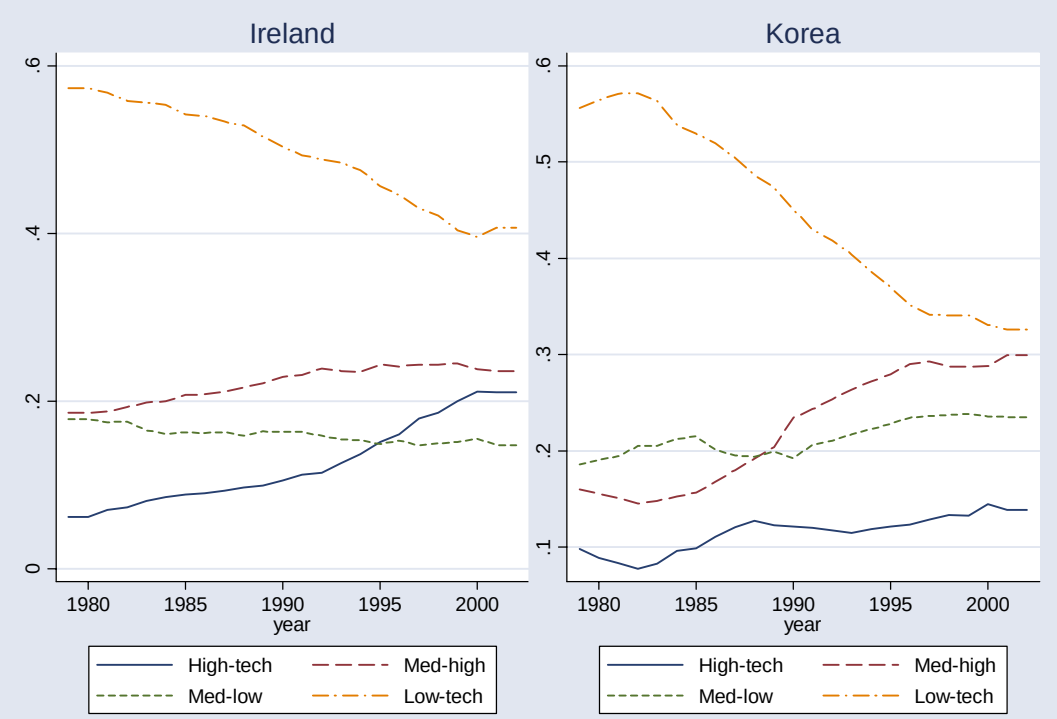
Figure 5: Manufacturing Labour Productivity by Sector



Note: Variable plotted is the log of value added per worker.
Source: authors' calculation using GGDC 60-industry database

The shifting of comparative advantage in both countries is also reflected in the shares of the four sectors in total manufacturing employment as given in Figure 6. In the late 1970s, although low-technology manufacturing had the highest level of labour productivity, its share in total employment started declining. By the end of the sample period in 2002, low-technology manufacturing only employed 40 percent of Ireland's total manufacturing labour force down from nearly 60 percent in 1980. In Korea, the decline was even more dramatic - from nearly 60 percent in the early 1980s to just over 30 percent two decades later. Parallel to the decline of the low-technology sector is the increase of the shares of high- and medium-high- technology sectors. In Ireland, the share of high-technology sector doubled from under 10 percent to 20 percent in twenty years.

Figure 6: Employment Share by Sector



Source: authors' calculation using GGDC 60-industry database

4.3 The Irish and Korean Experiences: Accumulation of Human Capital

4.3.1 Korea

Korea's education policy has changed over time to meet the demand for skills and talent that the new economic structure demands. Kim (2005) notes three distinct stages of the Korean economic development and the key features of Korea's economic structure and education policy in each stage are summarized in Table 1. The country has gone through three distinct stages of economic development. Each stage calls for a different mix of education policies. At the initial stage of economic development, the country's comparative advantage was in labor-intensive production. The key education reform was to ensure a sufficient supply of workers with basic skills: the ability to read and write and understand and follow technical instructions. The country achieved this by expanding general education at the primary and lower secondary level and vocational training and education. In 1967, the Korean government enacted the Vocational Training Law to allow the establishment of more vocational training institutes. In order to improve the quality of skilled manpower, the government implemented the National Technical Qualification Testing System in 1973. The passage of the Basic Law for Vocational Training in 1976 required companies to provide in-plant training. Failing to do so would result in the paying of a levy.

