HOW KOREA GOT RICH

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INTRODUCTION

At the conclusion of the Korean War in July, 1953, Korea was one of the poorest countries in the world with a per capita GDP of about $79[1] (about three percent of Mexico's at the time) that put it in the same category as sub-Saharan Africa at the time. At the conclusion of World War II in 1945, the country had barely a thousand university graduates, and the rate of illiteracy was 78 percent. Just over 50 years later, Korea became one of only two Asian members (the other is Japan) of the Organization of Economic Cooperation and Development (OECD). Today, it is the world's 11th largest economy, has a per capita GDP of $30,000 (double that of Mexico), graduates from university more than 70 percent of its young people who regularly score at the top of the PISA and other international tests, and leads the world in a wide range of technology industries like semiconductor memory chips, electronic displays, and smart phones. What lies behind this amazing performance and what can others learn from it? That is the question this project will aim to answer.

PREPARATION – 1953-1961

As a colony of Japan from 1910 until 1945, Korea had been subjected to harsh Japanization with school children being forbidden to speak Korean and families being forced to drop their ancient Korean names in favor of Japanese names. While the Japanese did invest in fairly extensive infrastructure and in some manufacturing in the north of the country, they mainly ran Korea as a source of rice, other agricultural products, coal, and minerals such as tungsten for Japan. The vast majority of the population was farmers who worked on large estates owned by a small traditional elite of wealthy landowners.

[1] Jung-en Woo, *Race to the Swift: State and Finance in Korean Industrialization* (New York: Columbia University Press, 1991) 58.

With the end of World War II, it was agreed that the Soviet Union would take the Japanese surrender north of the 38th parallel while the Americans took it south of the parallel. Subsequently, as the Americans strove to organize a functioning government in the south Syngman Rhee was elected head of a new South Korean administration and began an effort to build a new South Korean economy out of what was left from the war. Of course, he had little time before the outbreak of the Korean War in the summer of 1950, but two measures are particularly worthy of note. One was a far reaching land reform under which the government bought the big estates in return for government bonds and turned the land over to the share croppers who had been working it. This relieved the debts of the working farmers and halted their impoverishment while also removing a powerful roadblock to many other reforms. The second measure, which had actually been undertaken by the provisional authorities as soon as the Japanese surrender was taken, was a vast literacy and education program. Although there was a Korean phonic alphabet called hangul that could be used to write the language, it had traditionally been written using Chinese characters. Now, the government promoted hangul as a way of avoiding the time consuming and laborious task of memorizing five or six thousand characters in order to be able to read. By fostering the extensive use of hangul, the government could take years out of the time necessary for a student to be able to read a textbook or newspaper. And that is exactly what it did. It established schools all over the land in police stations, railway stations, agricultural coops, and in many other places and encouraged those who could read to identify and teach those who couldn't. This continued even during the war, and, in fact, the military became one of the main teachers so that by the end of the war in mid 1953, the illiteracy rate had been cut from 78 percent to 26 percent and by 1958 it was 4 percent. This may well be said to have been the base from which all else flowed in the development of the Korean economy.

In the wake of World War II, Korea's continued to be primarily an agricultural and mining economy, but a new element became U.S. military expenditures and developmental aid. With the outbreak of the Korean War, these, of course,

became even more important as the war wreaked near total devastation on the land. Between 1951 and 1960, total U.S. economic support was around $1 billion annually and amounted about twice Korea's domestic revenue.[2] It was from this flood of dollars that many of Korea's famous chaebol industrial and financial giants were born. Hyundai, for example began as a trucking company carrying supplies and then contracting to build bases for the U.S. military. LG first flourished as a resin and chemical supplier during the war.

Because virtually everything had to be imported, the economy ran a continuous trade deficit. This gave rise to policies of import substitution under which small Korean businesses were encouraged by the imposition of high tariffs and the awarding of preferential loans to begin manufacturing or at least processing domestically things like toothpaste, cement, sugar, flour, milled rice, textiles, and other consumer items. Of course, the tariff policies, the import licenses (for all imports were tightly controlled), and the funds available to finance these activities were all in the hands of the Syngman Rhee led government and were made available to those with good connections, and especially to those who gave kick backs and made donations to the ruling political parties. The rampant inflation of this war and post-war period also made the repayment of loans easy and those who could obtain them rich. Again, many of the chaebol such as Samsung, a small rice miller and trader, got their start at this time in this process. This import substituting activity was accompanied by significant investment in reconstituting and improving the war ravaged infrastructure. The sum result was that from 1953 to 1962, the economy grew by 4.5 percent annually, not yet a miracle, but not bad either.

RHEE TO PARK

In consequence of spreading corruption and election vote rigging, popular demonstrations in 1960 drove Rhee into exile in Hawaii and ushered in a short lived democratic regime that was pushed aside in a military coup in May, 1961 led

[2] Woo, 48.

by General Park Chung-hee who headed an army group known as the "Clean up the Military" movement that had been calling for an end to the kick backs and corruption that had become rampant in the army. Park's initial actions were punitive and aimed at cleaning house. Two thousand military officers were retired and a large number of business leaders were arrested or forced to flee into exile in Japan and elsewhere. Most politicians were placed under arrest and political parties were shut down while the press was placed under tight censorship and a newly established Korean Central Intelligence Agency carried out a campaign against fraud, corruption, prostitution, and "hooliganism."[3] But at a time when Mexico's GDP per capita was 2.5 times that of Korea, Park launched a much more ambitious project than the clean-up of the Korean political system – the creation of a modern, world class economy.[4]

MIRACLE ON THE HAN

In addition to corruption, the weaknesses of the import substitution strategy were that it still depended on growing imports of production machinery and materials that had to be paid for. But the economy was somewhat trapped in a relatively low growth, low income, low savings, and low investment syndrome. In the absence of significant exports, the imports were paid for by American aid assistance, but the Americans now began to reduce the amount of aid and to rethink its purposes. Increasingly, these became to enhance Korean agriculture and to foster it as an export industry. World Bank, IMF, and American experts at the time believed that Korea had a comparative advantage in agriculture and perhaps in some labor intensive industrial production.

Park shared the view that Korea needed to produce something it could export in order to pay for its imports, but he did not at all agree that Korea should concentrate only on agriculture and labor intensive industrial production. He had been part of the Japanese Kwangtung army in Manchuria during World War II and

[3] Frank Gibney, *Korea's Quiet Revolution: From Garrison State to Democracy*, (New York: Walker and Company, 1992) 52.
[4] *Korea as a Knowledge Economy: Evolutionary Process and Lessons Learned*, Edited by Joonghae Suh and Derek H.C. Chen, Korea Development Institute and World Bank Institute (Washington, DC: The World Bank, 2007), 5.

had seen the success some of the early Japanese economic development bureaucrats had enjoyed there in achieving rapid industrialization where none had existed previously. He had then watched as post-war Japan had applied those techniques to achieve an astounding recovery from the wartime devastation, and he now prepared to match and surpass the Japanese in the achievement of rapid economic growth.

The Korean War had served as a kind of school Korea's military officers and their men had learned about technology and management of large organizations. These men now were placed in the dominant positions in the Korean bureaucracy. The first step toward more rapid economic growth was the establishment of the Economic Planning Board. Unlike Japan's similar Economic planning agency, this was an executive board, not a planning body. Through this board, and in conjunction with the Export Planning Committee, which he personally directed, Park led a full-fledged national economic mobilization.[5] He and his team believed it necessary for Korea to develop a broad manufacturing base both to achieve large and rapid increases in productivity and technological knowledge and to enhance national security. But they also recognized that Korea's domestic market was not large enough to enable the economies of scale necessary for competitive production. Thus the economic strategy was turned on its head and export led growth became the leitmotif of the mobilization.

The leaders of the new military government had seen massive corruption and illegal wealth accumulation as the main cause of what they perceived as the stagnation of the Korean economy. Consequently, they moved to curb and root it out. An anti-chaebol law was passed and the leading businessmen were arrested on charges of illicit profiteering. The banks and the financial sector were effectively nationalized with 96 percent of all financial assets coming under state control[6] while 35,000 civil servants were dismissed.[7] Labor unions, not yet strong in Korea, were further suppressed. A five year plan was developed for 1962-67,

[5] Gibney, 54.

[6] John Lie, *Han Unbound: The Political Economy of South Korea* (Stanford, CA: Stanford University Press, 1998), 70.

[7] Ibid, 55.

and it gave priority to developing energy industries and cement production, expanding the economic infrastructure, export promotion, and the development of science and technology. It emphasized that sacrifices would be demanded and that this would be a producer's, not a consumer's, economy.[8] For exports, the plan focused on labor intensive light industries such as textiles, shoes, and plywood. Of particular significance was the role of businessmen. Many of them had not only been arrested, but had been publicly paraded in the streets of Seoul wearing dunce caps and being denounced as "businessmen –swine-people eaters."[9] But Yi Pyong-chol, Chairman of Samsung took the initiative, made himself chairman of the "illicit profiteer" businessmen, and went to Park with a suggestion – that the business leaders work hand in glove with the government as the spearhead of the new export led movement. Park agreed and made a deal. He called in ten major business leaders and told them he would not jail them and they could pay their fines by investing the money in new export industries with some of the shares in these being donated to the government. Thus was Korea, Inc. launched.

FREE LUNCH

The fuel to power the export drive was government assistance of various kinds. The policy loan was one of the favorite kinds. Such loans came with negative interest rates, which were what President Park would give to business executives who would throw the money into favored industries like textiles, electronics, and so forth. Tariffs on imports of finished goods were set high while those on imports of raw materials and essential parts and components for exporters were kept low. In 1964, the Korean won was devalued by fifty percent and the Korea Trade Promotion Corporation was established. The government made exporting into a patriotic duty and began giving awards to top exporters on National Export Day every year. It must be remembered also, that the Korean chaebol companies maintained a highly leveraged balance sheet with debt to equity ratios of 300/1 or

[8] Gibney, 55.

[9] Bruce Cumings, *Korea's Place in the Sun: A Modern History (Updated Edition)*, (New York: W.W. Norton & Company, 2005), 312.

higher. Because they were now the government's export led policy spearhead, these debt ratios were implicitly becoming guaranteed by the state. Indeed, the purpose of the banks became to further the national economic goals rather than to make profits through the lucrative lending of money. Because of the shortage of savings in Korea, the chaebol were encouraged to borrow abroad and the Korean Development Bank guaranteed these foreign loans, thereby, in effect, also guaranteeing the chaebol.

At the same time, important measures were undertaken to raise the Korean savings rate which in the early 1960s was less than 4 percent of GNP. Interest rates on time deposits were raised from 15 to 30 percent. High tariffs and limits on the amounts and kinds of goods that could be imported or bought by individual consumers, kept consumer prices relatively high. At the same time, consumer credit was non-existent except from the so called "curb" or loan shark market where interest rates could be prohibitive and protections non-existent. In this way, national savings was pushed higher and would eventually hit nearly 30 percent of GNP.[10]

VIETNAM and JAPAN NORMALIZATION

Two major outside developments contributed enormously at this moment to Korea's rapid development. The first was the Vietnam War. The reduction of U.S. aid in the early 1960s had pushed Korea toward reform and export led growth by reducing its buying power. With the increase in hostilities in Vietnam, Park offered to send two Korean divisions to join with American forces in the fighting. This offer was eagerly accepted by Washington and subsequently opened the gates to a flood of U.S. wartime procurement and spending in Korea. From zero in 1962, Korean earnings from Vietnam War related activity were $558 million in 1966, $745 million in 1967, and $993 million in 1968. This was close to 20 percent of total Korean earnings in 1967-68.[11] Needless to say, this flow of orders and funds provided an enormous boost to Korean production and jobs and more than

[10] Woo, 160.
[11] Ibid, 96.

compensated for the reduction of official U.S. aid funds. At the same time, Korea effected a normalization of its post World War II relations with Japan by agreeing to a settlement under which Japan undertook to pay reparations of about $800 million. This was mostly used to finance infrastructure and investment in export oriented industries. Thus the combination of the Vietnam War and the final, final end of the war with Japan gave Korea a tremendous economic boost just at the moment when it was most needed.

The result of all this was that the Korean economy grew at more than 8 per cent annually for most of the decade of the 1960s.[12] Electric power generation grew by a factor of ten. Freight car capacity doubled as did the number of postal stations, and the number of telephones rose by six fold. The percentage of national roads that were paved rose from 13 percent to 44 percent.[13] Perhaps most importantly, Korea had followed in Japan's footsteps as first an exporter of plywood and then of textiles, shoes, and toys and was now becoming visible as a developing country and potentially major exporting country that combined low wages with relatively high and rising educational levels and skills, a protected domestic market, and an undervalued currency. For all that, the average Korean per capita GDP in 1968 was $138 or $2 less than Japan in 1951 when it regained its sovereignty. Clearly there was still a long way to go.

CRISIS - THE BIG PUSH – HEAVY AND CHEMICAL INDUSTRIES (HCI)

By the beginning of the 1970s, the logic of maintaining high domestic interest rates while businesses with implicit government backing borrowed abroad at lower rates and exported their production on the basis of government provided subsidies became impossible to maintain. Foreign debt mushroomed to unsustainable proportions, from $645 million in 1967 to $1.2 billion in 1968 to $1.8 billion in 1969 to $2.2 billion in 1970, and to $2.9 billion or 30 percent of GNP in 1971.[14] The International Monetary Fund imposed restrictions on the increase

[12] Adrian Buzo, *The Making of Modern Korea*, (Oxford: Routledge, 2007), 115.
[13] Lie, 73.
[14] Woo, 105.

in loans from abroad and forced Korea to cut back on its export subsidies while devaluing its currency by 25 percent. Already carrying to many non-performing loans, the official (state controlled) Korean banks could not fill the financing gap for business which then turned to the informal curb market with its high interest rates and short maturities. When business began to suffer it demanded and received relief from the government.

In August, 1971, the Park regime imposed a three year moratorium on payment of all corporate debt owed to the private, domestic (curb) market. Thus was the crushing burden of debt shifted from the chaebol to the small lenders and investors in the curb market. It could not have been done in a democracy, but Park was not running a democracy. Indeed, when students and workers demonstrated against 15 hour days and less than subsistence wages at the textile factories, he declared martial law and directed his police to get the workers back to work.

Beyond the financial and domestic political situations, other developments were threatening the budding Korean miracle. In 1972, the new American President, Richard Nixon, announced the Nixon Doctrine that threatened to reduce U.S. military commitments in the Pacific and seemed to call on Korea and others to do more to take care of themselves. The U.S. congress as well as the Nixon administration also began to threaten to impose anti-dumping duties and other sanctions on imports of Korean textiles, shoes, and other goods. At the same time, other developing countries were rapidly expanding their exports of these same items and were thereby actually depressing the rate of increase of Korean exports.

In response to these developments, Park (and make no mistake, it was Park personally who was behind all of the major economic plans) announced what he called his Big Push for development of Heavy and Chemical Industries. In particular he specifically targeted six industries for special development – steel, ship-building, machinery-building, metals, chemicals, and electronics. By pushing ahead with these industries he hoped to move up the value added and

technology scales beyond the competitive reach of other developing countries while also strengthening Korea's indigenous national security industrial capability and increasing production of exportable goods to help pay for the oil imports that had become so expensive as a result of the recent Arab oil crisis.

Again, the U.S. authorities, the World Bank, the IMF, and most of the professional economics community were strongly opposed. They felt there was already too much global capacity in these industries and that by subsidizing their development Korea would only be adding to the glut. They also did not think that Korea, in view of its abundant, cheap labor and scarce, expensive capital and technology, did not have a comparative advantage in these industries and would only waste resources by trying to develop such advantages. None of that opposition deterred Park. Indeed, it only spurred him on. Not only did the EPB (Economic Planning Board) execute the policy under his direction, but his personal Secretariat became the effective industrial policy bureau that dictated to and guided the EPB. These industries were purely and simply Park's babies.

A major feature of the plan was the creation of one large scale complex with state of the art production facilities for each target industry. Thus, there was the Yosu-Yochon complex for petrochemicals, Changwon for machinery building, Pohang for steel, Okpo for ship-building, the Kumi Complex for electronics, and Onsan for nonferrous metals.[15] In each case, the government simply bought these properties from farmers, bulldozed the land, installed infrastructure (roads, water, electricity, harbors) and enticed businesses to invest and produce in each sector by providing financial sweeteners and exemptions on commodity and customs taxes on imported capital goods. Once located here, the enterprises were the first to receive available foreign capital, the first to benefit from government help with procurement of raw materials and production equipment, and the first to receive discounts on freight rates, harbor fees, and utility costs. The intention was for most of the investment capital to come from within through a National Investment Fund generated from pension funds and issuance of

[15] Woo, 129.

national investment bonds. In the case of foreign capital, the preference was for loans rather than equity, but if equity was necessary in order to obtain technology it had to be limited to less than 50 percent. These markets were heavily protected and the aim was to build a truly national industrial capability.

OIL CRISIS AND RECOVERY VIA BRETTON WOODS

The first Arab oil crisis of 1973 struck a heavy blow to Korea's HCI Big Push by pushing inflation up to the 40 percent level. This resulted in a retreat from the push into nonferrous metals and other energy intensive production such as pulp and paper and fertilizer. But Korea did not waver in its fundamental commitment to the heavy industries and to export led growth. Rather than opting for austerity as many countries did, it devalued the won and borrowed heavily in international markets while expanding heavy industry production as rapidly as possible in the belief that it could increase exports fast enough to more than offset the rising costs of imports. In fact it did.

In part, this was due to an unexpected bonus from the oil crisis. Awash in petro-dollars, Saudi Arabia and the other major oil exporters began their own rapid economic development in which the building of modern infrastructure played a huge role. Basing off their experience in Vietnam, the Korean logistics and construction companies began bidding on and winning contracts to build the new Arab infrastructure. In the ten years after 1973, such overseas orders for Korean companies rose from $170 million to $14 billion annually.[16] This substantially paid for the increased cost of Korea's oil imports. But beyond the infrastructure business, there was another bonus. To combat the chronic and rising U.S. balance of payments problem, President Nixon in 1972 had cut the tie between the dollar and gold and had forced Japan and Germany to revalue their currencies. This made them less competitive in global markets and gave a big boost to the competitiveness of the exports of Korea's new industries.

[16] Gibney, 61.

Of course, this accelerated the growth of these industries and increased their need for new investment capital. Here again the petro-dollars came to the rescue as the world's banks recycled many of them through loans to Korea's new HCI industries. An important aspect of these loans was that they were seen by the banks to be quasi sovereign loans with relatively low risk. The reason was that Korea was understood to be of strategic importance to the United States who would bail it out if necessary and, of course, the Korean government had already demonstrated that it would bail out its chaebol companies if necessary. In fact, in the mid-1970s, Korea was close to default. Yet U.S. banks continued to loan because as one U.S. banker put it: "the American government is the guarantor of the whole South Korean government, lock, stock, and barrel."[17]

PICKING WINNERS

During this period, investment in Korean industry rose from about 18 percent to 33 percent of GDP with heavy industry absorbing 70 percent of the total.[18] Because the investment was heavily subsidized in a variety of ways that we have seen, neither lending nor disbursement were guided by any normal financial disciplines. The Korean Central Bank and the Korean banking industry were not so much banks as simply writers of loans to whomever Park's Economic Secretariat directed. Moreover, it was fully expected and customary that recipients of large loans would make payments to the state and to state officials or at least be sensitive to the requests of officials. It was a system that was susceptible to corruption and that did sometimes become corrupt, and yet, for the most part, it worked well and in a relatively clean fashion. This was due to two factors – Park's personal dedication and that of his team not to self-aggrandizement but to the development of Korea and the imperatives of the developmental drive. Park and his regime wanted growth and exports. If those were not forthcoming, the easy loans could be recalled and new ones not made. The state did not enable loans or lower than normal costs for any old investment. It wanted investment in industry, especially in manufacturing industry, and if the investment wasn't resulting in

[17] Woo, 156.
[18] Woo, 154.

growing production and exports, then the easy money could be taken away. Park and his team kept score. Those who played well were rewarded and those who played poorly were discarded. In this way the chaebol "became the principal agents of state-led development."[19]

The results of all this were dramatic. In 1970, Korea was graduating 5,000 engineers annually. A decade later, the number was 15,000.[20] Manufacturing had climbed from 21.3 percent of GNP in 1970 to 28.6 percent by 1980 while light manufacturing fell from 60.8 percent of total manufacturing to 45.6 percent as heavy manufacturing grew from 39.2 to 54.4 percent of total manufacturing.

Table 2.5 *Production Structure of the Korean Economy, 1953–2005*
(percent)

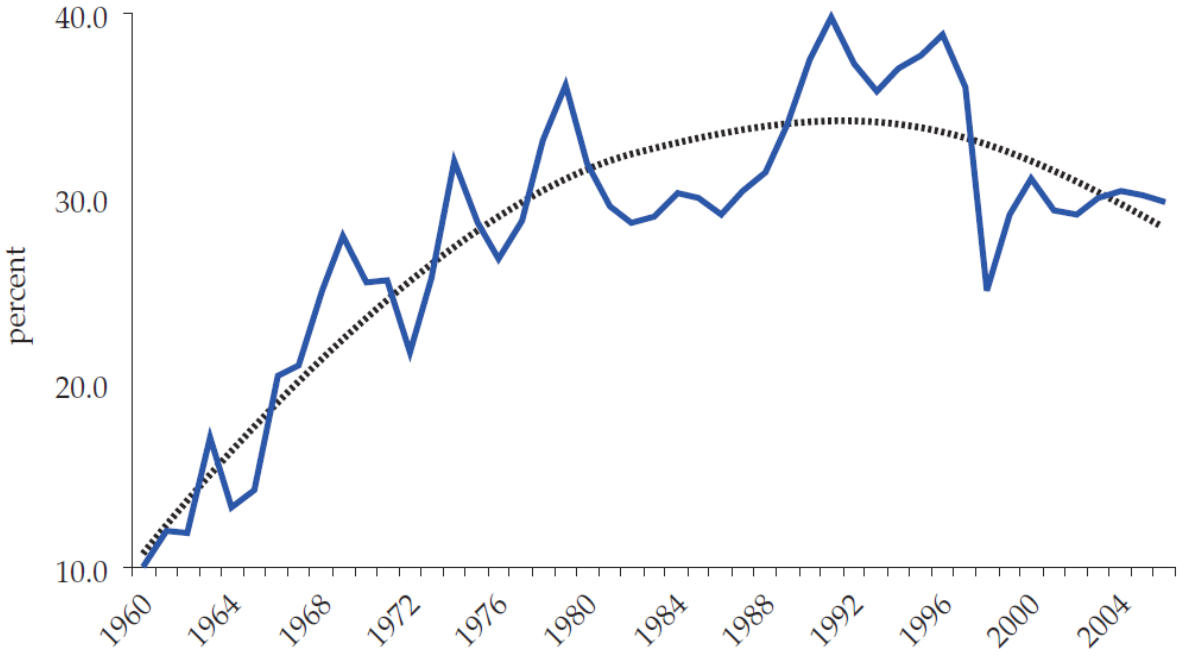
	Agriculture, fishery, and mining	*Manu-facturing*	*Light industries (% of mfg)*	*Heavy and chemical industries (% of mfg)*	*Services*
1953	48.4	9.0	78.9	21.1	42.6
1960	38.9	13.8	76.6	23.4	47.3
1970	28.7	21.3	60.8	39.2	50.0
1980	16.7	28.6	45.6	54.4	54.7
1990	9.3	28.9	32.6	67.4	61.8
2000	5.3	29.4	20.7	79.3	65.3
2005	3.8	28.4	15.3	84.7	67.8

Source: Bank of Korea, *National Accounts,* reported years.

Investment grew from about 25 percent of GNP in 1970 to nearly 35 percent in 1979.

[19] Woo, 97-98.
[20] Gibney, 62.