Table 1: From imitation to innovation: Korea's education policy			
Stage	Economy	Major Industry/ Exports	Education policy mix
1960s – mid-1970s	Take-off & Export-driven in 60's; export acceleration in early 70's	Light manufacturing goods(clothing, textile, shoes, etc); Electronic goods (television, radios)	Expansion of primary and lower secondary education; school equalization policy emphasis on vocational education and training (VET) (late 60s); separate VET track; limited access to university education
Mid-1970s -- late 1980s	Structural adjustments in late 70's: from imitation to innovation in 80's	Heavy & chemical industry; Iron industry, shipyard, precision manufacture	Expansion of upper secondary education; strengthening junior college and open university; expansion of higher education
1990s – present	Knowledge-based economy by mid-90's	Semiconductor, information & communication technology; Computers, cellular phone, memory chips	Establish life-long learning infra-structure; promote deregulation and diversity; curriculum integration and school diversification; employment insurance system; cyber university; and credit bank system.

At the second phase of economic development, the country embarked on a massive government-directed industrialization effort to steer the economy toward chemical and heavy industries. The focus of education policy at this stage was the expansion of upper secondary and tertiary education. Vocational training remains a top priority, though. The government expanded the enrolment in higher education in the 1980s due to social pressure. This caused enrolment in vocational, secondary schools to decline. A similar trend was also observed for in-plant training. This resulted in a shortage of production workers, especially in small- and medium-sized companies.

The current stage of development, which began in the mid-1990s, has seen the country establish a strong foothold in high-tech industries. The emphasis on education policy should be placed on strengthening the links between schools and industries, establishing infrastructure for life-long learning, having a competitive higher education system. To strengthen the links between schools and industries, especially in the areas of technical education and training, a system called the "Two-Plus-One" Program, which comprises two years of vocational education in schools, followed by a year of practical hands-on field training, was introduced in 1994.

In 1995 the Presidential Commission for Education Reform proposed the second Education Reform Program. Vocational education was reformed with the objective of

encouraging life-long vocational training. To achieve this goal, part-time registration to college was allowed on a test-based system. Students in vocational senior secondary schools and workers in industry were able to continue their education. Furthermore, these students had priority in the selection process for entry into colleges in related fields of study.

The Korean government initiated the Brain Korea 21 project to attempt to transform the country's universities into world-class institutions of higher learning. The government invested $1.2 billion in universities with three-quarters of the budget being used to support graduate schools in certain fields in the natural and applied sciences, humanities, and social sciences. Part of the budget was also used to provide a supportive educational environment for graduate students in the form of stipends, financial support for overseas study and research infrastructure.

Another lesson that can be drawn from the Korean case is that a systematic effort was made to link up the different components of the economic structure to the educational institutions. Over the years, higher education in Korea has evolved into a dual system: a few elite organizations setting the benchmarks and operating outside the organizational boundaries of the established system and mass higher education. A good example is the establishment of the Pohang Institute of Science and Technology (POSTECH).

4.3.2 Ireland

Being a small and open economy, Ireland is more vulnerable to external shocks compared to Korea. Thus, the mix of policies that Ireland employed to overcome its skills shortage also differs slightly from that of Korea. The ingredients of Ireland's economic success were identified as: 1) sound macroeconomic policy; 2) low corporate tax rates; 3) the presence of efficient government institutions, such as the Industrial Development Agency; 4) investment in ICT; 5) strategic location in the European Union, with an English-speaking population; 6) the existence of an education system that is integrated with global demand; 7) an open immigration policy; and 8) a centralized wage-bargaining system (Barry, 2005; Honohan & Walsh, 2002; Fortin, 2000).