Figure 2.4 *Long-Run Trends of Gross Investment Rates, 1960–2006*



GNP growth averaged close to 10 percent for most of the decade.

The chaebol controlled only 17 percent of the Korean economy in 1970, but by 1980 that had increased to 48 percent.[21]

And the condition of labor was poor. The industrial accident rate was high and wages were lower than in other developing economies. In 1980, the average industrial wage for an American was $10, that of a Mexican was $3, and that of a Korean was only $1. The average wage of a manufacturing worker was below the socially necessary minimum wage. The rural sector was in even worse condition and there was a steady stream of people out of the countryside into the cities where they provided a continuing supply of cheap labor.

[21] Lie, 91.

KOREA MAKES IT

The decade of the 1980s opened badly for Korea. The second oil embargo of 1978-79 had thrown the U.S. and EU economies into recession and that caused now heavily export dependent Korea also to suffer reduced economic growth. This occurred just at the moment when some of the big new heavy industry factories were coming on line with what was now enormous excess capacity. It also occurred as the remittances of Korean workers in the Middle East rose dramatically and, when added to recent increases in domestic wages and the rising oil prices, caused inflationary pressures.

Despite calls for abandonment of government led growth and the HCI programs, the Korean authorities responded with more of the same. It ordered a rationalization program under which Hyundai, Daewoo, and Samsung gave up production of power generating and heavy construction equipment and merged it into Korea Heavy Industries and Construction, Inc. (KHiC) Saehan Motors was directed to merge with Hyundai while Kia and Tong-a were combined and Hyundai and KHIC were given the exclusive right to produce marine diesel engines over 6,000 horsepower while engines under that horsepower went to Ssangyong, and so forth. In other words, instead of investment bankers, the government led restructuring and rationalization and did so by pulling on its loan, subsidy, and licensing levers. Inflation was attacked by dramatically reducing available consumer credit expansion from 41 percent in 1980 to only 16 percent in 1983 and by slashing wages so that real wages actually fell by 1 percent in 1981 while productivity rose by 18 percent.[22] The won was again devalued by 20 percent and as Korean debt rose, Japan, the biggest exporter to Korea, made a $3 billion credit available. At the same time, the Korean government strictly limited transfer of domestic capital out of Korea. Transfer of foreign exchange was a crime. (In contrast, the Mexican government never had anything like this control over domestic capital.)

[22] Woo, 180.

By 1982, the global economy was in recovery and Korea was off to the races. Especially after the 1985 Plaza Agreement forced Japan to revalue the yen from Y240/$ to Y140/$ between August 1985 and April 1987, Korean exports doubled largely due to the new capacity of the HCI industries.[23] Park's strategy was vindicated as Korea became super competitive through a combination of its shift to higher technology industries, the revaluation of the yen and the D Mark, and its continued low labor costs. For example, the wage cost for a small car in Japan in 1985 was $1003. In Korea, the figure was only $563.[24] With these advantages, Korea experienced average annual GDP growth of 8 percent for the sixteen years between 1981 and 1997. In four of those years it had 11 percent growth and the low point was 5 percent in 1997. Over that same period of time, average annual productivity growth was close to 4 percent. On the basis of this rare, superlative performance, Korea became, in 1996, only the second Asian country (Japan was the first) to join the Organization of Economic Cooperation and Development, widely known as the exclusive club of 34 rich countries.

It was also over the period of 1987- 1997 that Korea transitioned to a fully democratic form of government as its population became both highly educated and, on average, well off. The transition to democracy meant, among other things, that labor unions became free to organize and that strikes were permitted without strikers having to fear being crushed by police and soldiers. As a result the number of unions doubled and the 3600 labor-management disputes that broke out in the first six months of 1987 were more than had occurred in the preceding ten years. By 1992, wages and salaries had doubled[25] as had average per capita income, a national pension system had been established, national medical insurance expanded, a minimum wage established, and extensive public housing constructed. There were also efforts to reduce the power and privileges of the chaebol, especially the four (Hyundai, Samsung, Lucky Goldstar, Daewoo) that controlled more than half of the Korean economy. Not only were preferential loans cut back but tax investigations and penalties were pursued. Most

[23] Woo, 129.
[24] Woo, 130.
[25] Gibney, 95.

spectacularly, Hyundai's founder and chairman was hit with a $180 million fine for not paying personal income taxes. Credit allocation policies were made less favorable to the chaebol with more credit being shifted to small and medium sized enterprises and chaebol were required to obtain government permission before entering a new business. A number of chaebol were forced to restructure by closing businesses and factories or by merging with others. For consumers there were also rewards as the government lifted its restrictions on what they could buy. For example, Koreans had been forbidden to buy the color TV sets that they produced and exported to the rest of the world.

1997 AND THE ASIAN FINANCIAL CRISIS

These changes along with real estate driven inflation created pressures on the Korean economy. In the early 1990s, the trade surplus turned into a deficit as Korea became less competitive. The chaebol, with their high debt to equity ratios were vulnerable. In the spring of 1997, the Hanbo, Jinro, and Sammi conglomerates collapsed under their mountains of debt. But the tsunami that hit the Korean economy in 1997 was mainly generated by the conditions of its entry into the OECD in 1996. The most important of those was the requirement for open capital markets. This meant that Korea had to liberalize and globalize its banking system. There could be no more credit allocation, no restrictions on movement of domestic capital out of the country or on the movement of foreign capital into the country. Thus, many of the familiar tools for managing and guiding the Korean economy were thrown away just at a moment when Korean interest rates were above those elsewhere in the world. Korean banks and non-bank financial institutions began to engage in a frenzy of short term borrowing from foreign lenders. Between December 1996 and March 1997 Korea's long term foreign debt rose from $2.4 billion to $46.1 billion while its short term foreign debt climbed from $3.2 billion to $64.2 billion.[26] In the wake of the collapse of the Thai and Indonesian economies, the emergency measures in Malaysia, and the run on the Hong Kong stock market in the summer of 1997, the rating agencies

[26] Uk Heo and Terence Roehrig, *South Korea Since 1980* (New York, Cambridge University Press, 2010), 98.

downgraded Korean securities. That sparked a run on Korean financial institutions as foreign lenders declined to roll over their short term loans. This caused the won to begin falling. The central bank intervened in the currency markets to defend the won, but simply ran out of dollar reserves in November 1997 and the Korean government had to request a $57 billion IMF bailout and reform and restructuring program. It was a sad moment for a proud country.

KOREA REBOOTS

The crisis led to many reforms and dramatic shifts under the watchful eye of the IMF. The won devalued by about 50 per cent. New regulations made it easy for companies to lay off workers and more difficult for unions to engage in strikes because the corporations were given the right to hire others to replace striking workers. These measures were aimed at reclaiming cost competitiveness for Korea's key export industries. Other measures established the autonomy of the central Bank of Korea so that credit allocation could no longer be practiced and monetary policy could be removed from political influences. Reform and restructuring of the chaebol was also a high priority as the IMF attempted to bring the Korean model into conformity with orthodox IMF doctrines. The reforms were based on the Five Plus Three principles. The Five were: enhanced transparency in accounting and management, resolving mutual debt guarantees among chaebol affiliates, improving a firm's financial structure, streamlining business activities, and strengthening managers' accountability. The Three supplementary principles were: regulation of chaebols' non-bank financial institutions, restriction of circular equity investment, and prevention of irregular inheritance and gift giving among family members. Among the restructurings that resulted from these reforms were the absorption of Kia Motors by Hyundai and the sale of Samsung's auto business to Renault. Very significant was the requirement for independent financial audits and for the big chaebols to reduce their debt to equity ratios from the usual 300-500 percent to under 200 percent.

However, the most important consequence of the crisis was the recognition by Korea's leaders of the country's declining competitiveness and of the need for a new direction and a new plan. Korea's potential growth rate during the 1990s had already declined to 6.7 percent from the 8 percent of the 1980s mainly because of declining growth of the work force and population. Since that long term trend will continue, Korea recognized that it must find new sources of sustainable growth.

Table 3.2 *Potential Growth Rates and Sources of Growth in Korea*
(percent)

	1980–90	1990–2000	2000–10		2010–20	
			High	Low	High	Low
Actual growth rate	9.1	5.7				
Irregular factors	1.1	1.0				
Potential growth rate	8.0	6.7	5.1	4.5	4.1	3.2
Growth in factor inputs	4.5	3.4	2.5	2.4	1.9	1.7
Labor	2.6	1.5	0.6	0.4	0.2	0.2
Capital	2.0	1.9	2.1	1.8	1.7	1.5
Productivity growth	3.5	3.4	2.7	2.1	2.2	1.5
Technological advances	1.1	1.2	1.2	0.9	1.1	0.7

Source: Korea Development Institute (KDI) 2002.

Specifically, Korea realized that it would have to move its productive base to higher levels of technology, globalization, and innovation and that it would have to be able to compete on an equal basis with the likes of Japan, America, China, and other top countries. While the old Korean model system of strong government direction and credit allocation had been set aside, the government nevertheless took leadership in conceiving, articulating, and pointing in a new direction by developing a Knowledge Based Economy master plan in the course of 1999. After clearance by the National Economic Advisory Council, the plan was publicly announced by Korean President Kim Dae-jung in January 2000.

Put into effect in April 2000, the action plan set out three goals: a) leapfrog to the top 10 knowledge –information leaders in the globe, b) upgrade educational standards to OECD levels, and c) spearhead S&T such as bioengineering by upgrading to G-7 levels. To meet these goals the plan established 18 policy tasks

and 83 actionable subtasks in the five main areas of: information infrastructure, human resource development, knowledge- based industry development, S&T, and methods of coping with the digital divide. To implement the plan, the government formed five working groups involving 19 ministries and 17 research institutes under the coordinating direction of the Ministry of Finance and Economics (MOFE). Over the past several years the budget allocation for these activities has increased annually by about 13 percent.[27]

Table 3.3 *Korea's Three-Year Action Plan for the KBE, 2000–03*

Sector	*Target tasks (18 total)*
Informatization	• Complete a basic information infrastructure, such as an optical cable network • Foster an education information network • Manage a national knowledge and information system • Build a cyber government • Change mindsets with respect to IT • Build a sound and secure knowledge society
S&T and innovation	• Reinforce a strategic approach in R&D investment • Facilitate cooperation among industry, universities, and research centers • Build an efficient support system for research • Enhance an understanding of S&T and scientists
Knowledge-based industries	• Build an industrial infrastructure for a KBE • Nurture a new knowledge-intensive industry • Upgrade traditional industries through IT
Education and human resource development and management	• Reform the education system for creativity and competitiveness • Revamp the vocational training system • Develop a fair and efficient labor market
Digital divide	• Expand access to information and IT training • Empower the vulnerable and enhance their life quality

Source: MOFE 2000.

In fact, Korea had already established a significant base in some key high technology electronics industries as a result of the Big Push HCI policies of the 1970s. In those years Samsung entered the semiconductor memory business with

[27] Korea as a Knowledge Economy, 51.

the production of dynamic random access memory chips (DRAMs). Of course, it benefited enormously from the tax holidays, free land, under-valued currency, and export subsidies that were key elements of Korea's industrial development policies. Initially, it lagged behind the American and Japanese producers. But in 1985 it became the first company in the world to make a 256 K DRAM, then the technologically most advanced chip. In doing so, it beat out companies like Intel, IBM, Toshiba, NEC, Texas Instruments, and Sony. By 1999, Samsung was already the world leader in semiconductor memory technology and the most important producer of DRAM devices. Along with Lucky Goldstar, Samsung had also become a major player in electronic display technology and in production of consumer electronics generally.

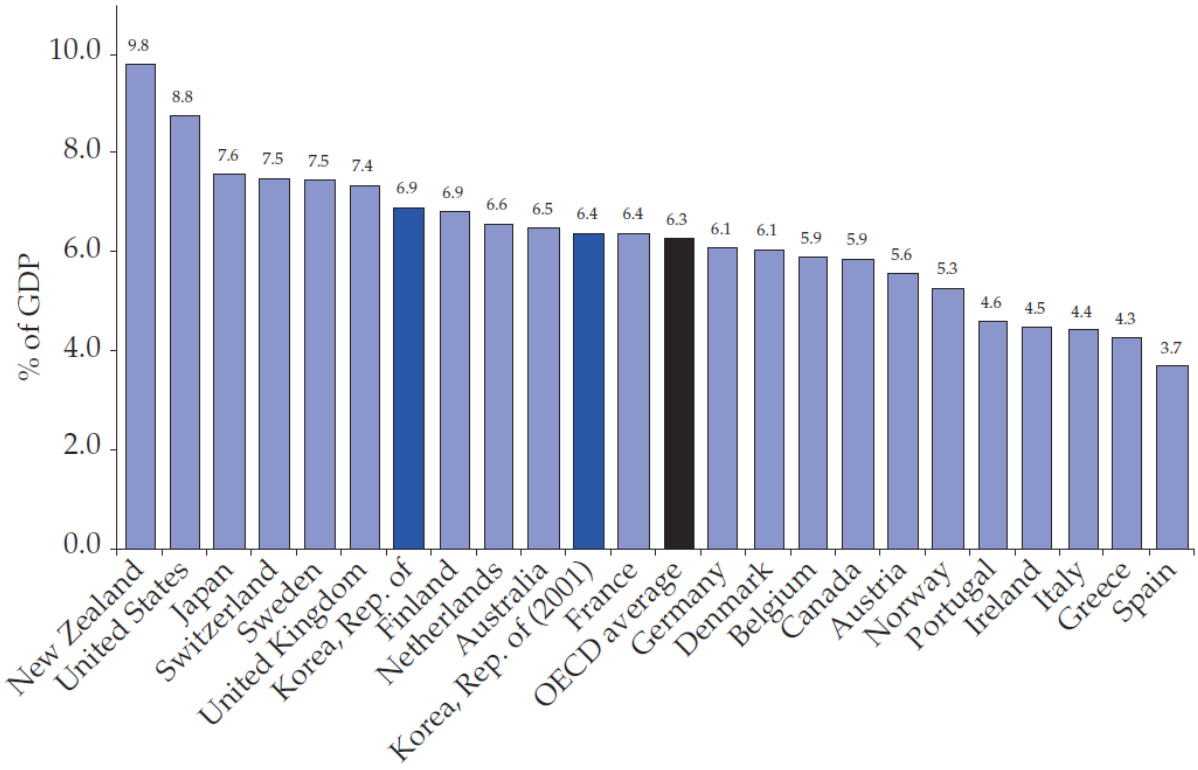
KNOWLEDGE IS POWER AND GROWTH

Because Korea's population is now beginning to age rapidly and will actually begin shrinking after 2020, the growth of the economy in the future will have to depend more and more on productivity gains. To achieve this, Korea has focused intensely on becoming the leader of the global knowledge economy and has even created the Ministry of the Knowledge Economy as a separate government ministry charged with overseeing the development of all knowledge economy public policies and with coordinating public and private activities in order to maximize the growth and benefits of the knowledge economy.

This has entailed a twin thrust approach. On the one hand, the Korean government has moved aggressively to assure that Korea is the world leader in high tech infrastructure, human capital, venture capital, and R&D. On the other hand, it has also taken care to assure that major Korean companies have a preferential position in the Korean market and that they have assured cost advantages in the global market.

With regard to infrastructure, the focus has been particularly intense in the area of Information and Communication Technologies (ICTs). Policies have covered the building information infrastructure, and the promotion of information industrial activities, including capacity building of the ICT industry.

Figure 5.1 *ICT Expenditure (Share of GDP), Selected OECD Countries, 2005*



Source: World Bank SIMA database.

Consequently, Korea has built what is probably the most sophisticated and advanced information superhighway in the world. To do this it privatized its telecom operators and introduced market competition based on full facilities competition. In other words, at each level from the home to the central switches, competitors installed their own facilities rather than using the U.S. model of competition over shared facilities. Despite the high investment cost involved in this model, the economic gains from the competition have more than justified the financial investment. The network competition promotes the service and content industries which in return attract more network subscribers in a kind of virtuous circle. Thus, e-commerce, on-line gaming, and Internet broadcasting have begun to flourish in Korea.

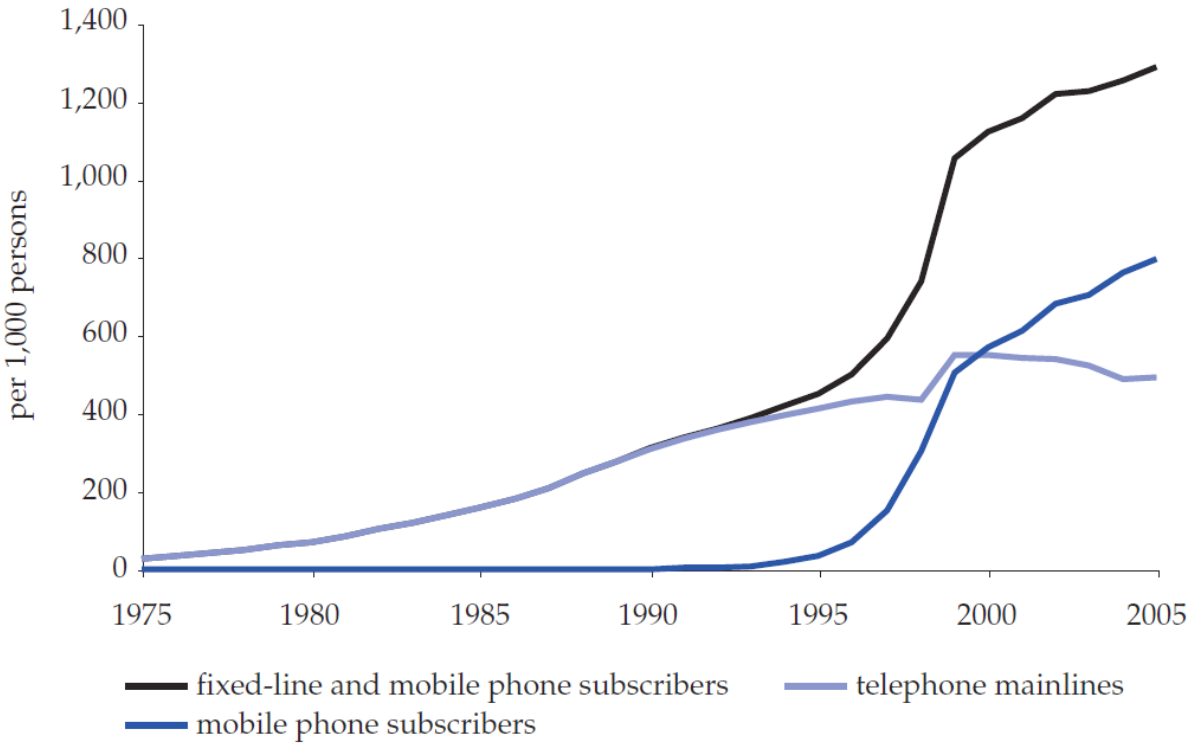
The government strongly facilitated this competition by providing so called Full Service Telecom Providers with public loans at prime rates, thereby reducing the financial burden of investing. To further promote the penetration of broadband networks to all households, the government created the Cyber Building Certificate system under which official certificates are issued to buildings according to the bandwidth of their high speed telecommunications capacity. This capacity, of course, depends on and the high speed backbone developed by the public-private Korea Information Infrastructure (KII) plan. Under it, the government invested $600 million in creating a Test Bed network and a special government Backbone Network to service all government agencies. This then served as the model and basis for the building of the advanced public backbone network that now delivers 100 megabits of information per second to about 75 percent of all Koreans (compare this to the 4-10 megabits per second available to U.S. broadband subscribers who account for only about 35% of the population). This kind of bandwidth enables services and R&D and products that are simply not possible with lower speed Internet service. Thus a passenger on a high speed bullet train riding through the tunnels and mountains of the Korean countryside can tune into her favorite television programs on her mobile phone or she can check the tracking device on her phone to see where the children are or if she is going to the airport she can arrange to pick up at the airport, the foreign exchange she'll need for her trip. None of this is possible in most countries outside of Korea.

To promote full use of this bandwidth, the government in 2001, undertook an E-Government initiative directly under the control of the President of Korea. His special committee for e-Government systematically reviewed and revised procedures and practices to maximize use of Internet based activities. Thus, all government data bases were connected. The Home Tax Service encouraged taxpayers to file their returns over the Internet and offered them a bonus for doing so. Citizens were also encouraged to receive electronic bills and to process payments from home over the Internet. The government also invested heavily in public awareness and education. Between 2000 and 2008, 20 million people

received a basic ICT education program.[28] All of the country's 10,064 schools are on high speed Internet and teachers receive a training program in ICT every four years. Much of this activity is funded by the Informatization Promotion Fund (IPF), a special vehicle for promoting ICT, broadband penetration, and Internet use that receives about half its money from the government and half from ICT industry contributions.

The results of all this have been dramatic as shown in the following charts:

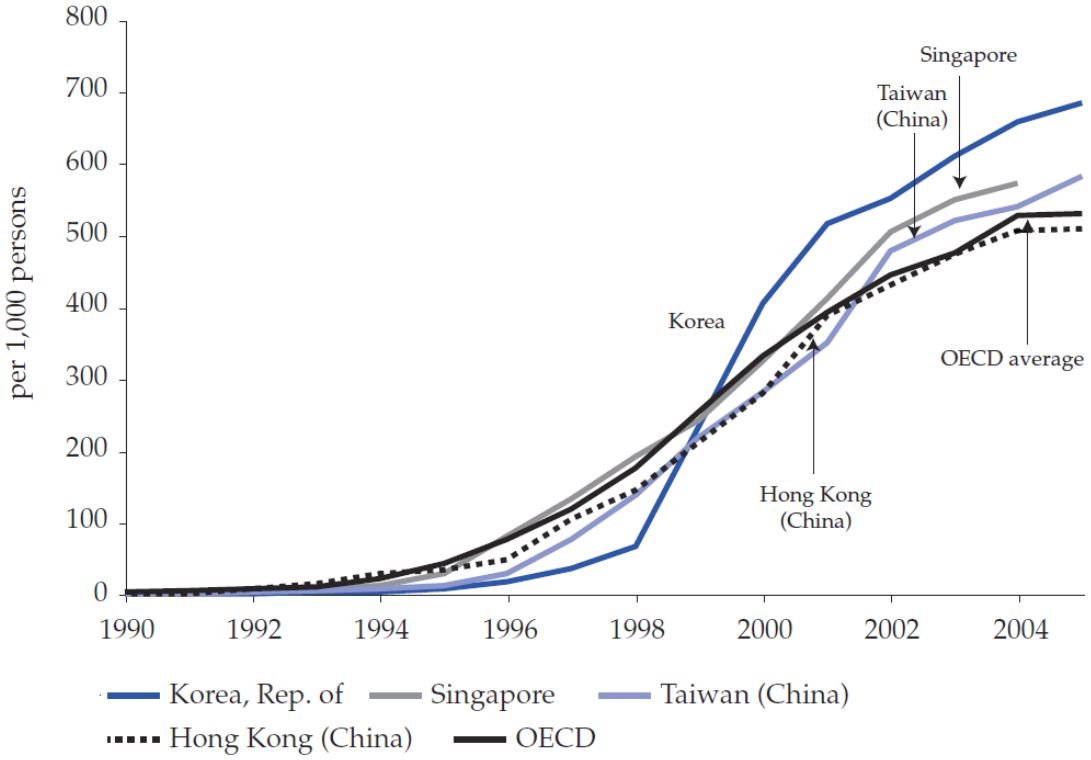
Figure 5.2 *Teledensity in Korea, 1975–2005*



Source: World Bank SIMA database.

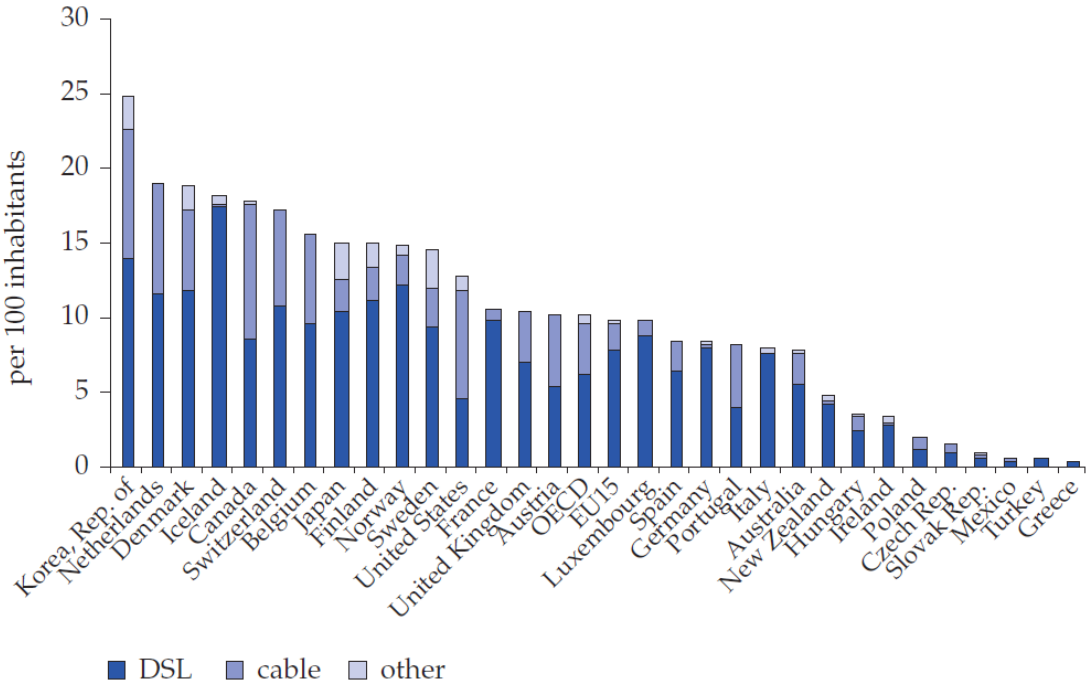
[28] Korea as a Knowledge Economy, 91.

Figure 5.4 *East Asian Newly Industrializing Economies and OECD Average—Internet Users, 1990–2005*



Source: Constructed based on data obtained from World Bank SIMA database.

Figure 5.5 *Broadband Subscribers by Technology per 100 Inhabitants, Selected Countries, 2004*



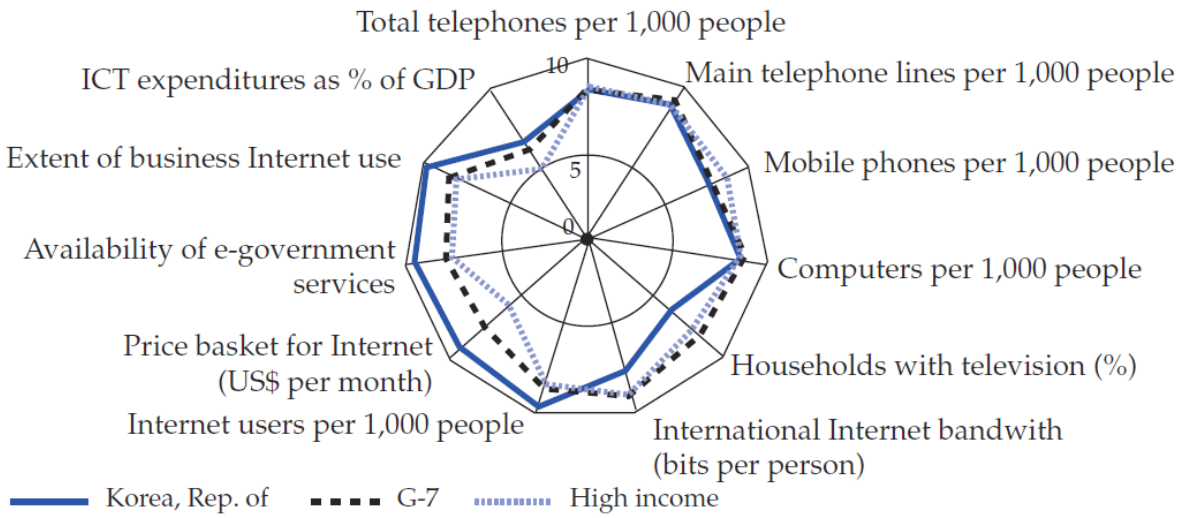
Source: OECD 2005b.

Table 5.3 *Major e-Government Initiatives*

Objectives	*e-government initiatives*
Upgrade government-wide services for citizens and private businesses	1. Set up information sharing in five major government services, including resident registration, real estate, and vehicle records. 2. Created a G4C system to establish a government-wide service processing system Established a Social Insurance Information Sharing system for health, pension, unemployment, and industrial accident compensation 3. Built a Home Tax Service system that enables online filing of tax returns, electronic bill payment, tax consultation, and issuance service for tax-related certificates 4. Established a government e-procurement system to achieve transparent procurement processes
Improve the effectiveness of administration	5. Built a National Finance Information System for budget planning and allocation, accounting, and settlement of accounts and made financial information available through an interagency network 6. Built a National Education Information System for the electronic distribution and management of records across schools, offices of education, and the Ministry of Education and Human Resources Development 7. Proceeded with the Local Government Information Network System project for 21 service areas 8. Built a Personnel Policy Support System to manage the hiring, promotion, and compensation of civil servants in a fair and systematic way
Establish an infrastructure for e-government	9. Expanded the use and distribution of e-approvals and e-documents between agencies 10. Expanded the use of electronic signatures and seals to establish a reliable e-administration 11. Constructed a government-wide integrated computer network in project-specific stages (since November 2002, the redesign plan for work processes and the strategic plan for IT has been formulated)

Source: Special Committee for e-Government 2003, p. 13.

Figure 5.6 *ICT Indicators—Republic of Korea, G-7, and High Income Countries*



Variable	*Korea, Rep. of*		*G-7*		*High income*	
	Actual	*Normalized*	*Actual*	*Normalized*	*Actual*	*Normalized*
Total telephones per 1,000 people, 2004	1,302.80	8.11	1,350.06	8.3	1,374.27	8.52
Main telephone lines per 1000 people, 2004	541.90	8.94	562.34	9.13	496.11	8.61
Mobile phones per 1,000 people, 2004	760.90	7.42	787.71	7.55	878.15	8.3
Computers per 1,000 people, 2004	544.90	8.73	564.86	8.85	479.61	8.31
Households with television (%), 2004	93.00	6.36	97.3	8.18	96.35	7.54
International Internet bandwidth (bits per person), 2004	1,484.50	7.74	5,207.33	8.9	5,475.39	8.93
Internet users per 1000 people, 2004	656.80	9.62	555.16	8.83	480.68	8.43
Price basket for Internet (US$ per month), 2003	9.70	9.32	16.76	7.39	21.21	5.8
Availability of e-government services (1–7), 2006	5.46	9.36	4.58	7.87	4.55	7.77
Extent of business Internet use (1–7), 2006	6.10	9.83	5.36	8.61	4.93	7.94
ICT expenditure as % of GDP, 2005	6.91	6.35	6.65	6.01	6.05	4.93

Source: KAM, December 2006 (www.worldbank.org/wbi/kam).

Korea sees ICT not only as a driver of productivity but also as a driver of innovation and manufacturing growth. The rise in ICT investment leads to capital accumulation and Bank of Korea statistics show that the contribution of ICT investments to overall GDP growth have risen from about 3.5 percent in 1995 to more than 20 percent today.[29] The use of the Internet and of Broadband communications also spurs the demand for optical fiber, semiconductors, electronic displays, and much else. The share of the ICT industry in Korea's GDP rose from 7.7 percent in 1997 to 16.2 percent in 2006. This reflects the powerful position that leading Korean producers such as Samsung, Lucky Goldstar, and Hynix have achieved in mobile phones, semiconductors, flat panel LCD monitors, LEDs, and flat panel TV sets. But this powerful position also owes much to government policies and assistance. For example, production of semiconductors, flat panel displays, and other electronics is energy intensive. So the Korean power company offers the producers a reduced electricity rate. At the same time, technical standards are sometimes used as a trade barrier. Thus Apple was prevented from selling the iPhone in Korea for a long time because of a Korean rule that required the phone to be produced in Korea in order to be technically certified. This effectively gave Samsung a protected haven within which to develop.

[29] Korea as a Knowledge Economy, 94.

Table 5.5 *Contribution of the ICT Industry to Economic Growth, 1997–2006*
(percent of GDP)

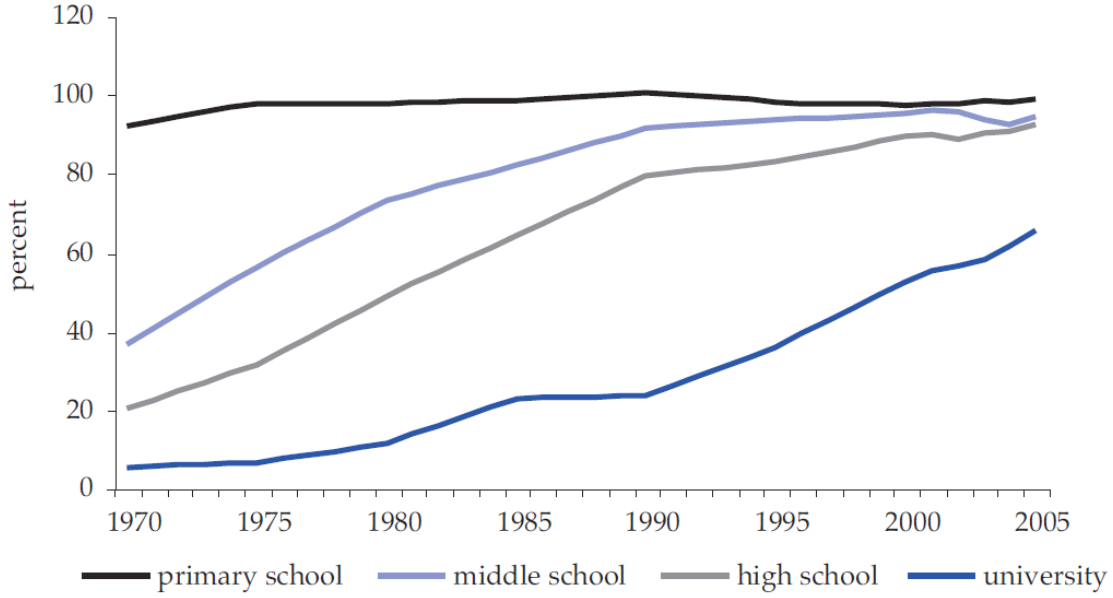
	1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
Growth rate of the ICT industry	11.6	23.0	35.3	33.8	10.5	17.6	14.2	17.5	13.5	13.3
Growth rate of GDP	4.7	−6.9	9.5	8.5	3.8	7.0	3.1	4.7	4.2	5.0
ICT industry share of GDP	4.7	6.2	7.7	9.5	10.1	11.1	12.3	13.8	15.0	16.2
ICT industry contribution to GDP growth	0.5	1.1	2.2	2.6	1.0	1.8	1.6	2.2	1.9	2.0

Source: Bank of Korea 2006.
Note: 1997–2006 statistics were calculated at 2000 constant prices.

SMART KOREA

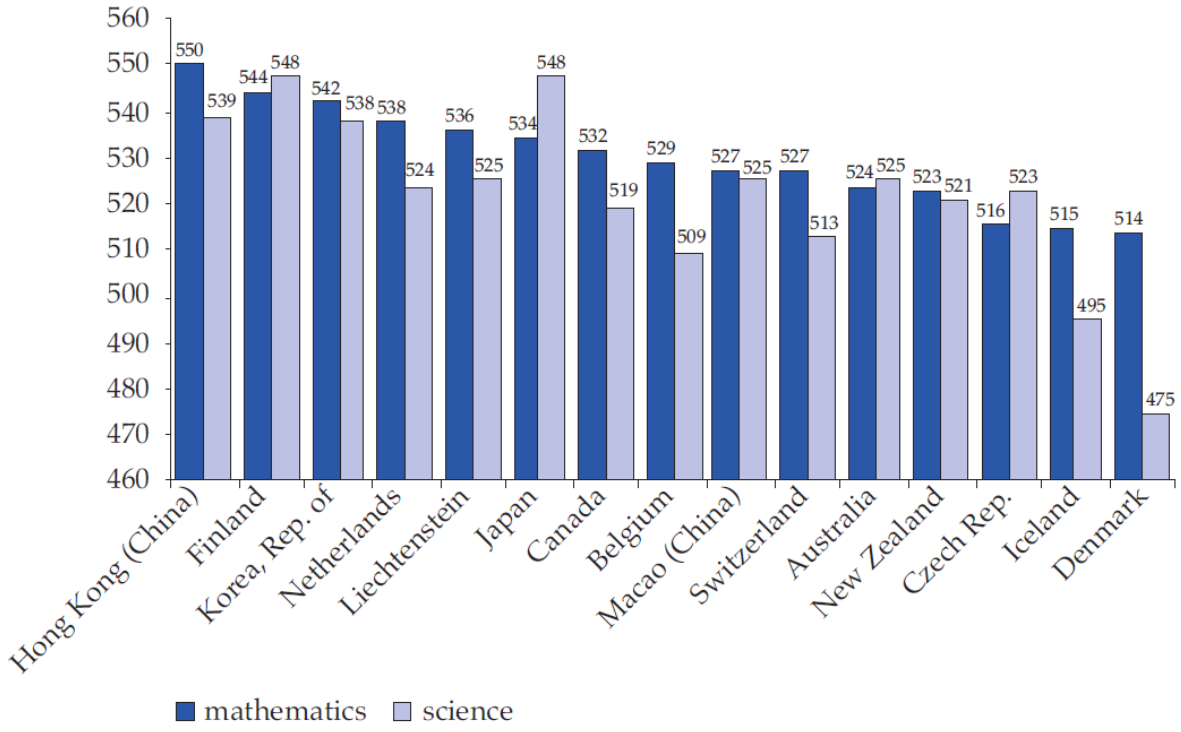
Beginning with the literacy campaign of the late 1940s and 1950s, Korea has always emphasized education as a matter of the highest public policy priority. Teaching has always been a prestigious profession and teachers are not only respected, but also rewarded. Thus teachers earn 2.5 times the average per capita income versus, for example, 1.2 times in the case of U.S. teachers. A high school teacher in Korea with 15 years of experience made $77 per hour in 1999 compared to $35 for a U.S. teacher similarly qualified. The results are evident from the statistics and comparisons in the following charts:

Figure 6.1 *Educational Expansion in Korea, Gross Enrollment Rates*



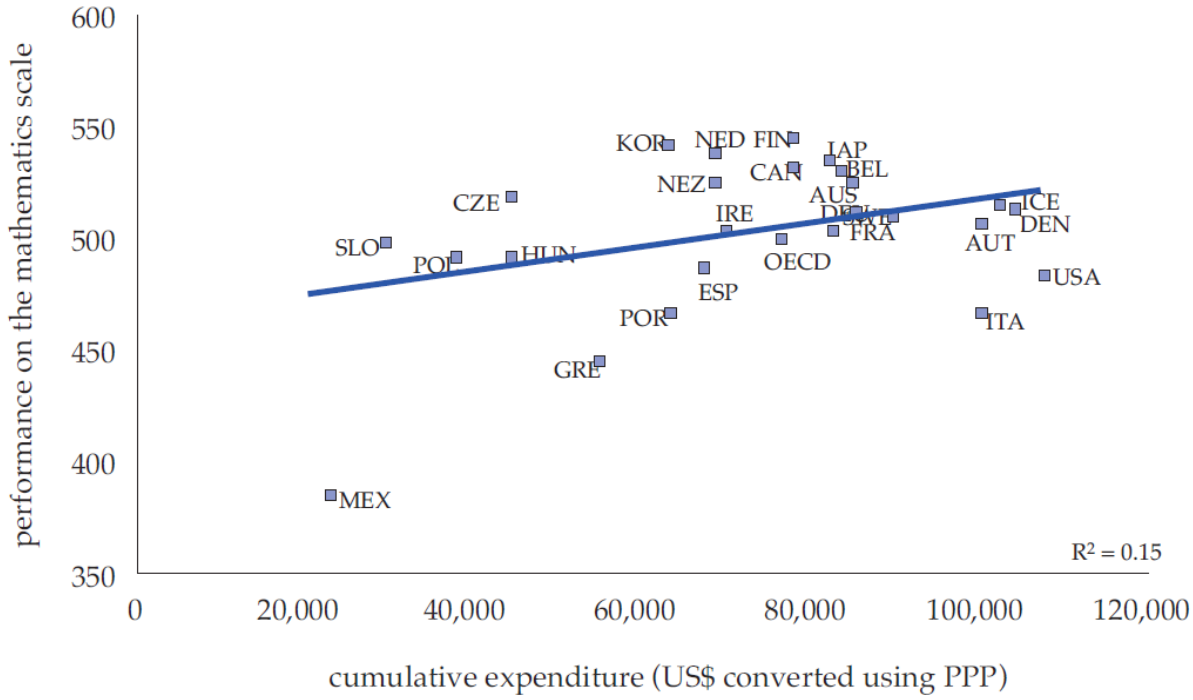
Source: Ministry of Education, Statistical Yearbook, various years.

Figure 6.3a *PISA 2003 Mathematics and Science Scores, Selected Countries*



Source: OECD 2004c.

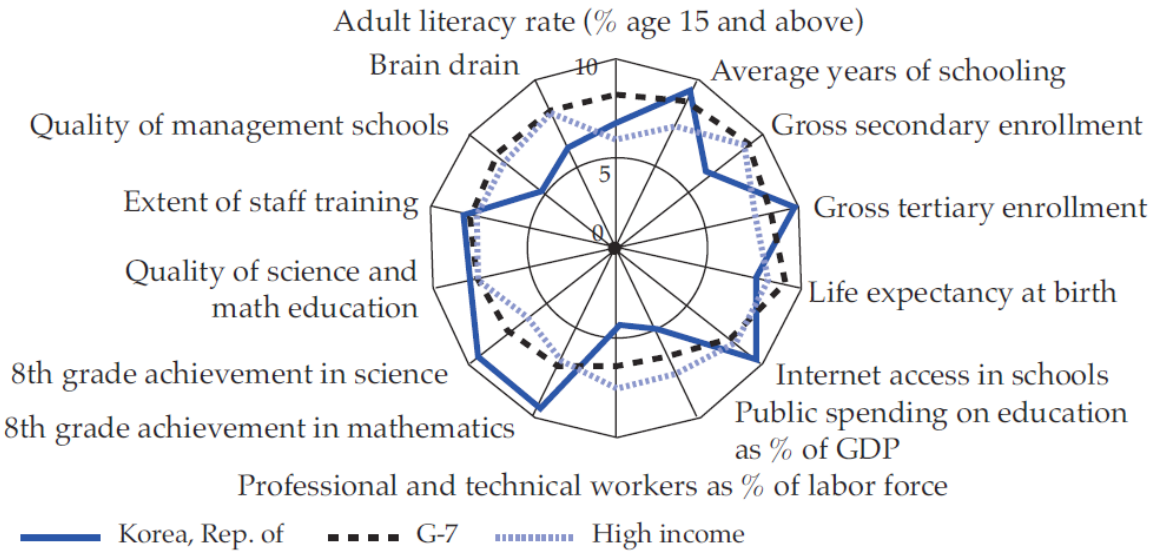
Figure 6.4 *Student Performance and Spending per Student, 2003*



Source: OECD 2006. Education at a Glance. Paris: OECD

Note: Relationship between performance in mathematics and cumulative expenditure on educational institutions per student between ages of 6 and 15 years, in U.S. dollars, converted using purchasing power parity (PPP).

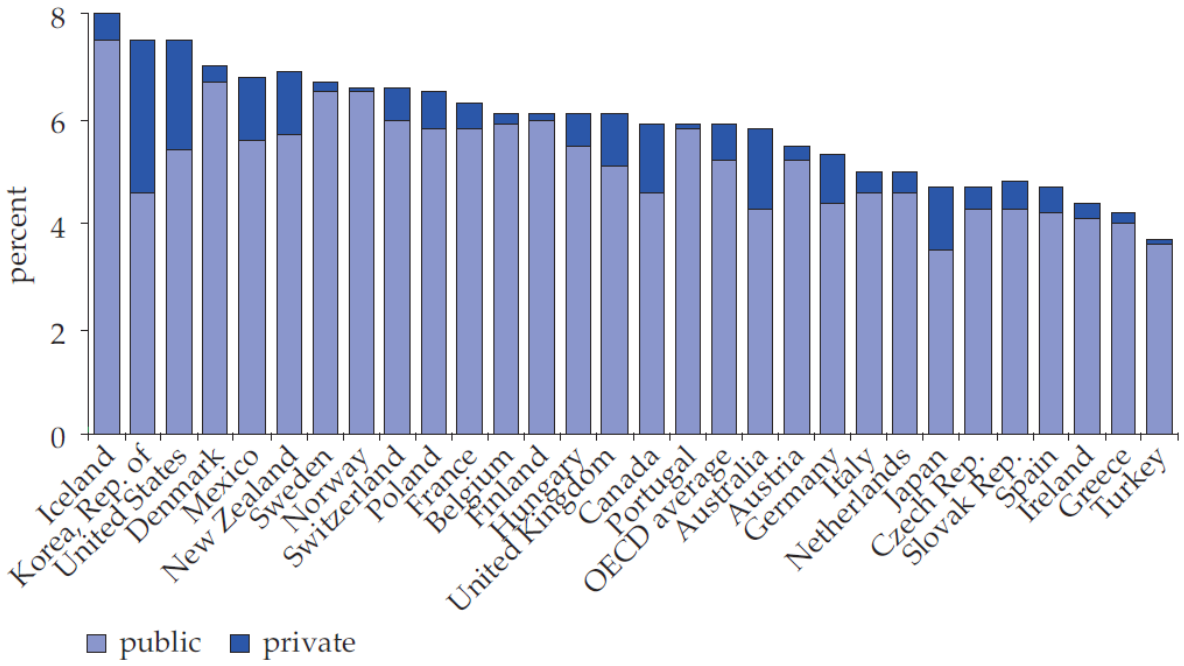
Figure 6.5 *Education Indicators*



Variable	*Korea, Rep. of* Actual	Normalized	*G-7* Actual	Normalized	*High income* Actual	Normalized
Adult iiteracy rate (% age 15 and above), 2004	97.90	6.59	99.77	8.22	96.68	5.95
Average years of schooling, 2000	10.84	9.26	9.68	8.67	9.20	7.38
Gross secondary enrollment, 2004	90.90	6.28	102.73	8.80	102.18	8.72
Gross tertiary enrollment, 2004	88.50	9.84	60.84	8.28	56.19	7.64
Life expectancy at birth, 2004	77.10	7.58	79.46	9.12	78.57	8.26
Internet access in schools (1–7), 2006	6.40	9.66	5.53	7.09	5.61	8.02
Public spending on education as % of GDP, 2003	4.60	5.04	5.14	6.42	5.59	7.17
Professional and technical workers as % of labor force, 2004	17.98	4.20	24.71	6.38	26.25	7.35
8th grade achievement in mathematics, 2003	589.00	9.39	517.00	7.18	513.48	6.86
8th grade achievement in science, 2003	558.00	9.39	528.20	7.35	516.24	6.02
Quality of science and math education (1–7), 2006	5.10	7.84	4.96	7.52	4.94	7.46
Extent of staff training (1–7), 2006	5.20	8.36	5.17	8.25	4.99	7.80
Quality of management schools (1–7), 2006	4.30	5.09	5.36	8.19	5.10	7.67
Brain drain (1–7), 2006	3.70	6.09	4.70	8.22	4.67	7.96

Source: KAM, December 2006 (www.worldbank.org/wbi/kam).