Like Korea, Ireland's education policy has been one of the key factors for its economic success. The country has had the highest percentage of population with tertiary education. It also has one of the highest numbers of science and engineering graduates per 1000 persons of the population. This largely had to do with a major educational policy in the late 1960s that made secondary schooling free for all school-age youths, as "the fee-paying aspect to secondary education prevailing prior to reform was a major hurdle for families" (Denny and Harmon, 2000). The provision of free secondary education in the late 1960s has definitely contributed to this spectacular achievement. Other reforms to the education system were the abolition of primary school certification and increases in the compulsory attendance age.

In the 1990s, Ireland encountered a skills-shortage problem when there was a surge in FDI and export demand in the ICT sector. The number of science graduates produced was insufficient to meet the requirements of the high-tech economy. Policies to increase the supply of skilled workers were proposed. They were: 1) curriculum

reform to establish the relevance of science and technology to contemporary life and society; 2) provision of hands-on laboratory experiments at the primary and secondary levels; 3) provision of in-service teacher training; and 4) science grants to enhance science education in all primary schools.

Ireland's response to the increasing skills demand of this industry is to harness its own capabilities in science and technology and align the education system to the FDI development strategy of the economy. Ireland adopted the Northern European model of higher education, which focuses on the need for technical as well as traditional university education. As a result, the percentage of students enrolled in universities fell from 75% in 1965 to 54% in the late 1990s. Conversely, the percentage of students enrolled in vocational and technological education increased from 2% to 37% for the same period.

At the tertiary level, Ireland has an education system that places equal emphasis on general education and vocational and technological training. To a certain extent, this mitigates the shortage of workers that have the necessary skills to meet the demand of high-tech FDI. The establishment of the Regional Technical Colleges and two National Institutes of Higher Education has also played a part in building up Ireland's pool of skilled labor.

Besides the shift towards a more vocational- and technological-based educational system, the establishment of the Regional Technical Colleges (RTCs) in the 1970s also helped equip the Irish people with the necessary skills to meet the demand of the high-tech FDI. The initial objectives of RTCs were to provide i) senior-cycle post-primary courses leading to the Leaving Certificate, ii) junior and senior Trade Certificate courses for apprentices on day or block release from work, iii) courses for technicians and iv) adult education and retraining courses (Barry, 2005). Subsequently, they shifted their focus from the provision of secondary teaching to that of tertiary courses. The scope of courses was also expanded to include subjects such as engineering, construction and business studies, applied science and art and design. The majority of courses are of two-year duration, leading to a National Certificate award. There are also a small number of one year certificates courses, a significant number of three-year courses leading to a National Diploma, and a limited number of four-year degree-level courses. The introduction of European Social Fund aid to the RTCs also played a part in building up Ireland's pool of skilled labour.

Ireland's technical education was given a further boost when two National Institutes of Higher Education (NIHEs), modelled after the UK system of polytechnics were set up in 1972 and 1980 respectively. The NIHEs operated primarily at degree level and were subsequently granted university status in 1990.

The key institutions in charge of attracting foreign direct investments into the economy such as the Industrial Development Agency was given authority to continuously align and improve the educational and infrastructure. Concerned by the looming shortage of electronics graduates, the Industrial Development Agency (IDA) persuaded the government to increase the educational capacity for technology-related courses. As a result, the number of engineering graduates increased by 40% between 1978 and 1983, while the number of computer science graduates increase tenfold for

the same period. The IDA also introduced a range of one-year conversion courses to equip science graduates with electronics qualifications.

In the 1990s Ireland's foreign direct investment and export demand have been largely driven by the information and communications technologies sector. However the current output in scientific degrees was not enough for Ireland to meet the requirements of a high-technology economy. A number of other policies were proposed to increase the supply of skilled workers in the economy: curriculum reform to establish the relevance of Science and Technology to contemporary life and society and secondly, the importance of hands-on laboratory experiments at the primary and secondary level; provision of in-service teacher training; new physical sciences grant to enhance science education in all primary school.

The immigration policy between Ireland and the United Kingdom allows workers from the two countries to move in and out freely. This equalizes wages in the two countries. But more importantly, when Ireland is facing a skills shortage, this drives the wages of skilled labor higher, which, in turn, attracts labor from Great Britain. All of this would not be possible without a highly flexible immigration policy (Honohan and Walsh, 2002).

5. Implications for Malaysia

There are several policies that are very crucial to help address the skills shortage problems in Malaysia. First, the development of human capital is the key factor for the growth of the innovation-based economy. Both Ireland and Korea have invested heavily in higher education and aligned their educational policy to the changing manpower demands in the economy. It must be recognized that the Malaysian economy is an open economy driven primarily by foreign direct investment and export growth. Thus, the education system must recognize the changing manpower demand conditions in terms of the needs of the multinational corporations and the large corporations. As the Malaysian economy transits toward an innovation-based economy, the demand for technical and scientific skills will increase. To meet the rising demand for science and technical skills the following alignment in the education system to vocational- and technical-based education will be important:

i) Increase the supply of the workforce with science and technical (S&T) backgrounds. The intake in S&T courses at the university level should be increased with relevant investment in key S&T technologies in the universities.

ii) The investment in laboratories and research centres at universities will provide the link between academic institutions and industries in transferring technologies and knowledge. This will also be an important conduit for aligning the educational system to the changing needs of industries. The case of POSTECH in Korea is a good example. POSTECH was a spin-off of POSCO, a leading Korean steel company and was created in response to an acute shortage of high-quality graduates. The establishment of Bell Labs at Lucent Technologies' Dublin facilities – the Digital Enterprise Research

Institute – was established in collaboration with University College Galway and Hewlett-Packard, and the collaborative partnership by three Irish universities to set up the Centre for Research on Adaptive Nanostructures and Nanodevices are some key examples of collaboration between Irish industries and universities.

iii) The increase in student intakes in technical and science subjects should also be complemented with strong academic staff in S&T. The retention of strong and well-qualified academics and teachers was one of the key components in improving the quality of academic institutions in Ireland.

iv) Training and retooling are important for workers to sustain their human capital in rapidly changing industrial structures. There are a number of Industrial Training Centres and Polytechnics in Malaysia. The scope and depth of industrial-training education in these institutions could be improved. The various industrial training centres could be consolidated and merged to form larger training centres to provide training for the older and younger members of the workforce. For example, the initial objectives of RTCs in Ireland were not only to provide adult training, but also for certification and accreditation of the adult courses. This increase the recognition of the employability skills of the workers. The larger training centres also have the economies of scale to shift their focus from the provision of secondary teaching to that of tertiary courses. The scope of courses was also expanded to include subjects such as engineering, construction, business studies, applied science, art, and design. The certification of the various training programs at the national level is very vital for the recognition of the training certificates. A national agency should be set up to accredit the various training institutes and maintain the quality of skill training.

v) The introduction of European Social Fund aid to the RTCs also played a part in enhancing Ireland's pool of skilled labor. Thus, a nation-wide fund to assist workers in upgrading their skills will be crucial for life-long learning.

vi) The recognition of changing demand for skilled workers should also recognize the need for an English-speaking workforce with high educational attainment to be employed in rapidly changing S&T production activities. For example, a significant advancement in information and telecommunication technologies requires workers with good communication and soft skills to support activities ranging from business services to sophisticated financial services. Thus, there is an urgent need for the Malaysian education system to adopt English as a medium of instruction and strong emphasis should be placed on written and communication skills for all levels of education.

vii) There should be a central government planning agency to coordinate and integrate the educational system to the changing needs of the private sector such as the Industrial Development Agency in Ireland. This agency should be driven by global best practices in promoting Malaysia's investment in its industrial structure. This government agency should be a leading agency to

monitor the needs of industries and continuously improve and align education and infrastructure in the economy.

viii) Immigration policy is another important component in creating flexibility in the labor market, and skilled foreign workers could be used to augment domestic human capital. Ireland's immigration policy allows immigrants from the UK, the European Economic Area (EEA), and Switzerland to take up employment in Ireland without any requirements of work permits or work visas. Thus, the Malaysian government could liberalize the flow of more skilled foreign workers into the domestic economy.