Figure 6.7 *Education Spending as a Percentage of GDP, 2003*



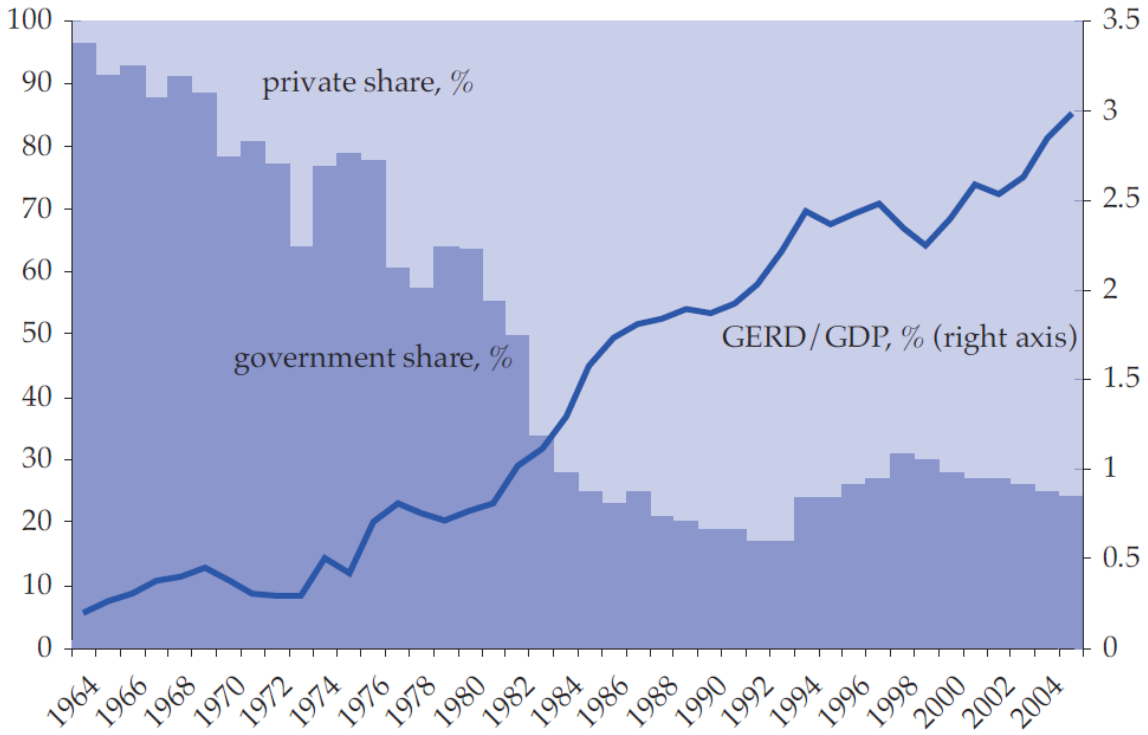
Source: OECD. 2006. *Education at a Glance.* Paris: OECD.

Obviously Korea has an outstanding record of educational achievement and is much better placed than many other countries in this field. Nevertheless, there are issues that the government is trying to confront. One is the fact that the high performance of students on tests seems to be more the result of external pressure than of self-motivation. The other is a mismatch between the needs of industry and the economy in terms of trained employees and the quality of and fields of education in which students are being trained. Specifically, there are not enough science and engineering students and too many liberal arts students. At the same time, the Korean education system is said to be mechanical and rule driven rather than encouraging of creativity and independent thought. Numerous commissions under the Ministry of Education Science and Technology are laboring to devise new approaches for making Korean education both better and better suited to the needs of the future Knowledge Economy.

COPYCAT OR LEADER

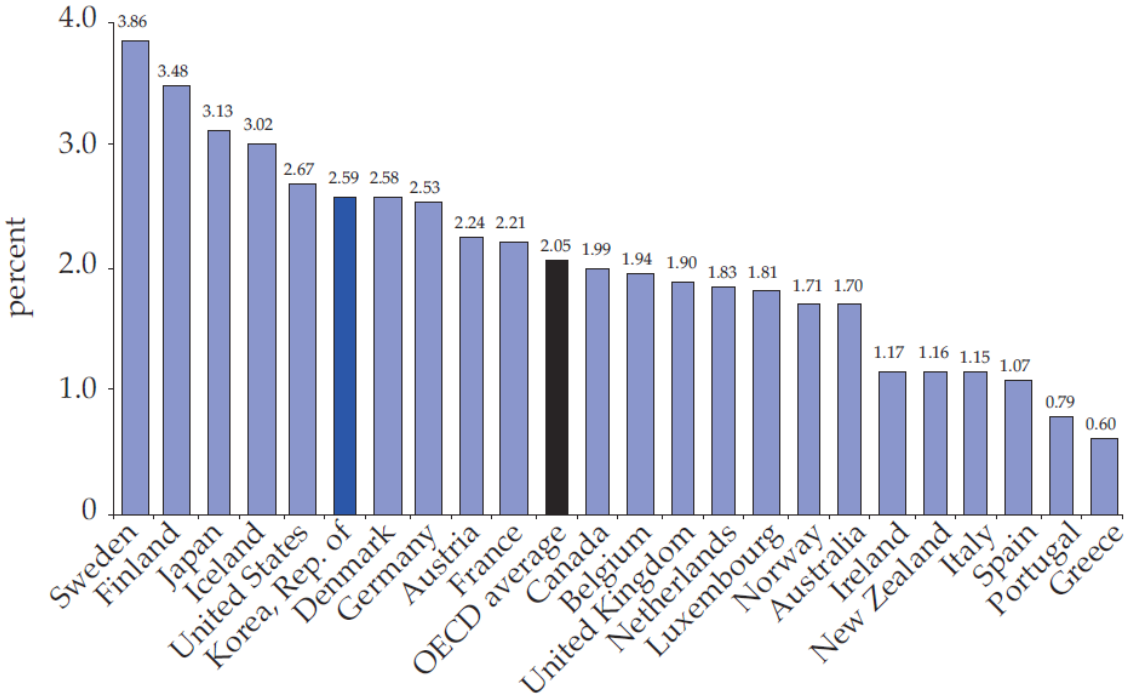
In the early years of Korea's industrialization, the country relied on reverse engineering, licensing of foreign technology, and original equipment manufacturing as sources of technology. Essentially, it copied the technology of the leading countries as it tried to catch up to them both technologically and in terms of standard of living. During the push for HCI in the 1970s, the government helped industry compensate for its lack of R&D and technical capability by creating Government Research Institutes of which there are now 28. As Korea increased its technological capability, it became increasingly a competitor to the leading countries and global companies and the opportunities to assimilate technology became less available. This necessitated greater efforts at developing indigenous technology and both the government and private industry began to increase their spending on R&D and to seek advantage through Korea's own innovation. This can be readily seen in the charts below:

Figure 7.1 *Gross Expenditure on Research and Development in Korea, 1964-2005*



Source: Ministry of Science and Technology.

Figure 7.2 *GERD (Share of GDP), Average for 2002–05*



Source: World Bank SIMA database.

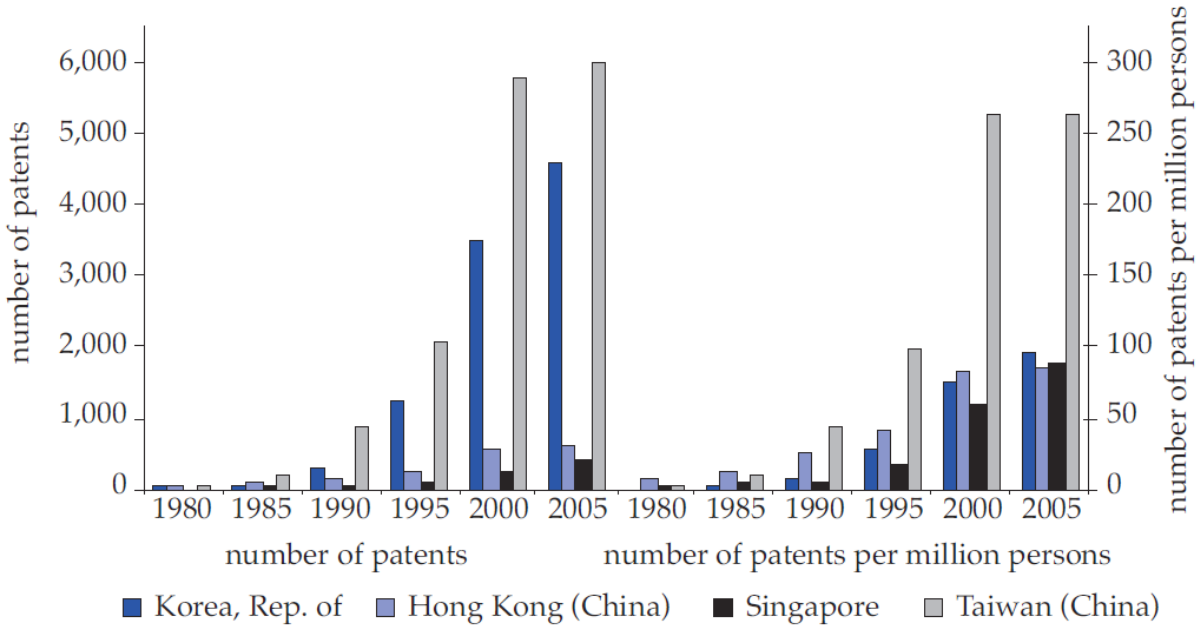
Table 7.2 *Basic Statistics on Korea's R&D, 1965–2005*

	1965	*1970*	*1975*	*1980*	*1985*	*1990*	*1995*	*2000*	*2005*
R&D expenditure									
(in billion won)	2.1	10.5	42.7	282.5	1,237.1	3,349.9	9,440.6	13,848.5	24,155.4
Government	1.9	9.2	30.3	180.0	306.8	651.0	1,780.9	3,451.8	5,877.2
Private sector	0.2	1.3	12.3	102.5	930.3	1,698.9	7,659.7	10,387.2	18,106.8
Government versus private sector	61:39	97:03	71:29	64:36	25:75	19:81	19:81	25:75	25:75
University R&D	NA	0.4	2.2	25.9	118.8	244.3	770.9	1,561.9	2,398.3
GRI R&D	NA	8.9	28.1	104.5	367.2	731.0	1,766.7	2,032.0	3,192.9
Corporate R&D	0.2	1.3	12.3	81.4	751.0	2,374.5	6,903.0	10,254.7	18,564.2
R&D as percentage of GNP	0.3	0.4	0.4	0.8	1.6	2.0	2.5	2.4	3.0
Manufacturing sector R&D									
expenditure (in billion won)	NA	NA	16.7	76.0	688.6	2,134.7	5,809.9	8,584.9	16,463.7
Percent of sales	NA	NA	0.4	0.5	1.5	2.0	2.7	2.2	2.7
Number of researchers	2,135	5,628	10,275	18,434	41,473	70,503	128,315	159,973	234,702
GRI	1,671	2,458	3,086	4,598	7,542	10,434	15,007	13,913	15,501
Universities	352	2,011	4,534	8,695	14,935	21,332	44,683	51,727	64,895
Private sector	112	1,159	2,655	5,141	18,996	38,737	68,625	94,333	154,306
R&D expenditure per researcher									
(in thousand won)	967	1,874	4,152	15,325	27,853	47,514	73,574	86,568	102,920
Researchers per 10,000 population	0.7	1.7	2.9	4.8	10.1	16.4	28.6	34.0	48.6
Number of corporate R&D centers	0	1	12	54	183	966	2,270	7,110	11,810

Source: Ministry of Science and Technology.
Note: GRI = government research institute.
NA = not available.

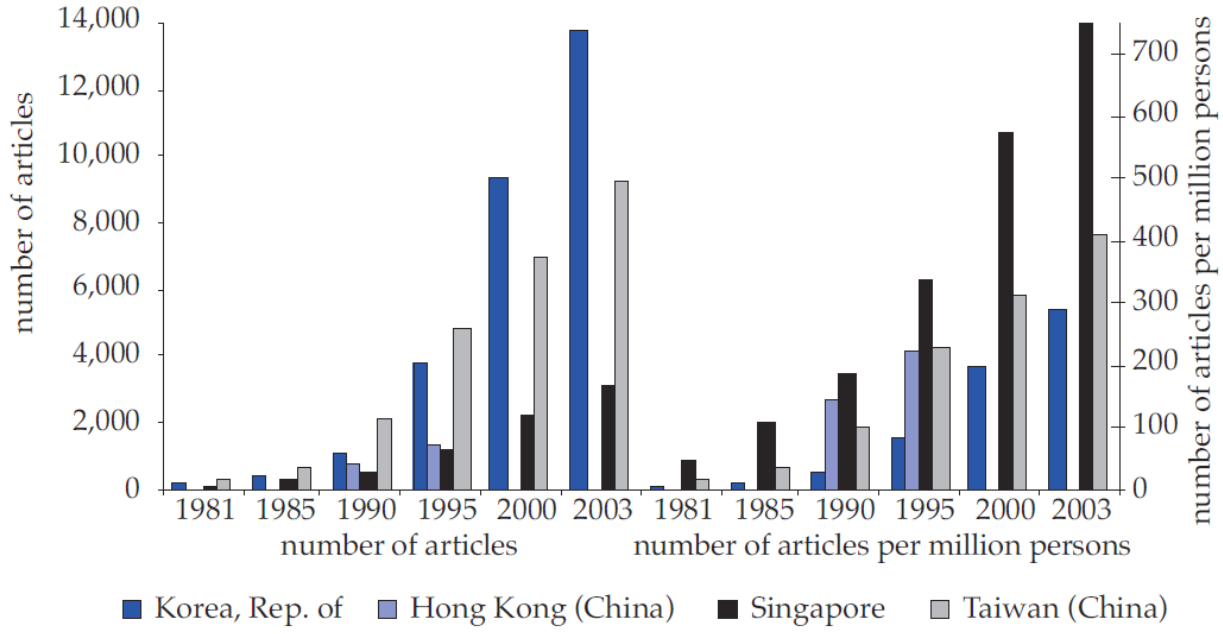
The results of these R&D efforts are evident from the rise in Korean patent filings and the publication of Korean articles in technical journals:

Figure 7.3 *USPTO Patents Granted to East Asian Newly Industrialized Economies Inventors, 1980–2005*



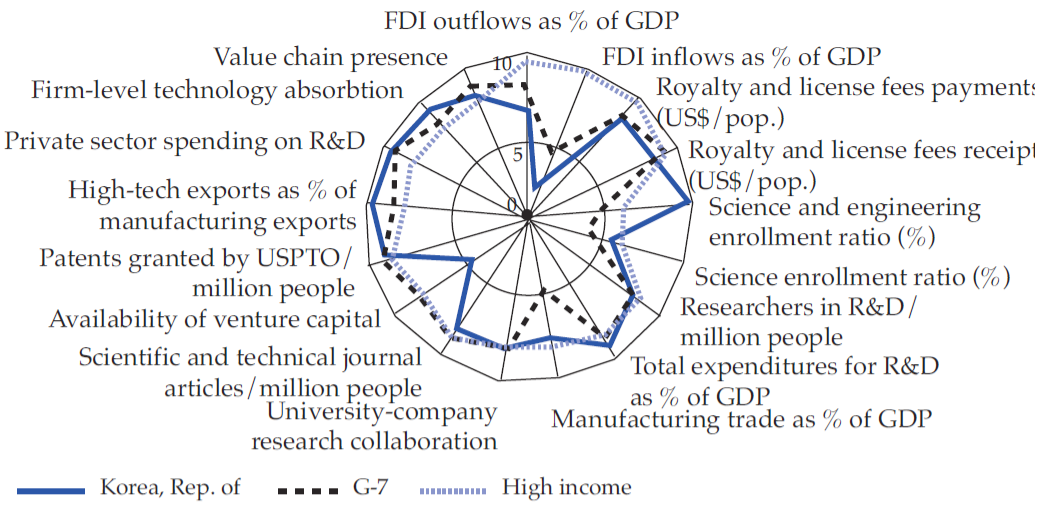
Source: World Bank SIMA database.

Figure 7.4 *Scientific and Technical Journal Articles Published by East Asian Newly Industrialized Economies Authors, 1981–2003*



Source: World Bank SIMA database.

Figure 7.5 *Innovation Indicators: Republic of Korea, G7, and High-Income Countries*



Variable	*Korea, Rep. of* Actual	Normalized	*G-7* Actual	Normalized	*High income* Actual	Normalized
FDI outflows as % of GDP, 2000–04	0.71	6.58	2.98	8.29	14.90	9.78
FDI inflows as % of GDP, 2000–04	1.04	1.89	2.23	3.90	14.46	9.58
Royalty and license fees payments (US$/pop.), 2004	92.52	8.56	95.28	8.62	291.95	9.76
Royalty and license fees receipts (US$/pop.), 2004	37.22	8.41	107.69	9.28	83.00	9.02
Science and engineering enrollment ratio (%), 2004	41.09	9.88	21.59	4.24	23.79	5.76
Science enrollment ratio (%), 2004	10.25	5.35	8.80	3.81	10.76	5.99
Researchers in R&D/million people, 2004	3,187.00	8.09	3,411.71	8.48	3,367.55	8.44
Total expenditure for R&D as % of GDP, 2004	2.64	9.25	2.21	8.66	1.97	8.57
Manufacturing trade as % of GDP, 2004	55.37	7.58	31.45	4.23	60.82	8.02
University-company research collaboration, 2006[a]	4.60	8.28	4.64	8.49	4.30	8.02
Scientific and technical journal articles/milion people, 2003	287.57	7.94	612.98	8.80	535.89	8.66
Availability of venture capital, 2006[a]	3.10	4.14	4.54	8.10	4.50	7.93
Patents granted by USPTO/million people, avg. 2001–05	88.44	8.86	146.45	9.43	86.64	8.84
High-tech exports as % of manufacturing exports, 2004	32.80	9.34	19.67	8.16	17.69	7.87
Private sector spending on R&D, 2006[a]	5.10	9.22	4.91	9.14	4.43	8.06
Firm-level technology absorption, 2006[a]	5.90	8.97	5.51	8.06	5.48	7.87
Value chain presence, 2006[a]	5.50	8.25	5.83	8.82	5.15	8.07

Source: KAM, December 2006 (www.worldbank.org/wbi/kam).

a. Ratings are from 1 (worst) to 7 (best).

A WORD ON CHAEBOL

In closing, it must be noted that Korea has developed a unique form of corporation that is enormously powerful in Korea and also in the global economy. This, of course, is the chaebol a la Samsung, Lucky Goldstar, Hyundai, and about 30 others. These sprawling conglomerates have from the beginning been the core of the Korean economy and the engine of its rapid industrialization and growth. Despite the IMF imposed reforms after 1997 and various efforts to promote small and medium sized companies and despite new rules on transparency and competition policy, the top four chaebols still account for about half of Korean production and that percentage may grow in the future. Over the years, they have been involved in corruption but have also been quasi agents of the Korean government. What is particularly striking is how innovative, persistent, bold, and inexorable they have been both as organizations and in terms of their products and commercial operations. They started from behind, in terms of technology, economies of scale, global marketing know-how, and financial strength. They have now become the leaders in a variety of key industries. Samsung is the dominant producer of DRAMs and flash memory devices that are critical to computers, mobile phones, and a wide variety of other electronic products. It and Lucky Goldstar have overtaken the Japanese to become the leaders in electronic display technology and products. Hyundai has become the world's most competitive auto company, gaining market share at the expense of the Japanese producers in Europe, the United States, and China. Samsung has been described by former Intel Chairman Craig Barrett as Intel's most formidable competitor. It is also Apple's most dangerous opponent.

To be sure, the chaebols had a lot of help from the Korean government and even from the U.S. government and other international bodies over the years. They didn't do it all on their own. But neither has their success been solely due to government policy. They have been willing to take big risks that most other global corporations have shied away from. Take Samsung's eclipse of the Japanese

electronics companies as the leader in DRAMs and electronic displays. Production of these products is enormously capital intensive. A new factory may cost as much as $10 billion. A wrong decision of that magnitude can sink a whole company. So the decision to build or not to build a factory is a bet the company kind of decision. But just because the capital cost is so high, the importance of gaining economies of scale before other producers can do so is paramount. He who enters the market first with economies of scale will almost surely become the dominant player. Samsung has consistently been willing and able to move ahead quickly with massive investments while the likes of Toshiba, Elpidas, Renensas, and Sony have hesitated.

Looking forward, the only other country that has anything like the chaebol is China with its big state-owned enterprises and quasi- state owned enterprises. One sometimes wonders if these two countries will be dividing the future between themselves.

CONCLUSIONS

Korea got rich by applying its variant of the East Asia economic miracle formula. This is essentially a mercantilist prescription the key ingredients of which are:

1. Commitment to gaining economic competitiveness as a matter of the highest national priority, the most important single issue and objective for the top leaders of the country. President Park Chung-hee epitomized this element.

2. Restriction of domestic consumption coupled with strong measures to force a high savings rate which feeds a high investment rate of more than 30 percent of GDP. For the 16 years from 1981 to 1997 the Korean investment rate was about 35 percent of GDP.

3. High quality bureaucrats who are both largely free of personal corruption and powerful enough to assert the national economic interest against the individual interests of corporations and labor unions.

4. A guiding vision of the country as a leader in a wide range of industries and technologies and a plan for realizing the vision.

5. Placement of a high priority and of substantial investment in world class infrastructure – roads, airports, water systems, communications, trains, ports, and so forth.

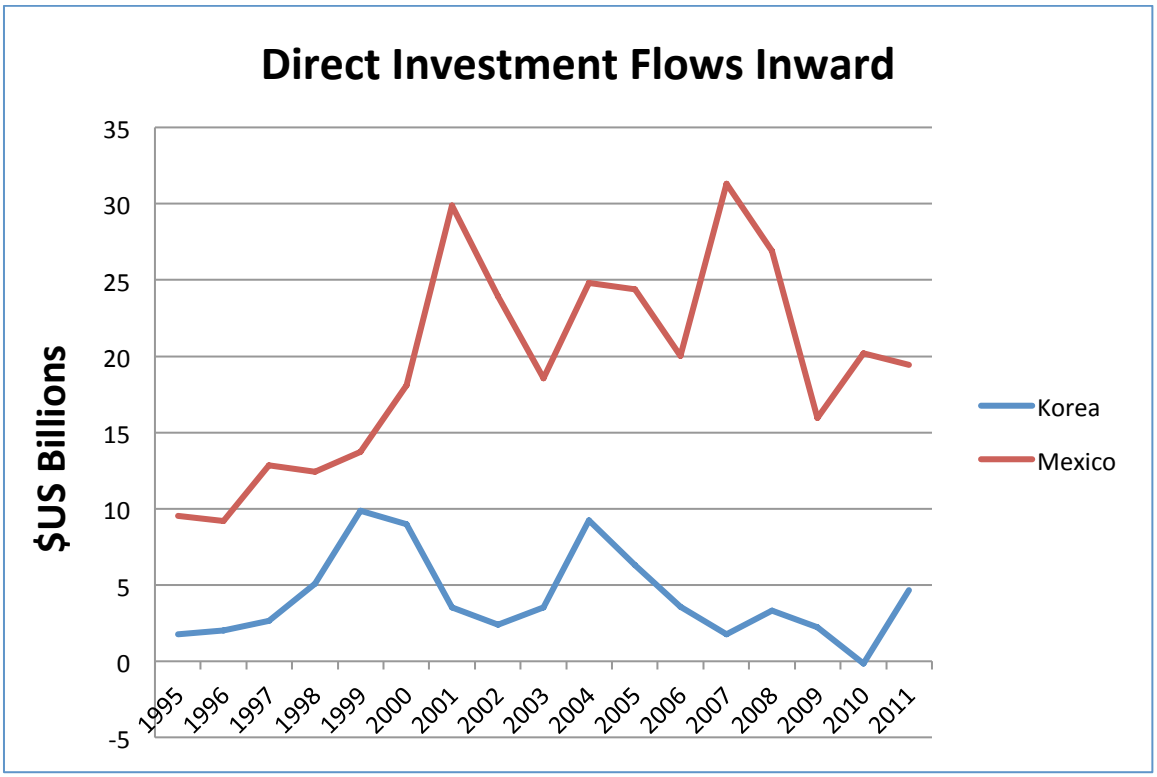
6. A sense of national solidarity and widespread commitment to the vision and the plan. Social cohesion so that the country's citizens feel as if they are all on the same team dedicated to becoming a leader and a winner.

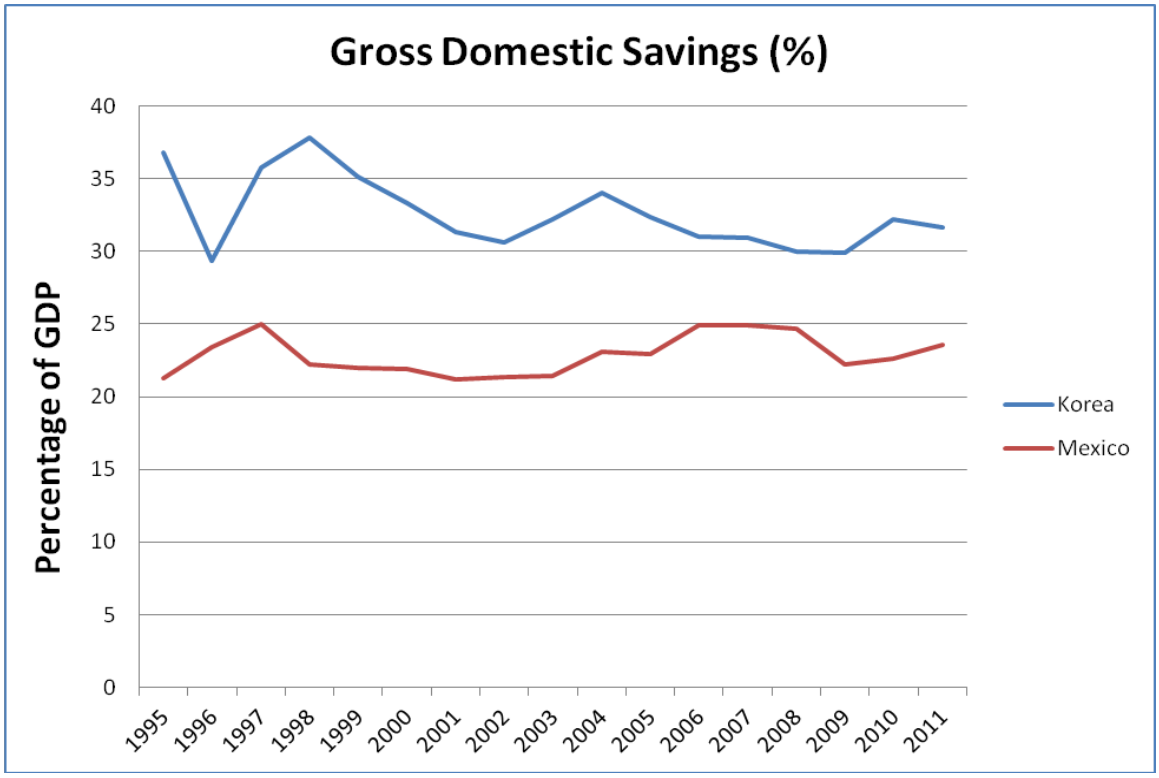
7. A strong focus and top priority for MANUFACTURING, MANUFACTURING, MANUFACTURING. It must be recognized that manufacturing contributes disproportionate gains in productivity, skill acquisition, innovation and R&D, and economies of scale. During the 47 year period from 1953-1999 manufacturing expanded at double the rate of the overall economy with an average annual growth rate of 14 percent. Manufacturing increased from 10 percent of total GDP in 1953 to 33 percent in 1988 and is now about 30 percent.

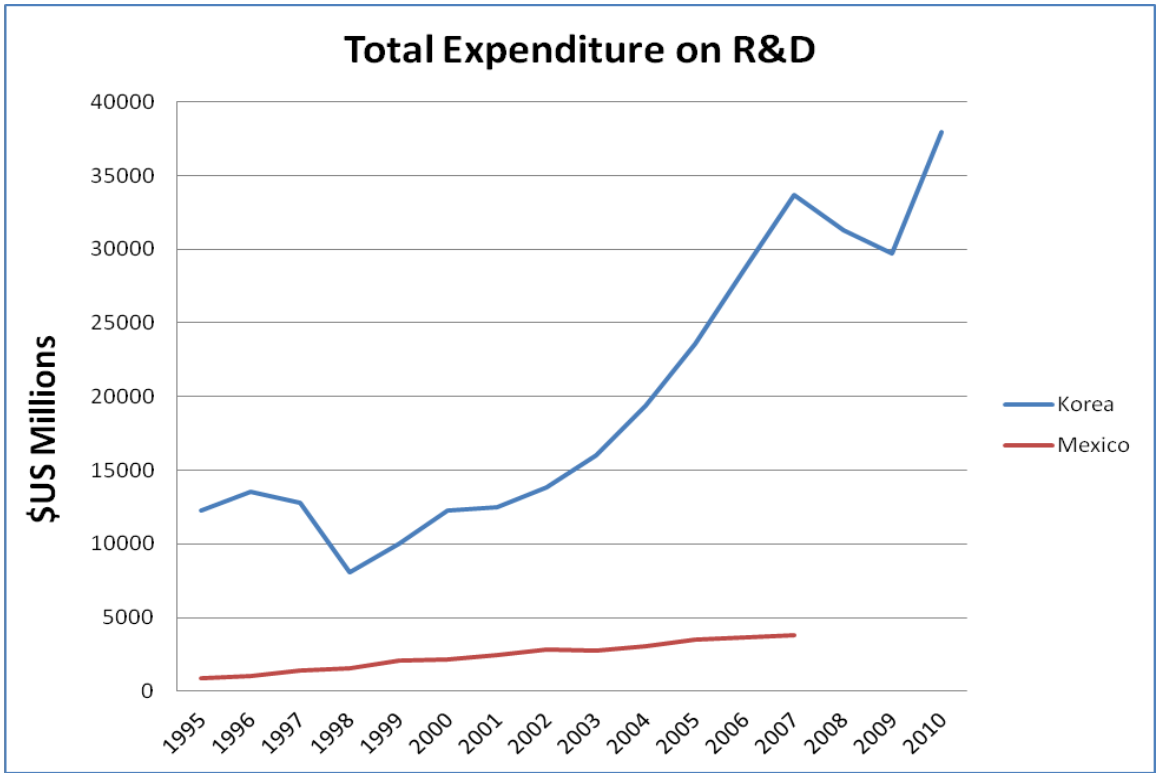
8. An export led growth strategy that keeps the currency undervalued, protects the domestic market, subsidizes exports in various ways, forces technology transfer as a condition of market access, and carefully controls direct foreign investment.

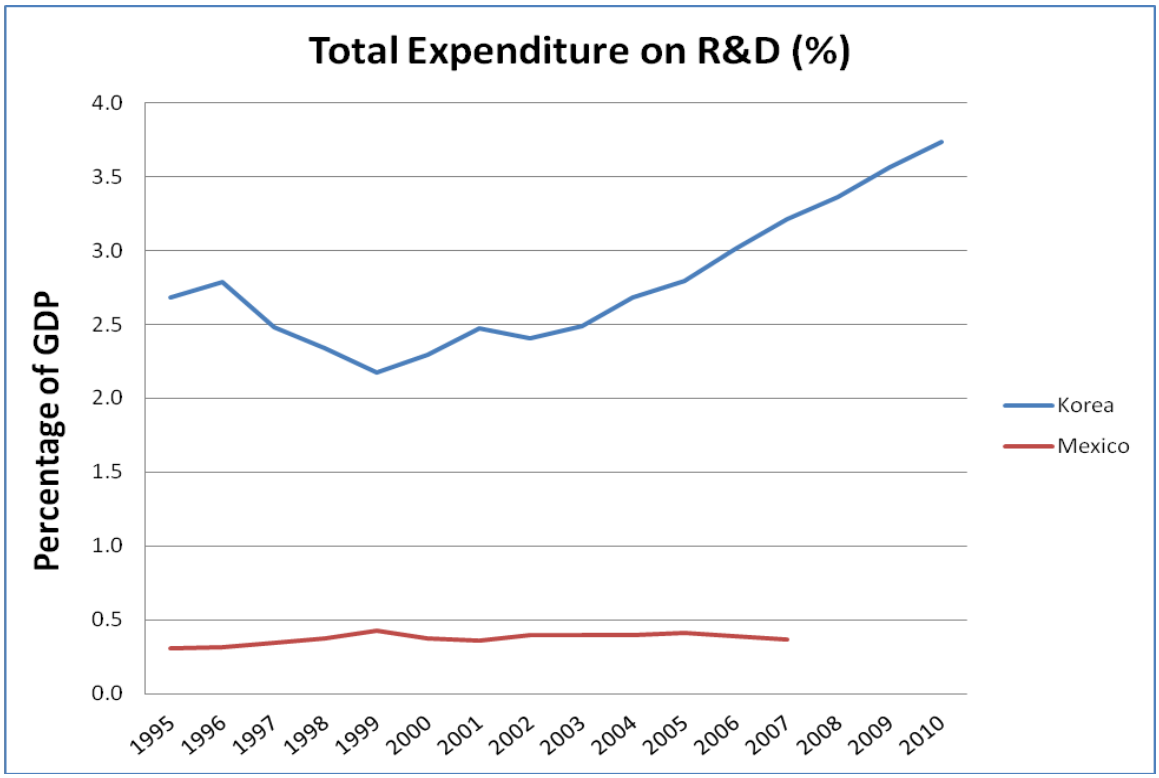
9. A major emphasis on excellence in education and coordination between the educational institutions and businesses and government.

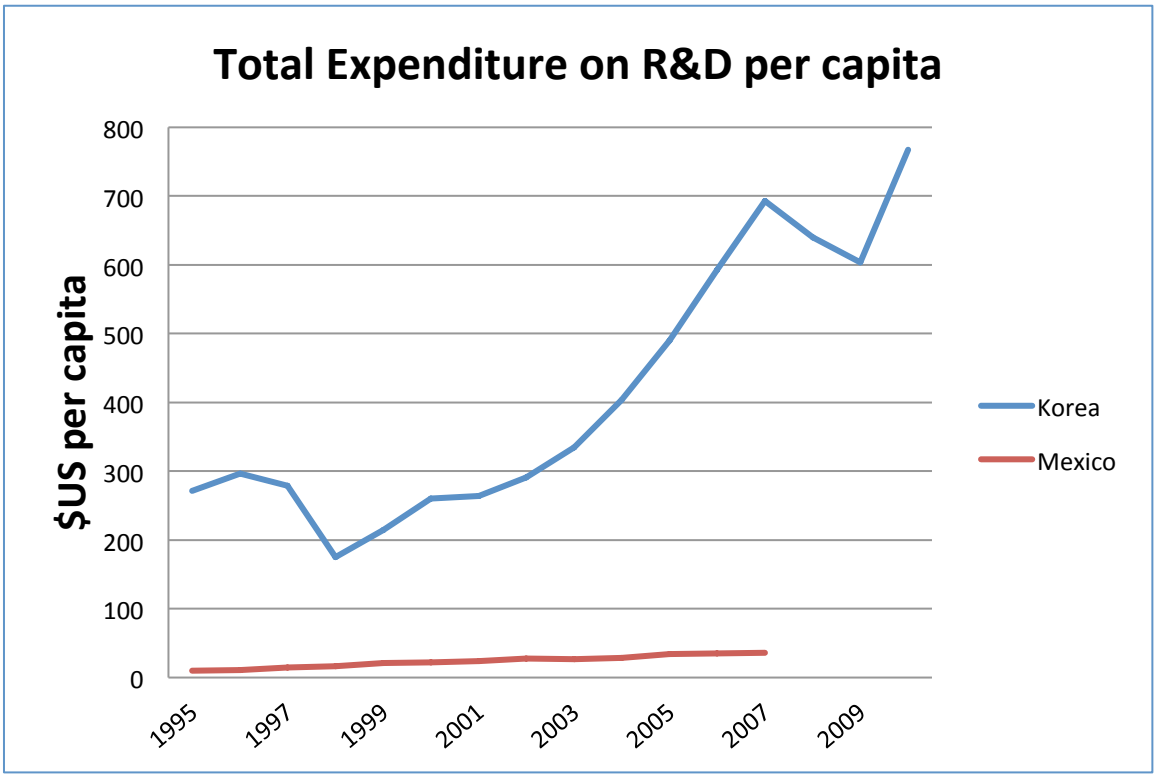
10. A major emphasis on promoting science, technology, and innovation.

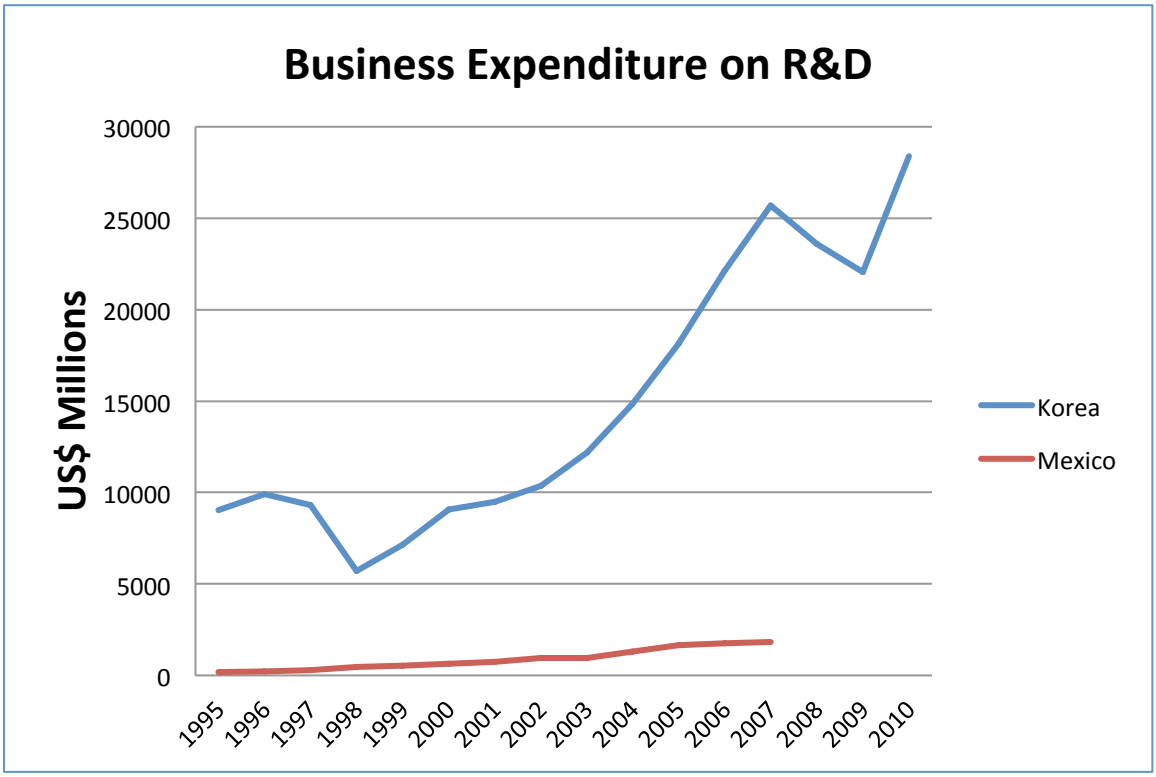

Direct Investment Flows Inward
$US Billions
35
30
25
20
15
10
5
0
-5
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

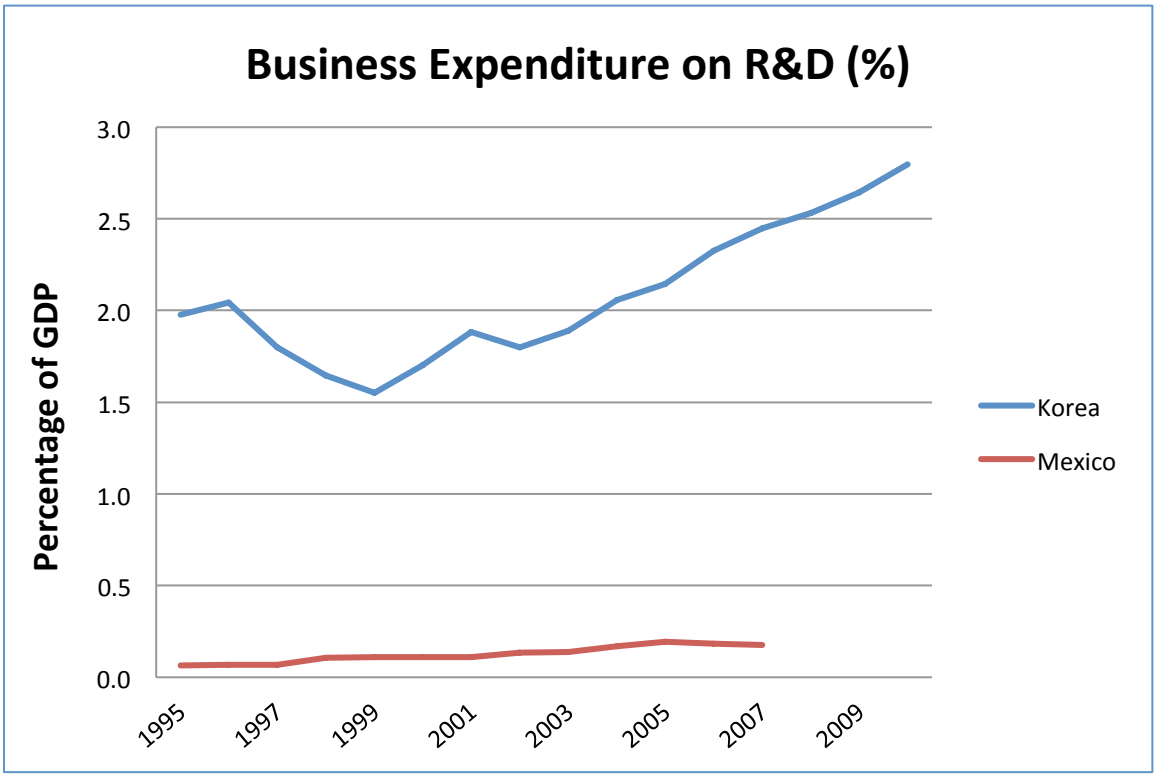

Gross Domestic Savings (%)
Percentage of GDP
40
35
30
25
20
15
10
5
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

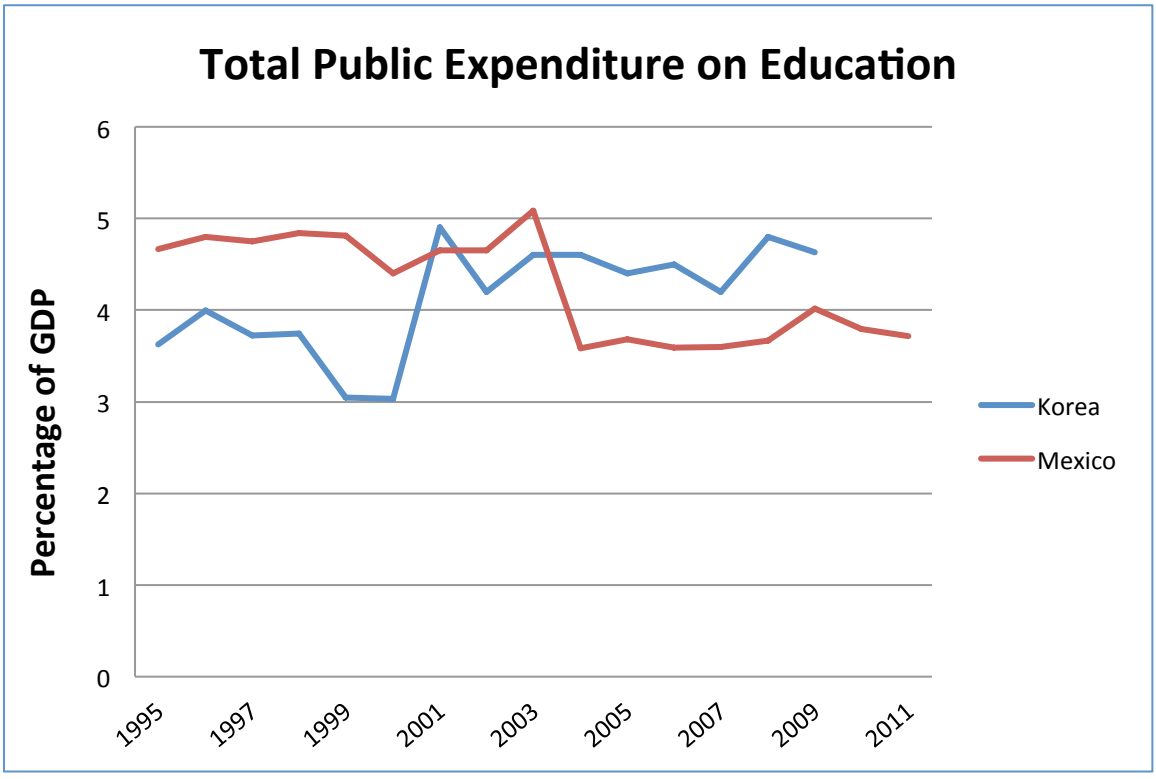

Total Expenditure on R&D
$US Millions
40000
35000
30000
25000
20000
15000
10000
5000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Korea
Mexico

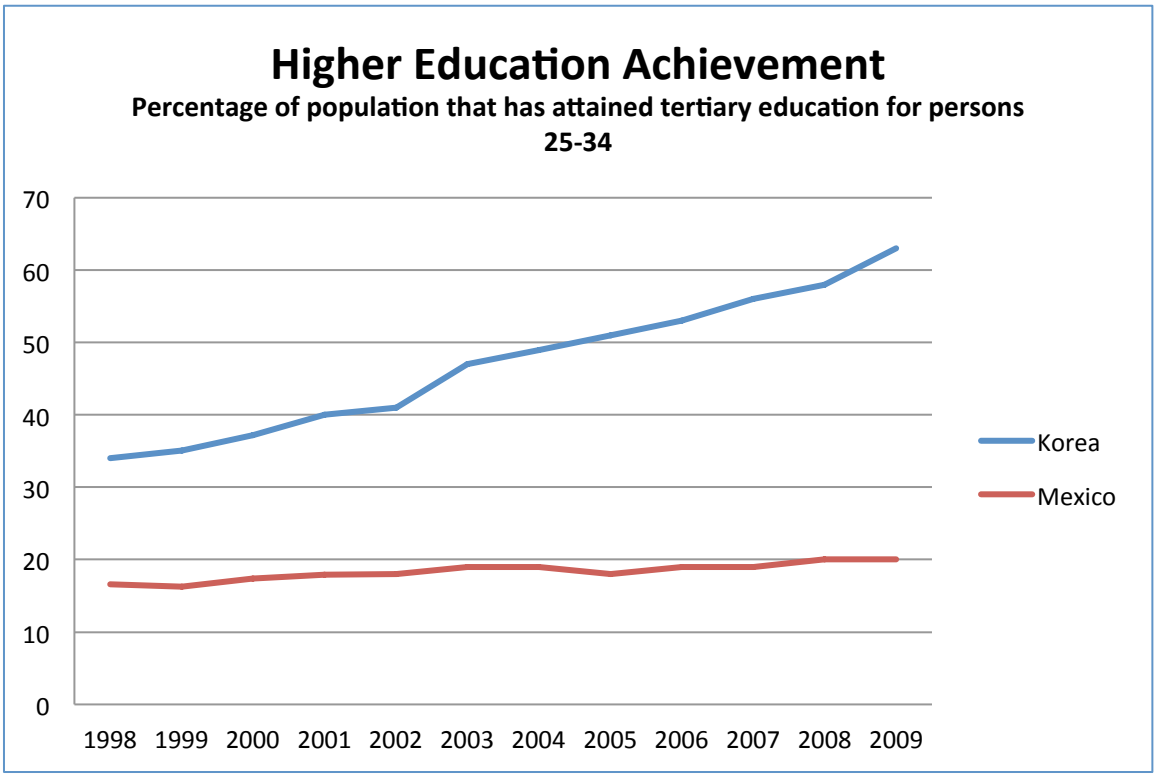

Total Expenditure on R&D (%)
Percentage of GDP
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Korea
Mexico