ix) A greater cooperative approach among workers, employers, and government could play an important role in harmonizing the structural changes and skill shortages in the domestic economy. The harmonizing of the labor market could be in the form of moderating wage changes and greater recognition of skill shortages at the national level, which could be important in recognizing the bureaucratic bottlenecks and pushing for important labor-market reforms at the national level.

x) In addition, there should be a greater investment in domestic "Absorptive Capacity," such as the infrastructure for information and telecommunication technology. The provision of infrastructure is an important component of innovation system in terms of creating the externalities of for amalgamation of key local and foreign industries.

xi) Finally, SMEs will play an important role and conduit in creating linkages to multinational companies and, hence, create direct and indirect access to the technologies of multinational corporations.

Although the Malaysian economy has good technical education and training policies to help tap into the global stock of knowledge and its firms are technologically active in terms of adopting new technologies, the economy is still lagging behind other countries in terms of technology competitiveness. It has to improve its development in vocational and technical education system that will allow life-long accumulation of human capital for the Malaysian economy.

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Annex

Figure A.1: Agricultural Value Added's Share of GDP

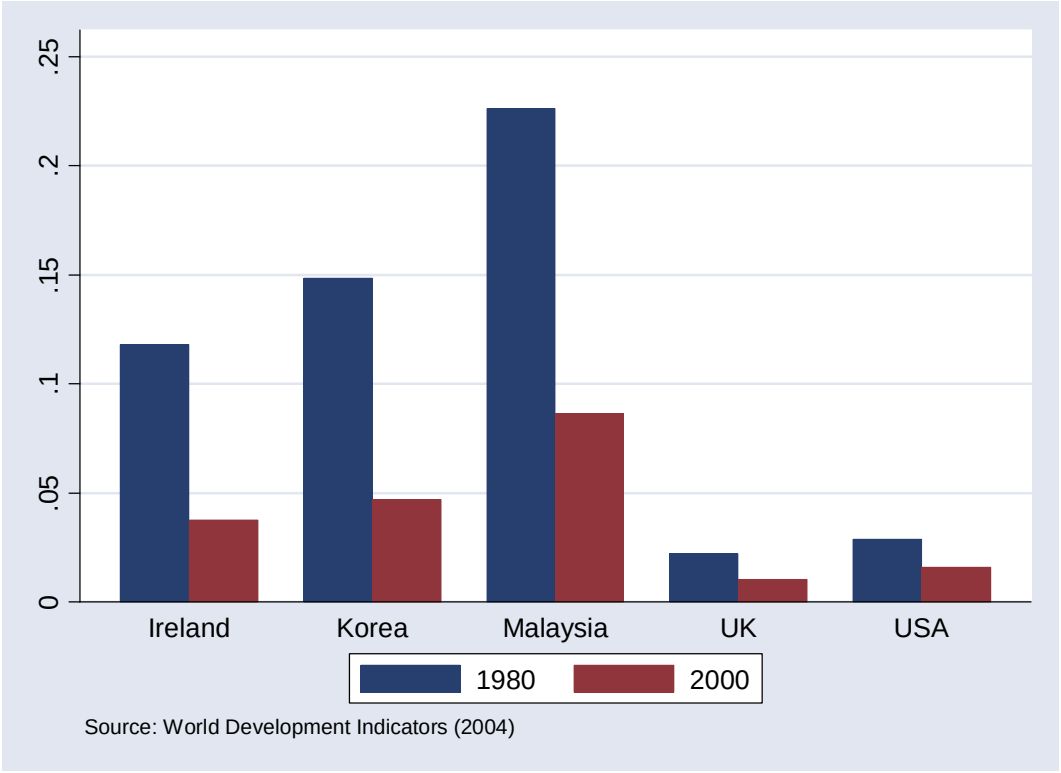


Figure A.2: Manufacturing Value Added's Share of GDP

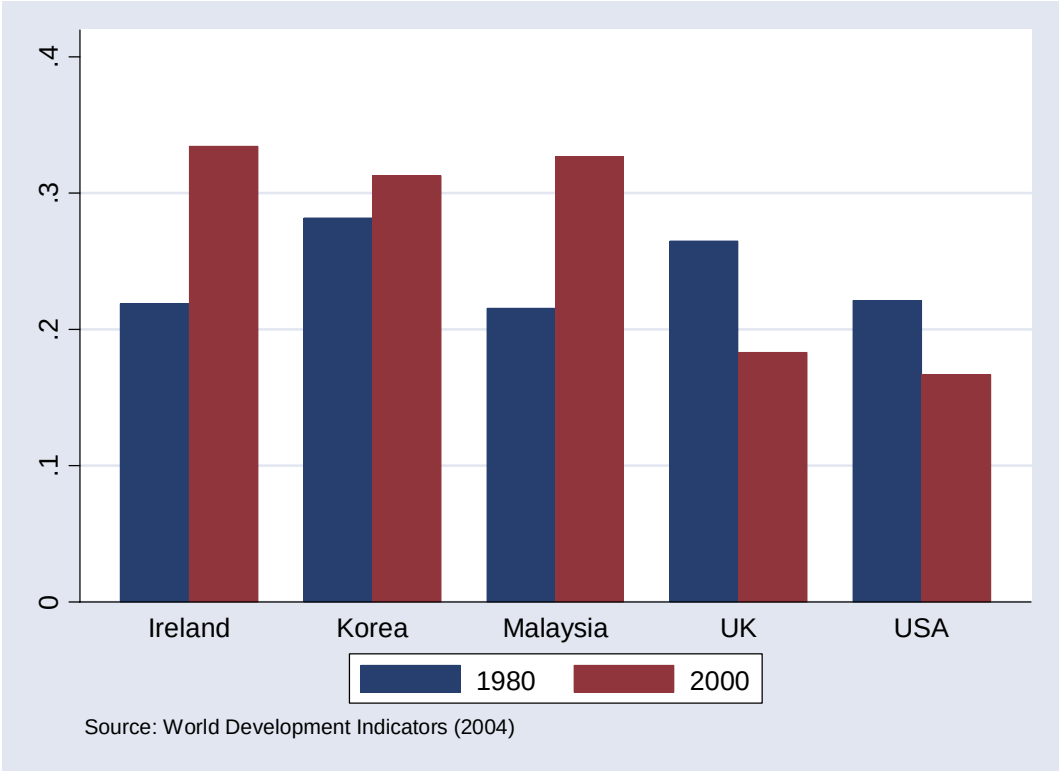


Figure A.3: Services Value Added's Share of GDP

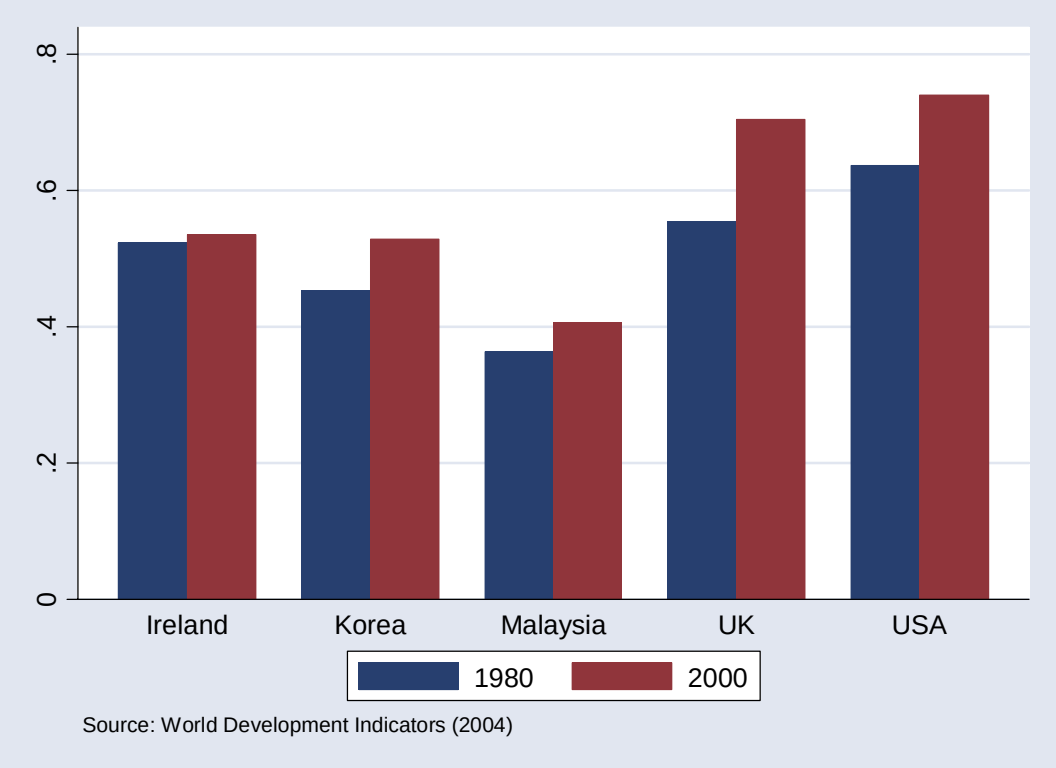
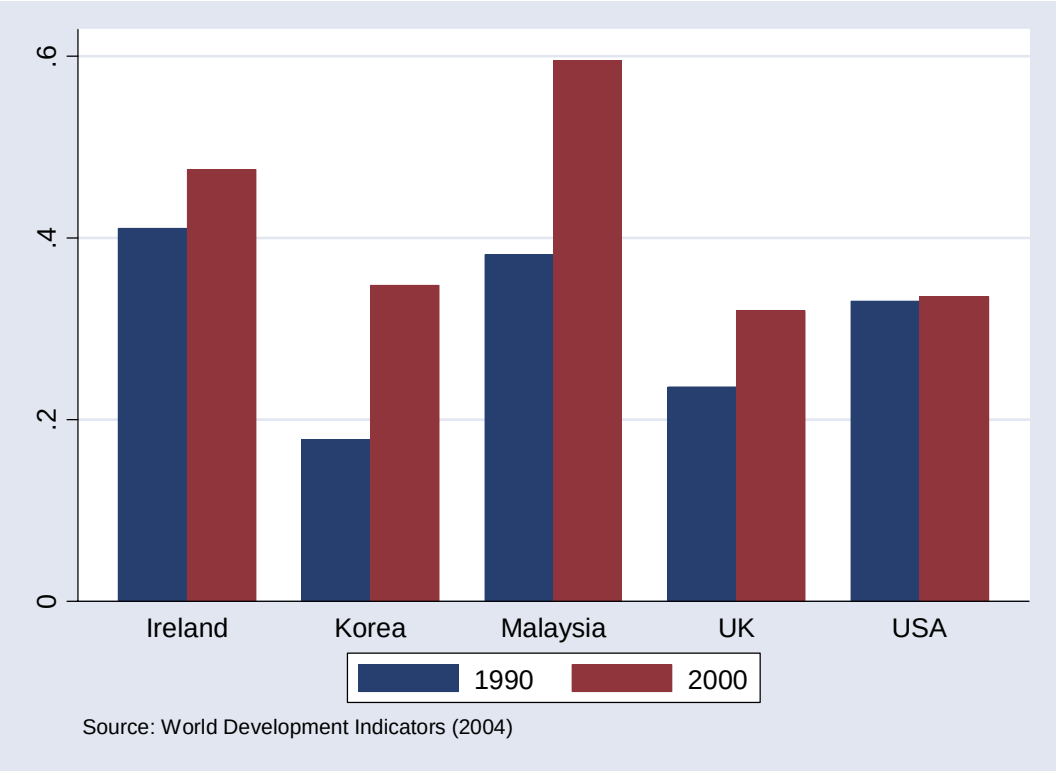


Figure A.4: High-tech Export's Share of Manufacturing Exports



Definition: Products with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments and electrical machinery.
Source: UN COMTRADE database