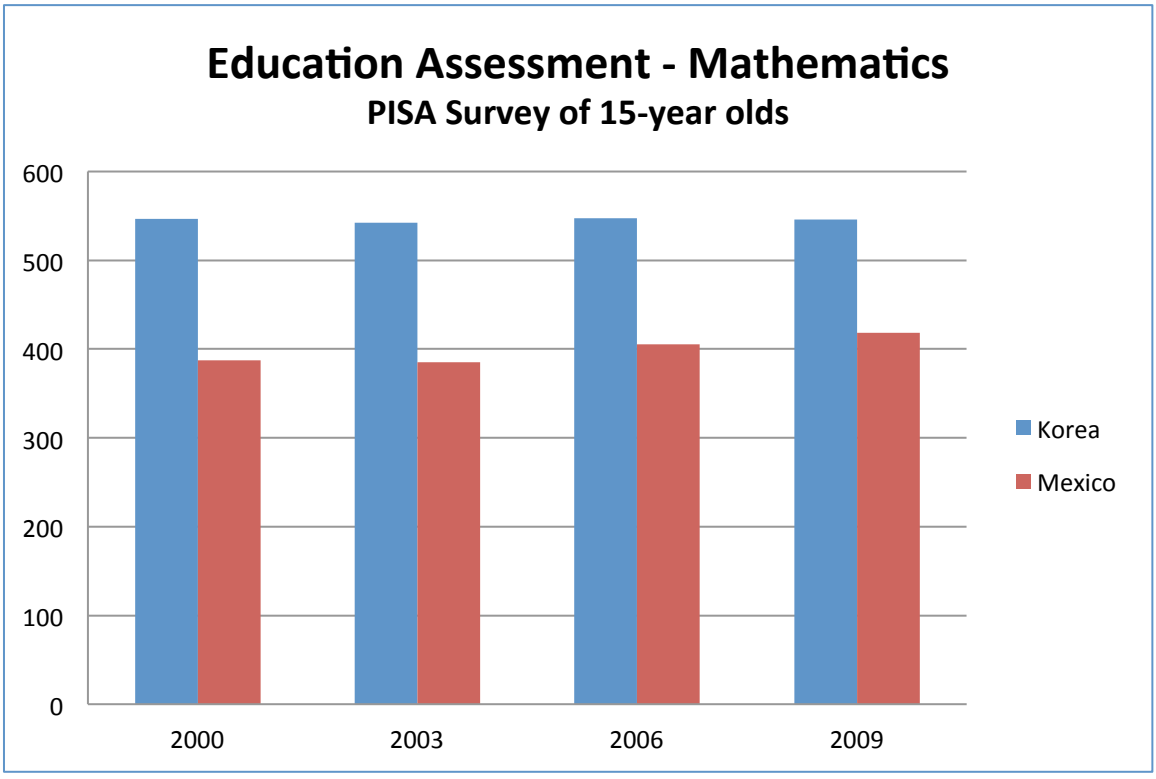

Total Expenditure on R&D per capita
$US per capita
800
700
600
500
400
300
200
100
0
1995
1997
1999
2001
2003
2005
2007
2009
Korea
Mexico

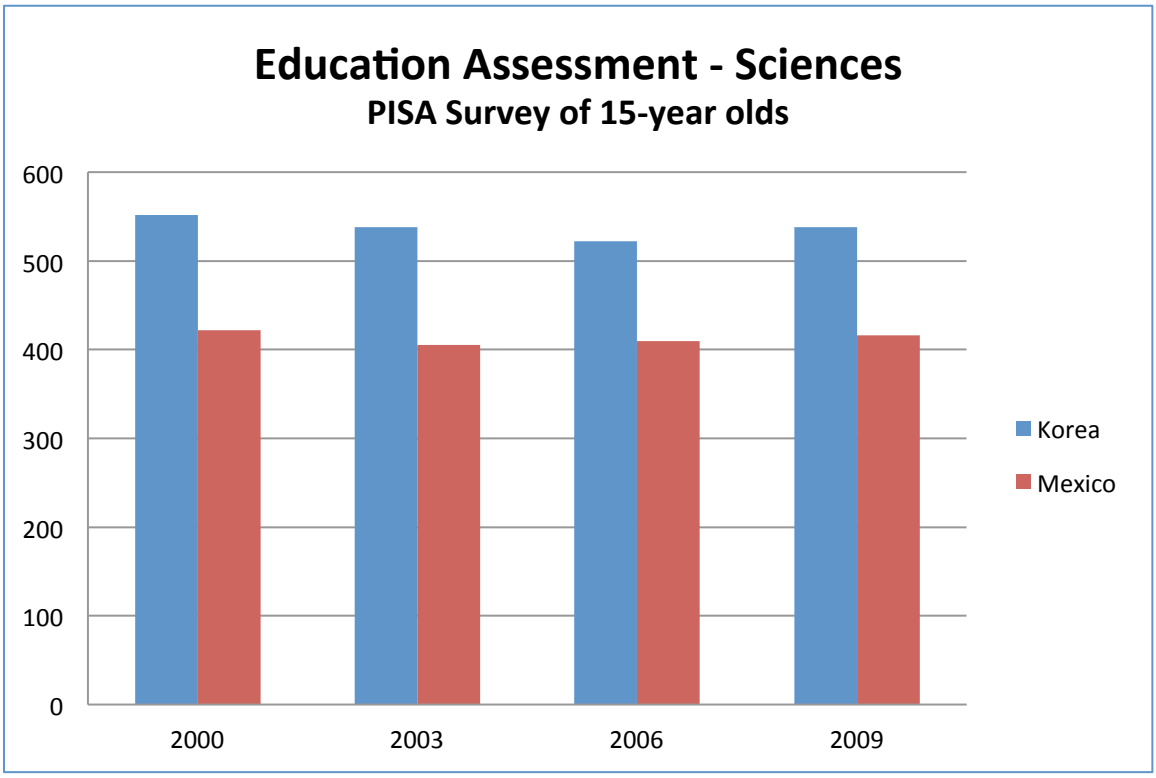

Business Expenditure on R&D
US$ Millions
30000
25000
20000
15000
10000
5000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Korea
Mexico

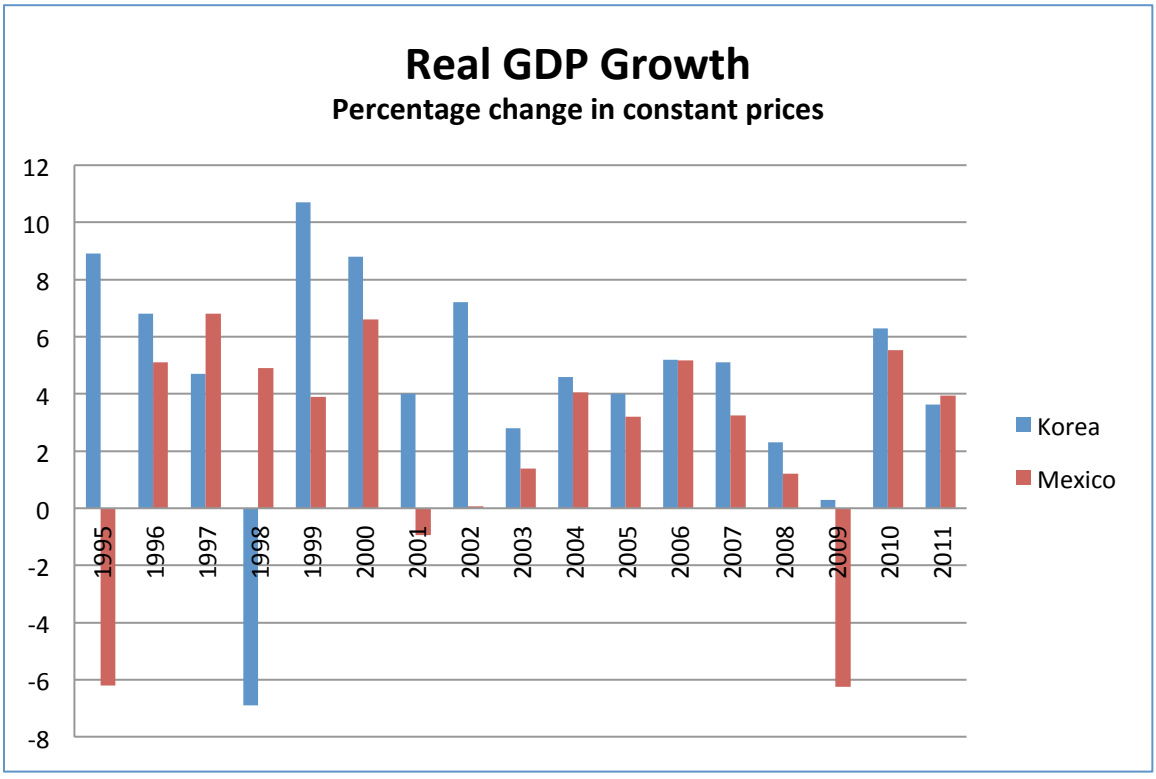

Business Expenditure on R&D (%)
Percentage of GDP
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1995
1997
1999
2001
2003
2005
2007
2009
Korea
Mexico

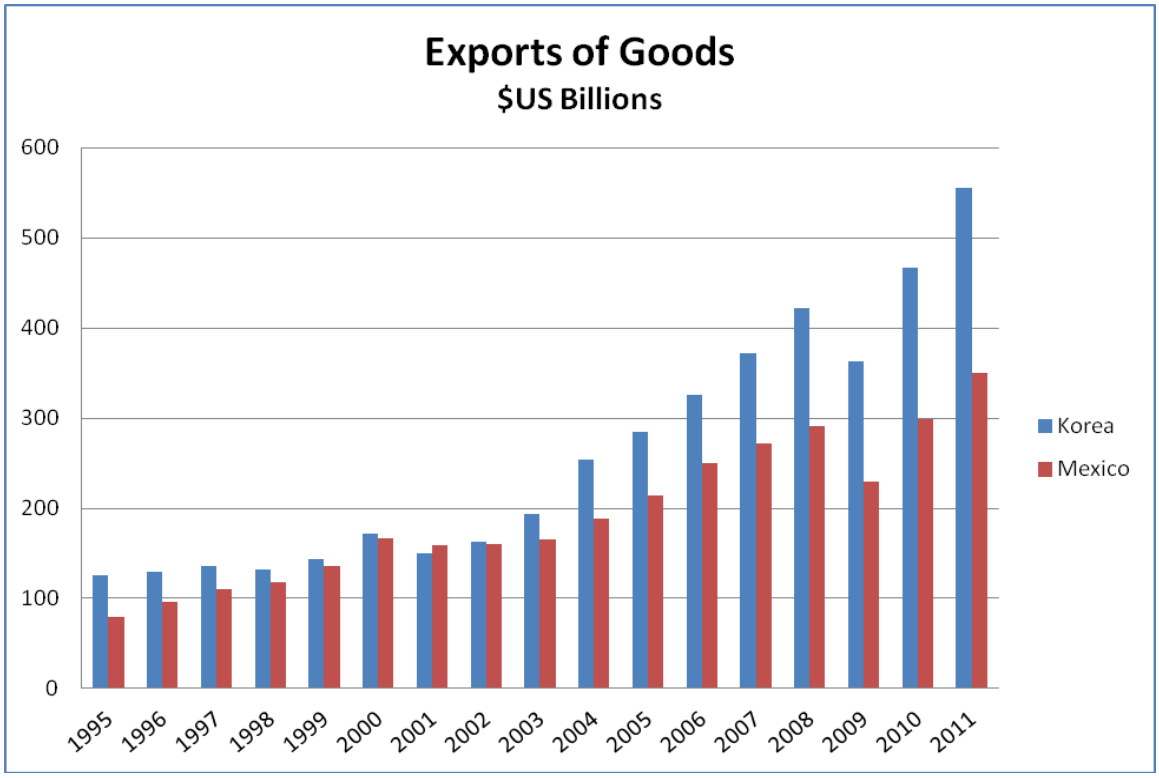

Total Public Expenditure on Education
Percentage of GDP
6
5
4
3
2
1
0
1995
1997
1999
2001
2003
2005
2007
2009
2011
Korea
Mexico

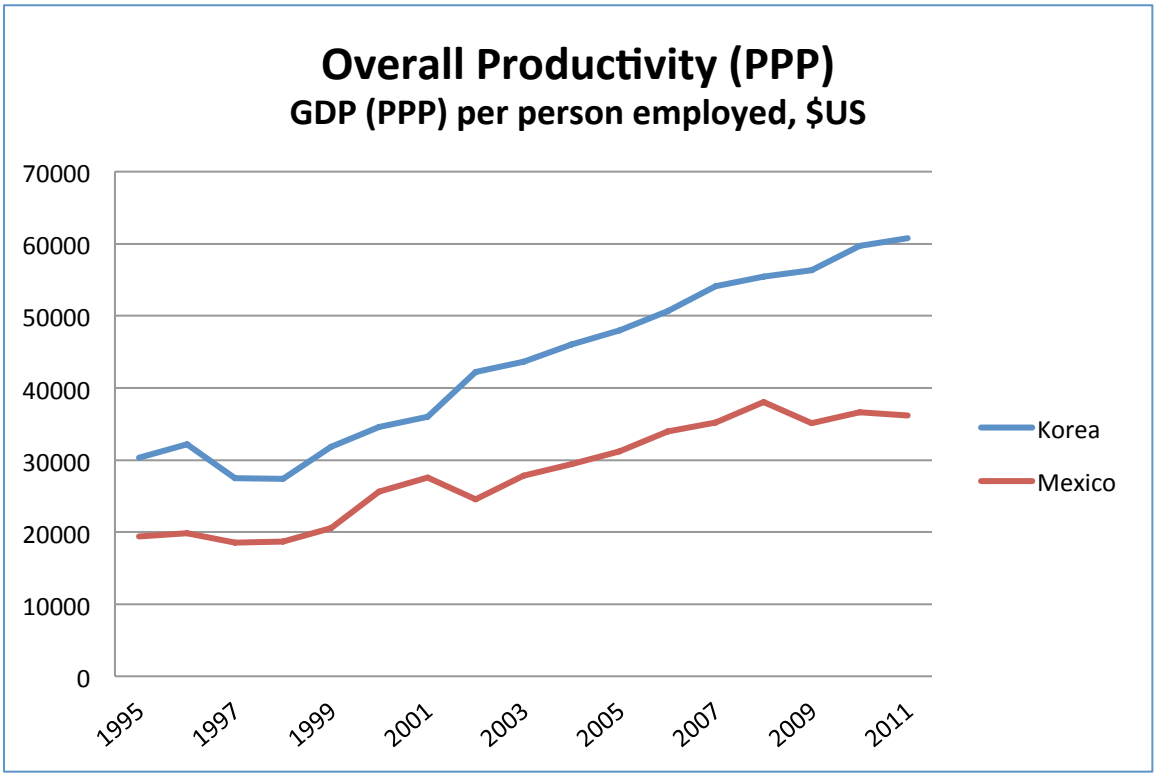

Higher Education Achievement
Percentage of population that has attained tertiary education for persons 25-34
70
60
50
40
30
20
10
0
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Korea
Mexico

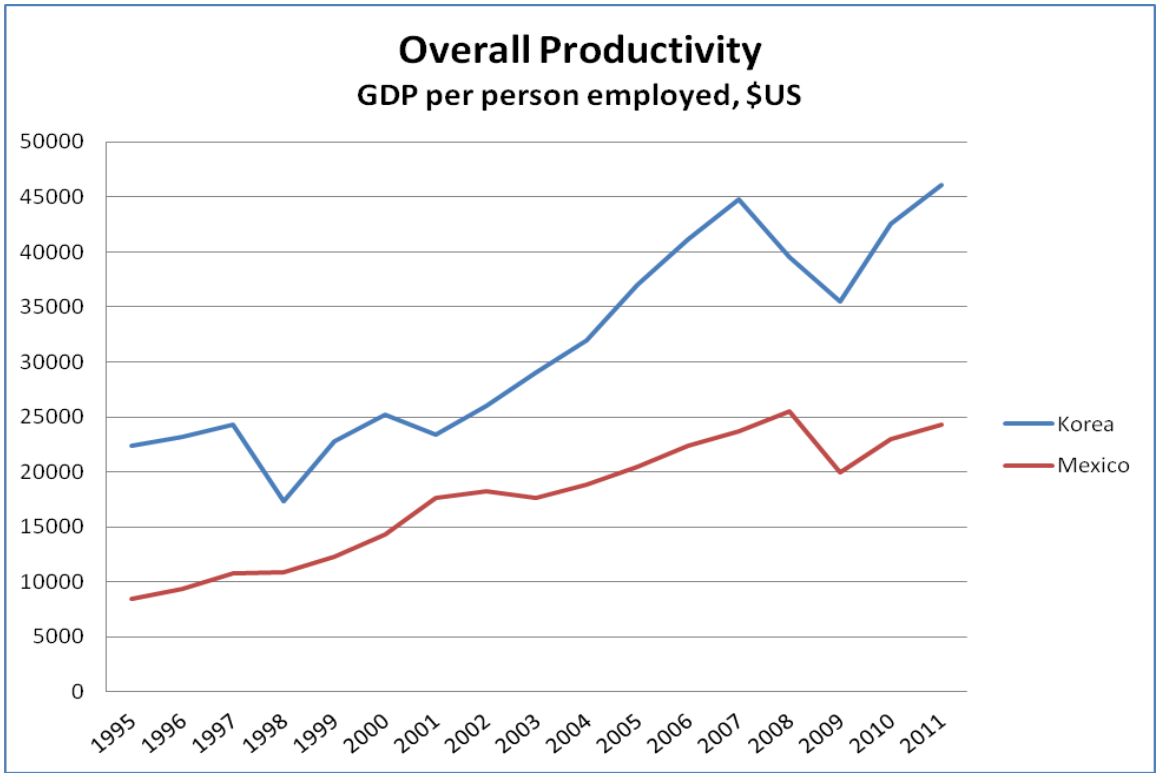

Education Assessment - Mathematics
PISA Survey of 15-year olds
600
500
400
300
200
100
0
2000
2003
2006
2009
Korea
Mexico

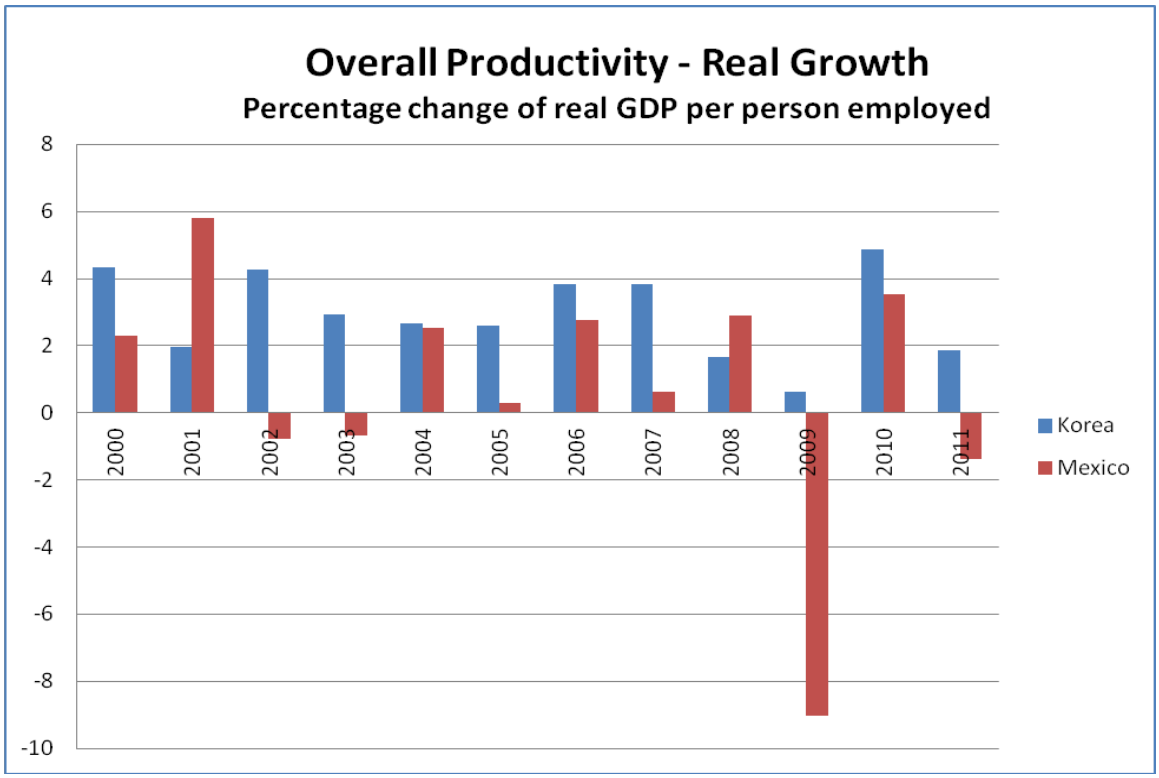

Education Assessment - Sciences
PISA Survey of 15-year olds
600
500
400
300
200
100
0
2000
2003
2006
2009
Korea
Mexico

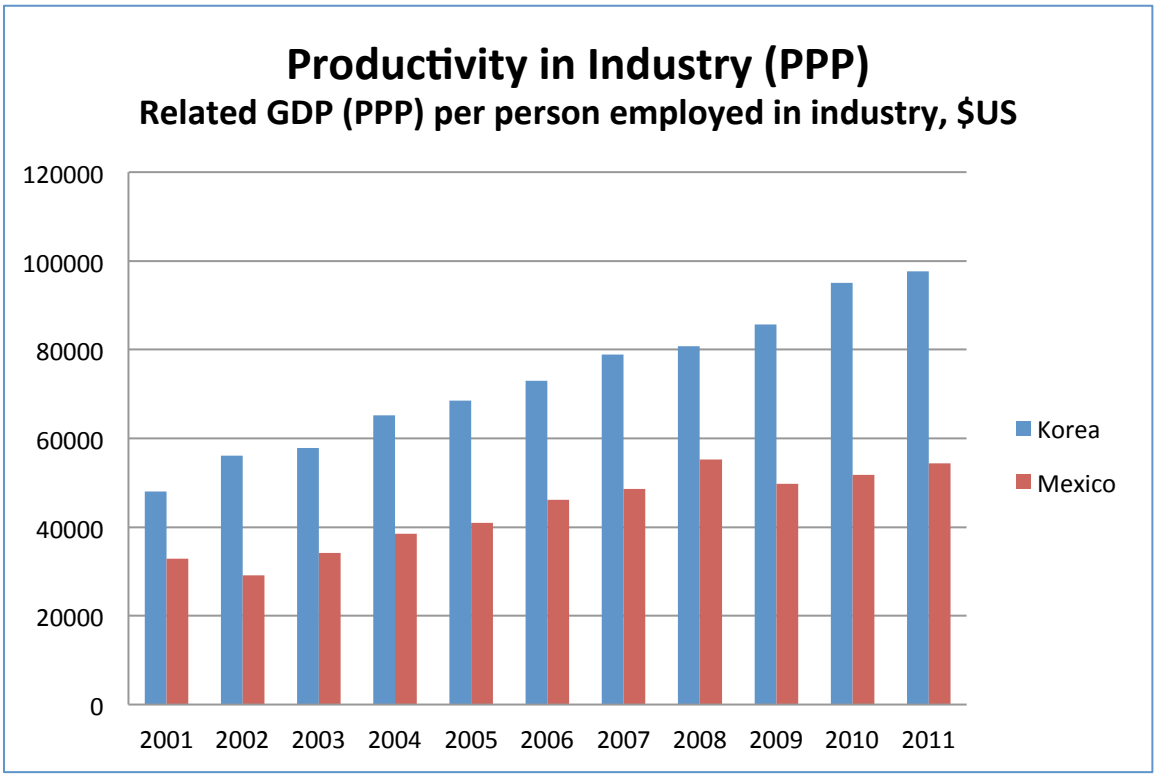

Real GDP Growth
Percentage change in constant prices
12
10
8
6
4
2
0
-2
-4
-6
-8
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

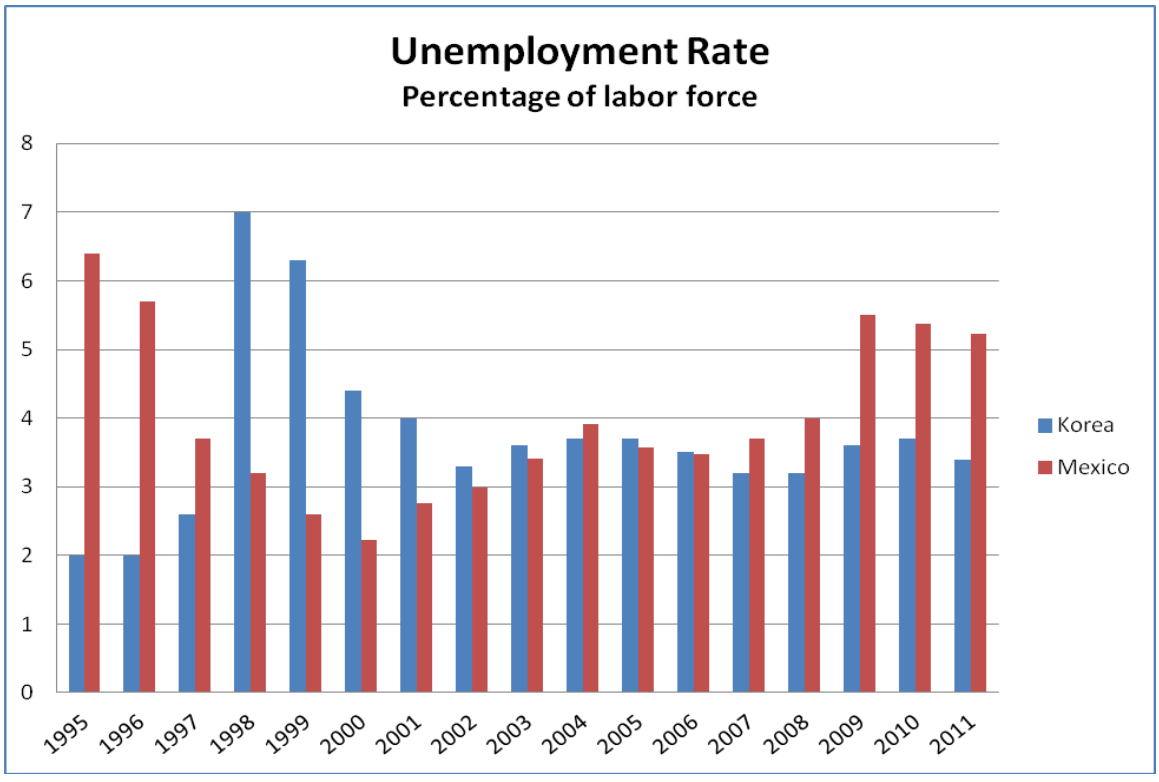

Exports of Goods
$US Billions
600
500
400
300
200
100
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

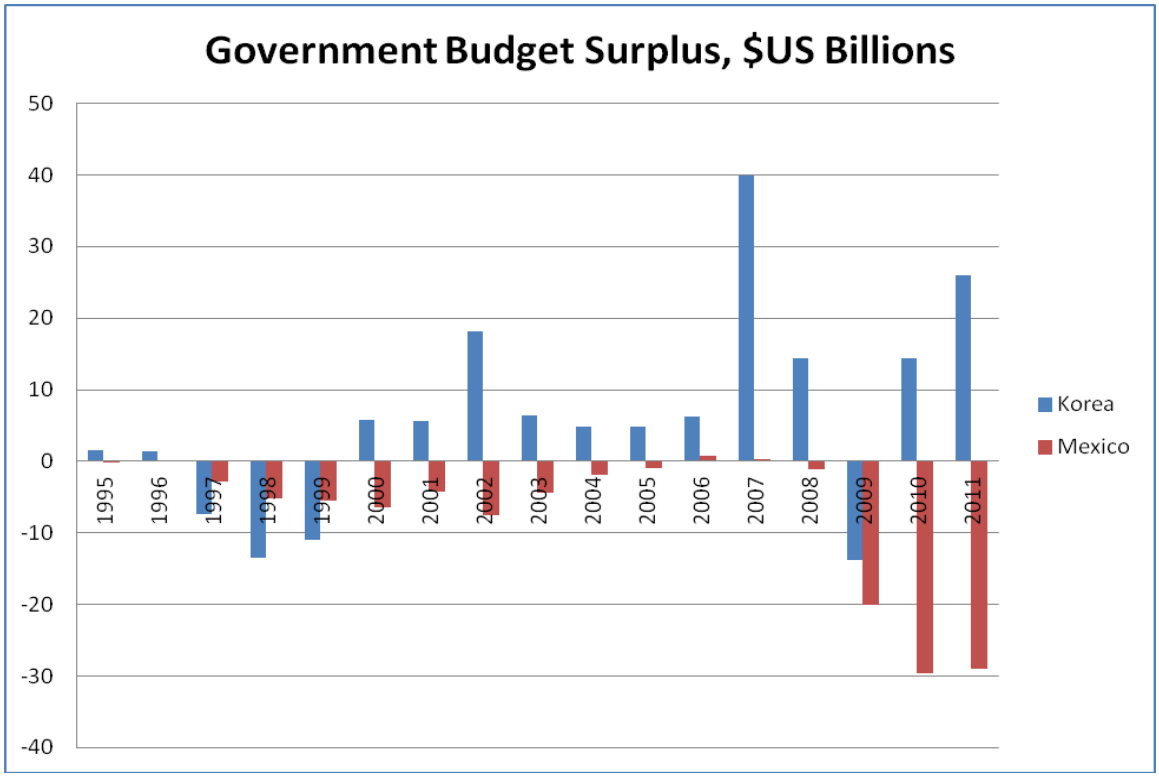

Overall Productivity (PPP)
GDP (PPP) per person employed, $US
70000
60000
50000
40000
30000
20000
10000
0
1995
1997
1999
2001
2003
2005
2007
2009
2011
Korea
Mexico

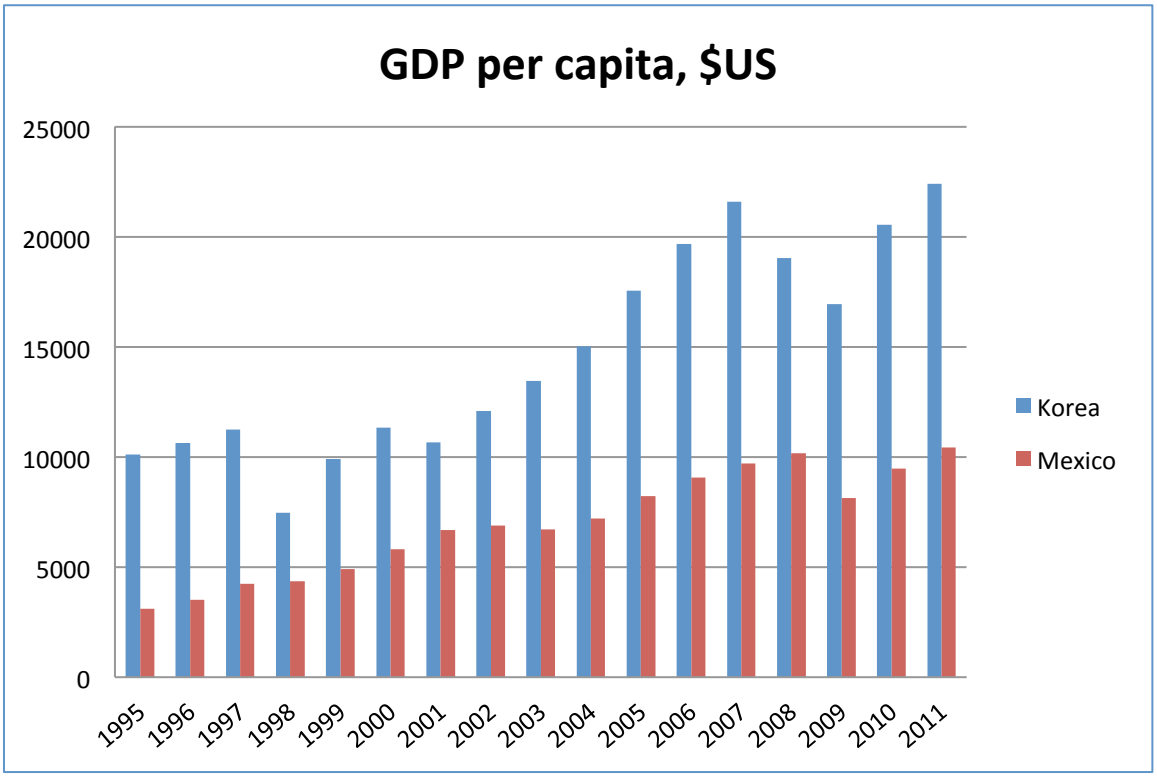

Overall Productivity
GDP per person employed, $US
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

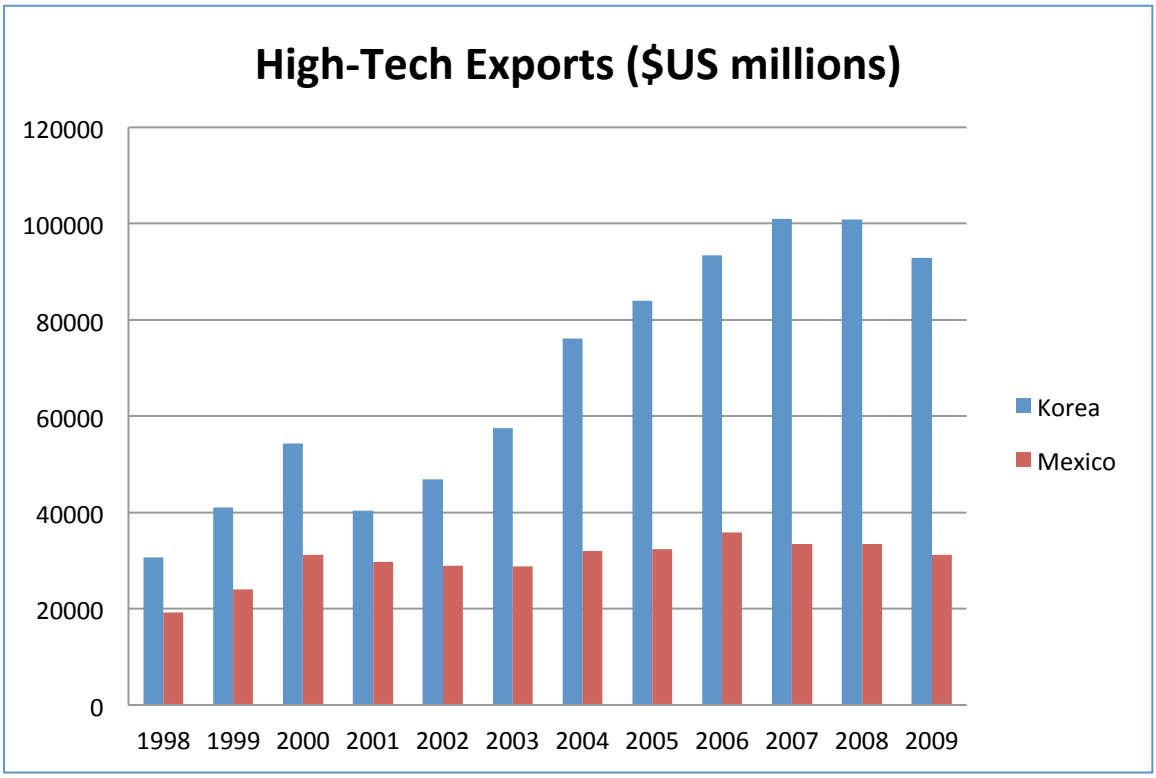

Overall Productivity - Real Growth
Percentage change of real GDP per person employed
8
6
4
2
0
-2
-4
-6
-8
-10
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

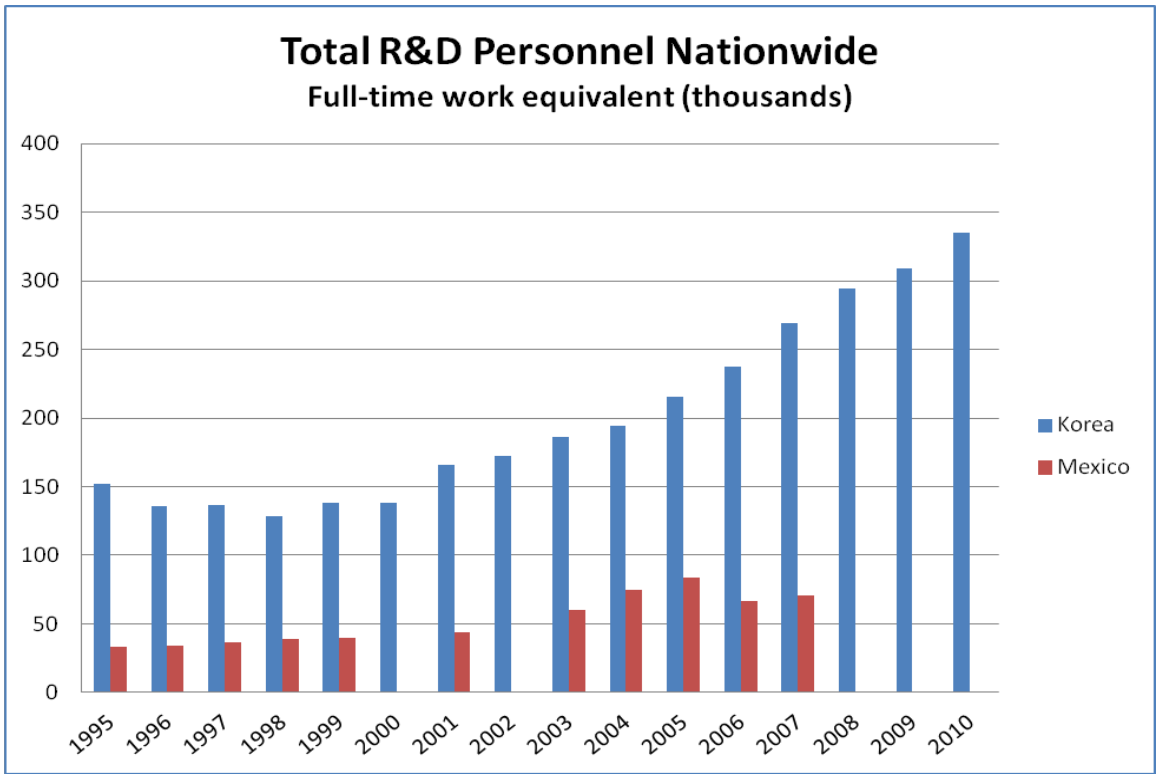

Productivity in Industry (PPP)
Related GDP (PPP) per person employed in industry, $US
120000
100000
80000
60000
40000
20000
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

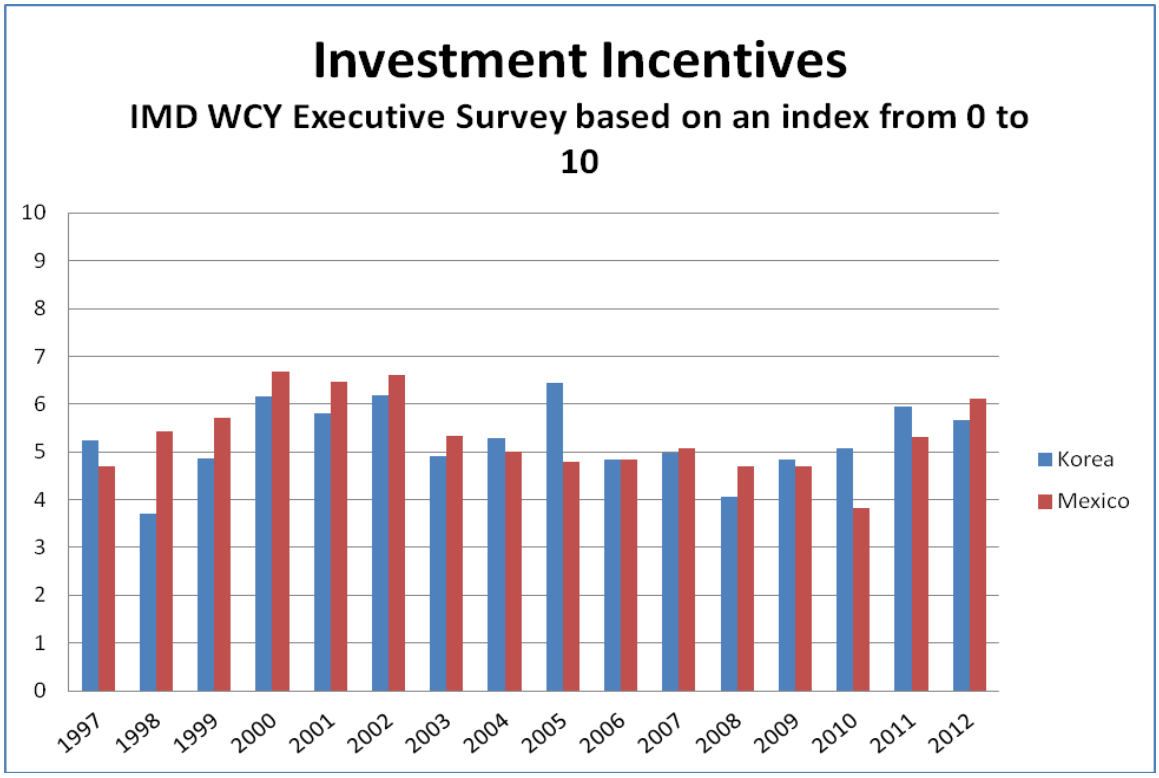

Unemployment Rate
Percentage of labor force
8
7
6
5
4
3
2
1
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

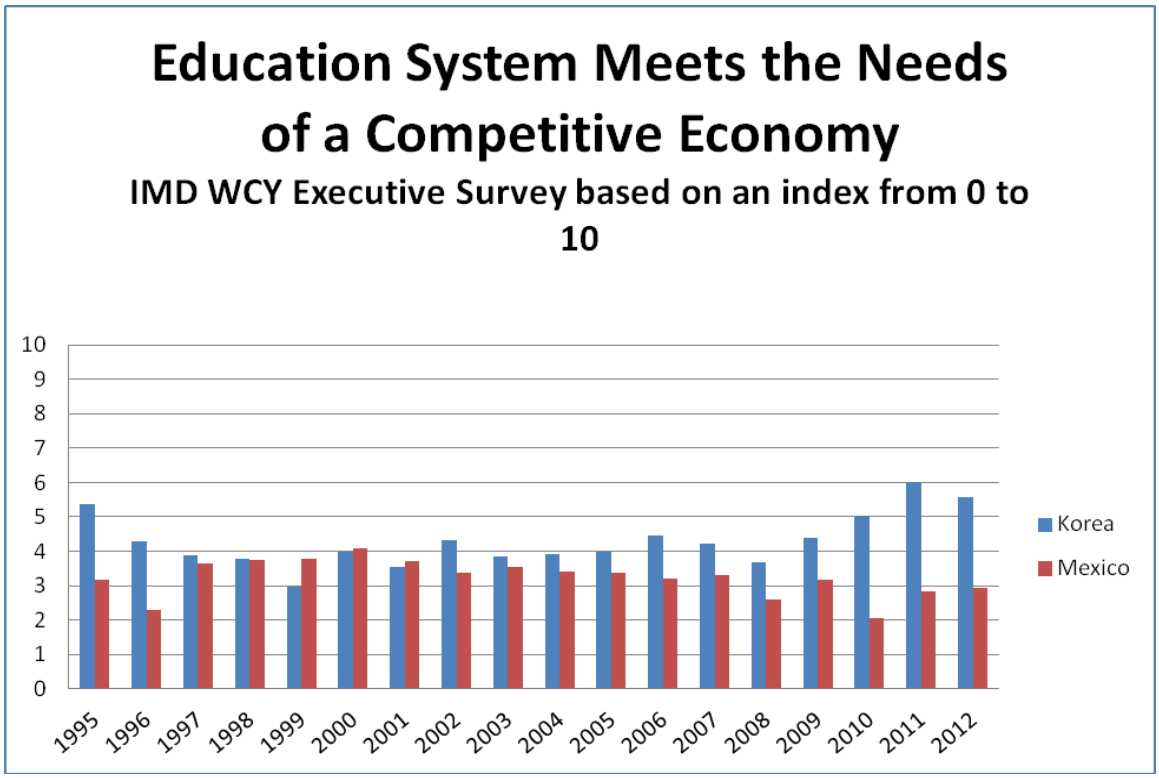

Government Budget Surplus, $US Billions
50
40
30
20
10
0
-10
-20
-30
-40
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

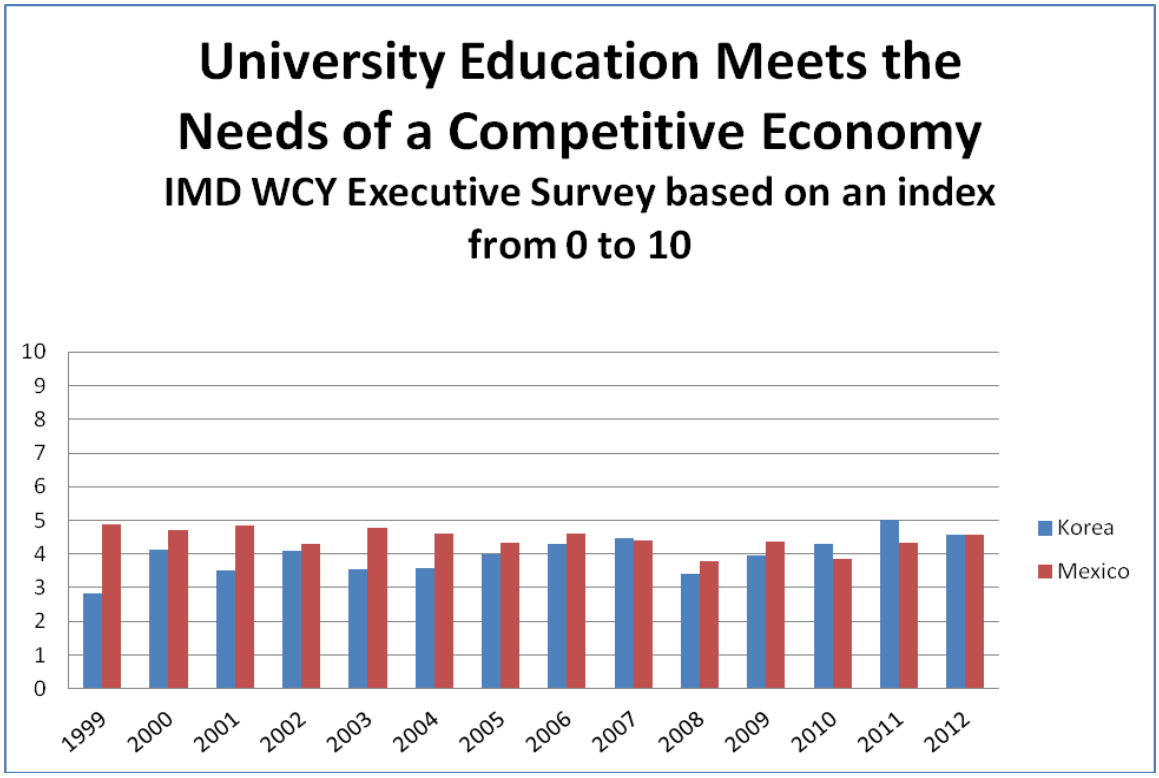

GDP per capita, $US
25000
20000
15000
10000
5000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Korea
Mexico

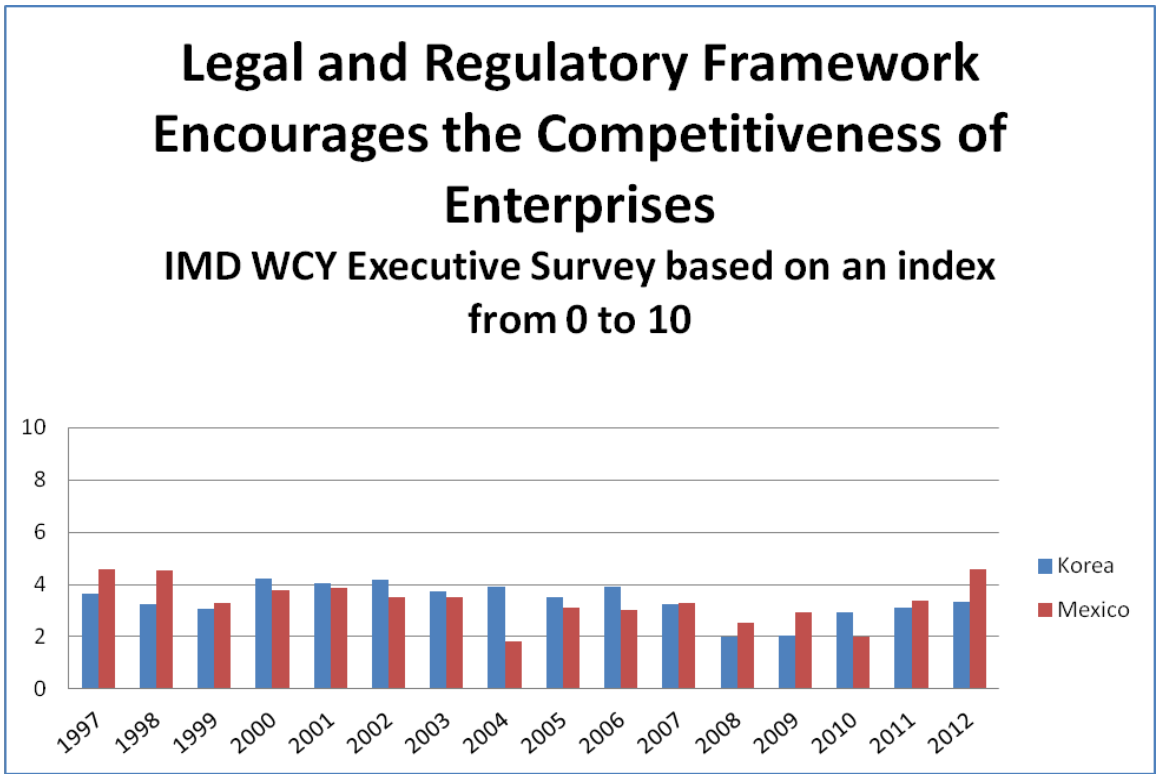

High-Tech Exports ($US millions)
120000
100000
80000
60000
40000
20000
0
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Korea
Mexico

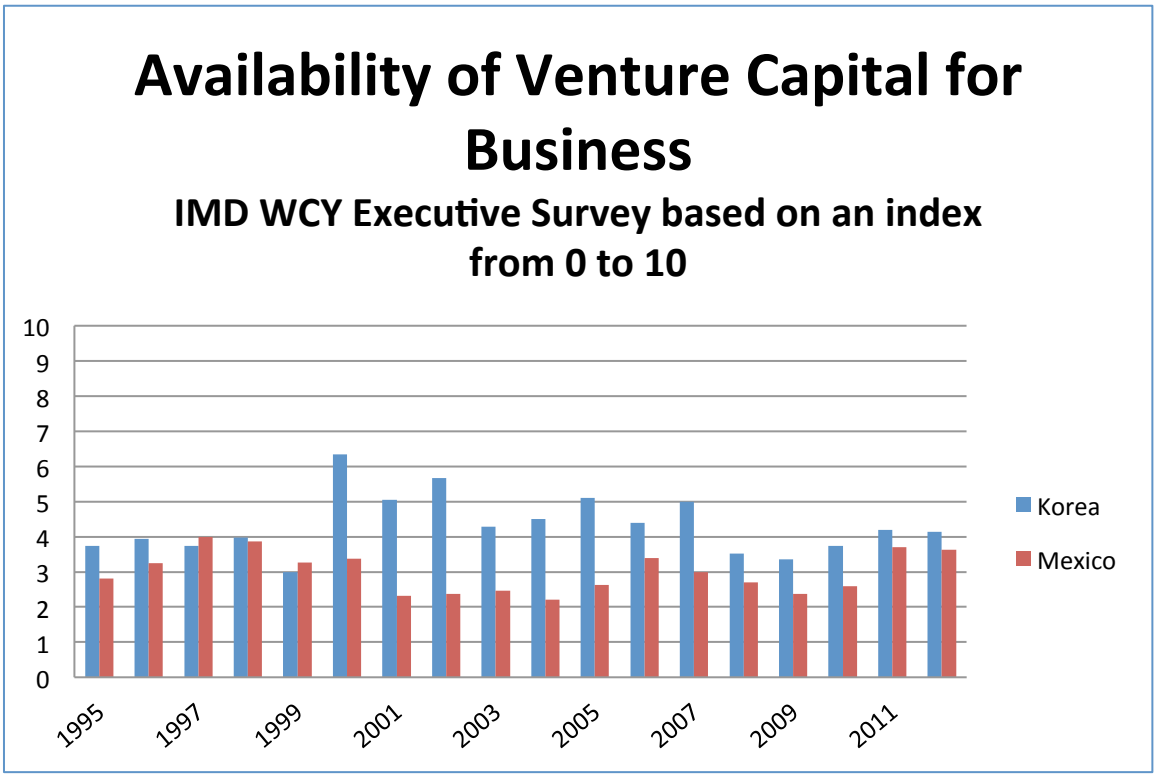

Total R&D Personnel Nationwide
Full-time work equivalent (thousands)
400
350
300
250
200
150
100
50
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Korea
Mexico

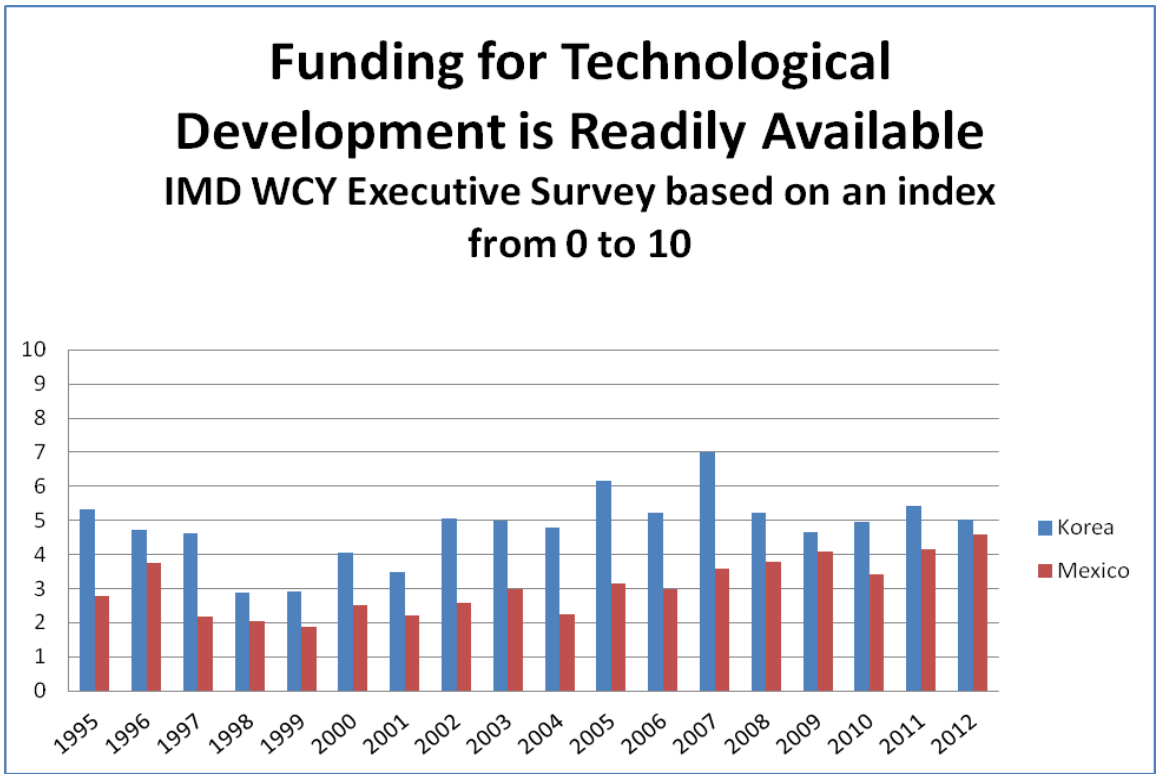

Investment Incentives
IMD WCY Executive Survey based on an index from 0 to 10
10
9
8
7
6
5
4
3
2
1
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Korea
Mexico


Education System Meets the Needs of a Competitive Economy
IMD WCY Executive Survey based on an index from 0 to 10
10
9
8
7
6
5
4
3
2
1
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Korea
Mexico


University Education Meets the Needs of a Competitive Economy
IMD WCY Executive Survey based on an index from 0 to 10
10
9
8
7
6
5
4
3
2
1
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Korea
Mexico


Legal and Regulatory Framework Encourages the Competitiveness of Enterprises
IMD WCY Executive Survey based on an index from 0 to 10
10
8
6
4
2
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Korea
Mexico


Availability of Venture Capital for Business
IMD WCY Executive Survey based on an index from 0 to 10
10
9
8
7
6
5
4
3
2
1
0
1995
1997
1999
2001
2003
2005
2007
2009
2011
Korea
Mexico


Funding for Technological Development is Readily Available
IMD WCY Executive Survey based on an index from 0 to 10
10
9
8
7
6
5
4
3
2
1
0
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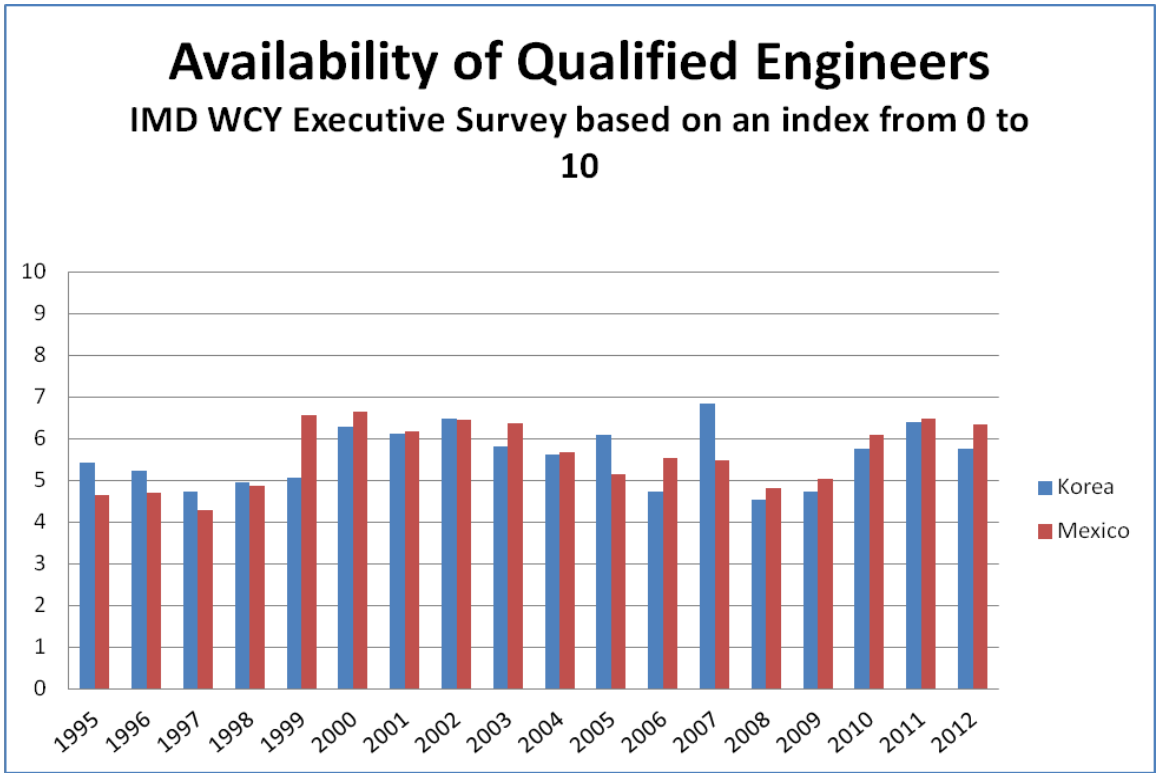
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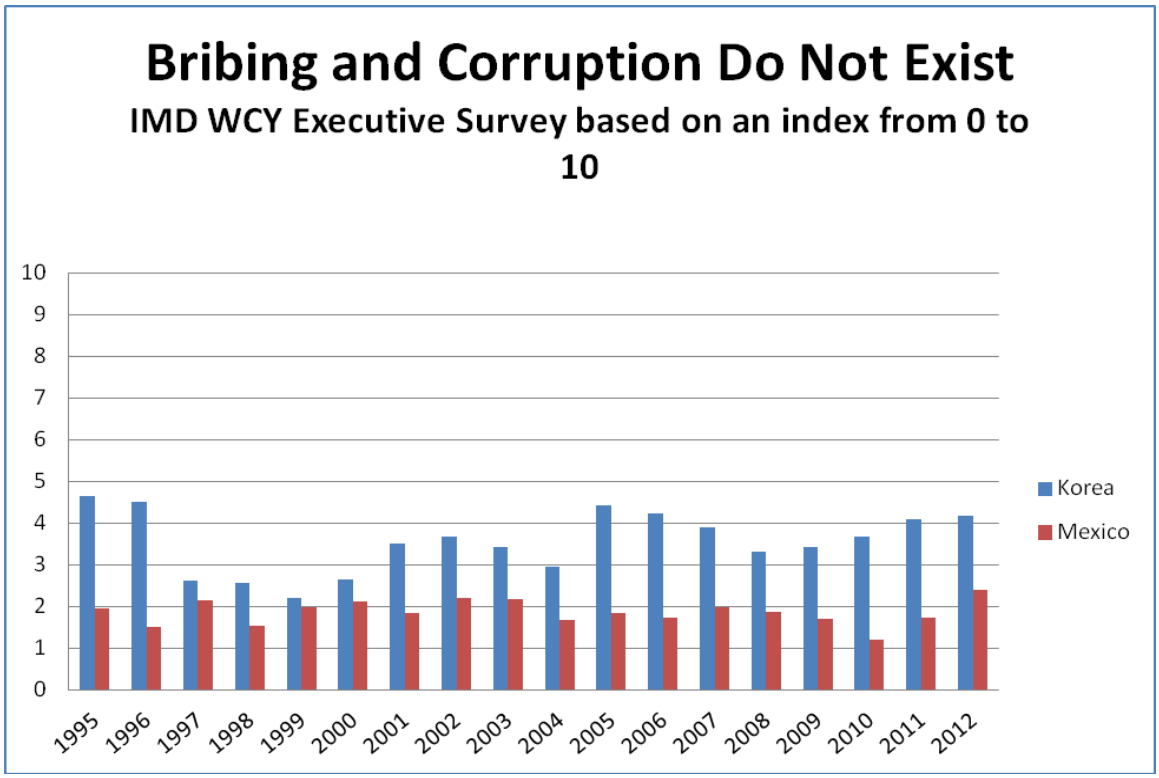
Bribing and Corruption Do Not Exist
IMD WCY Executive Survey based on an index from 0 to 10
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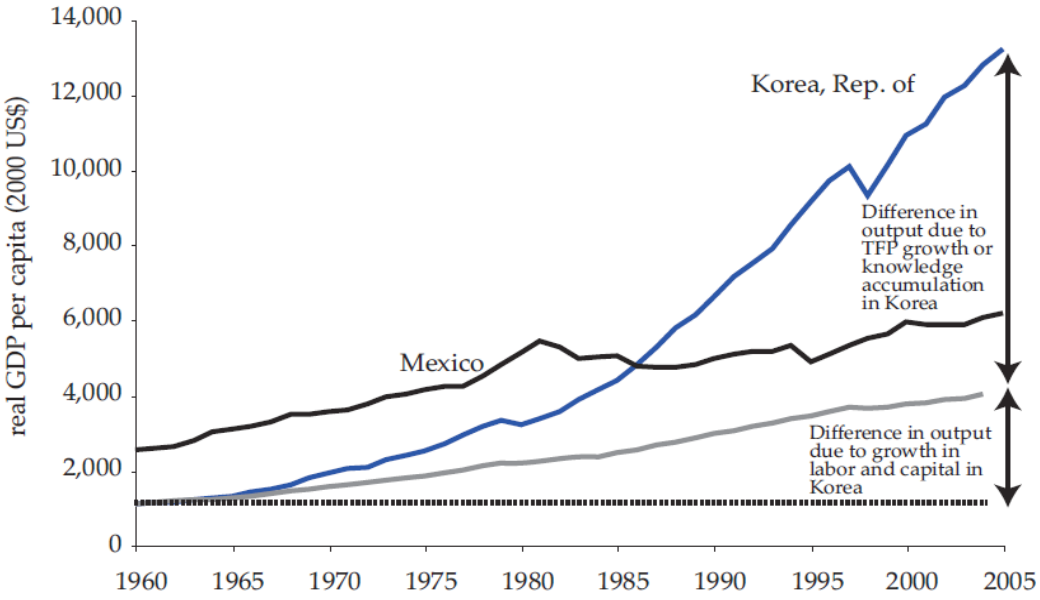
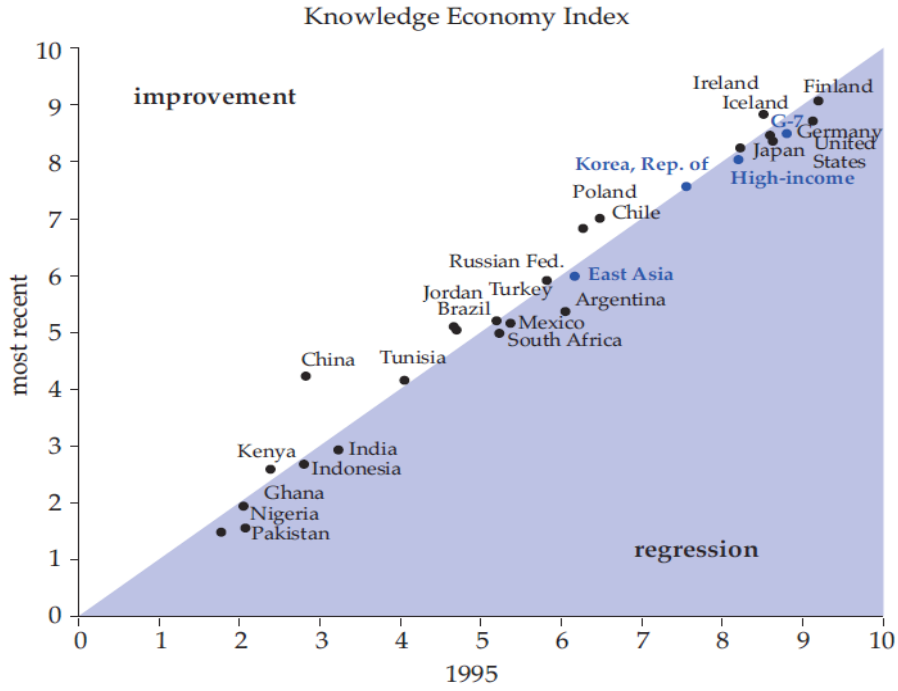
Figure 1.5 *Effect of Knowledge on Korea's Long-Term Economic Growth (1960–2005)*



Source: Author's estimates.

Figure 1.9 *The Knowledge Economy Index for Selected Countries, 1995 and Most Recent Year*[a]



FINLAND

Background

At the beginning of the 1990's, the Finnish economy was notable, if it was noted at all, for the severity of the recession engulfing the country and the collapse of its traditional forestry and metals industries. But by the end of the decade, no discussion of high-tech innovation, ICT, or economic competitiveness was complete without a mention of Finland and the extraordinary economic turnaround it had engineered in a few short years.

Much of Finland's recovery was due to the explosive growth of Nokia, which by now has become synonymous with mobile phones and is the champion of the Finnish business sector. Nokia was blessed with an exceptional management team lead by Jorma Ollila, which foresaw the huge commercial potential of wireless communications and strategically positioned Nokia to capitalize on this promise. But Nokia did not just happen to find itself in the right place at the right time to lead the global telecommunications revolution through prescient management or sheer luck. In fact, the seeds of Nokia's success had been planted years earlier in the economic development strategies put forward by the Finnish state.

Moreover, it would be a mistake to assume that Nokia was solely responsible for Finland's economic turnaround. Starting in the 1980's, Finland started implementing a series of structural reforms that liberalized the financial sector, joined the European Monetary Union, reoriented the country away from the Soviet Union and towards Europe, and most importantly, began using state money and institutions to invest in high technology and innovation.

Despite the hardships of the recession in the early 90's, Finland had a lot of strengths to build upon. Taking its cue from Sweden and the other Nordic countries, Finland had built up a strong social welfare state and made large investments in education, health and infrastructure. Its stock of human capital was very high, its political institutions were strong, transparent and free from corruption, its social welfare programs shielded laid-off workers from destitution, and its infrastructure was in good shape. Even if the immediate challenges of getting its economy back in gear were high, Finland's endowment of human and

physical capital, built up over many years, gave it the relative luxury of planning and implementing a coherent turnaround strategy.

Finland gained its independence only in 1917, after a long history as a dependency of first Sweden and then Russia. However, it had to fight three separate wars with the Soviets (in 1917, 1939, and 1941-45) in order to maintain its sovereignty, and then had to operate under a delicate status of neutrality until the Soviet Union collapsed. In the early years of the Cold War it could not join any western European economic or security institutions, and was forced to pay reparations to the Soviets for damages inflicted during the fighting in World War II. Finland maintained an important trading relationship with the Soviet Union up until its collapse.

Finland is one of the most ethnically homogenous countries in the world, which is reinforced by its remote geographic locations, and the fact that the Finnish language is unrelated to other Indo-European languages (not to mention the weather). For most of its history, the Finnish economy has been agrarian and heavily dependent on forestry. But over the past forty years, Finland has developed one of the world's most advanced high tech economies. These achievements in high technology have accrued largely since the early 1990's, though the seeds of the current high-tech boom were planted well before then in the 1950's and 60's. But the events of the early 1990's were an important turning point. The collapse of the Soviet Union meant that Finland essentially lost its main export market, and the ensuing economic crisis was severe.

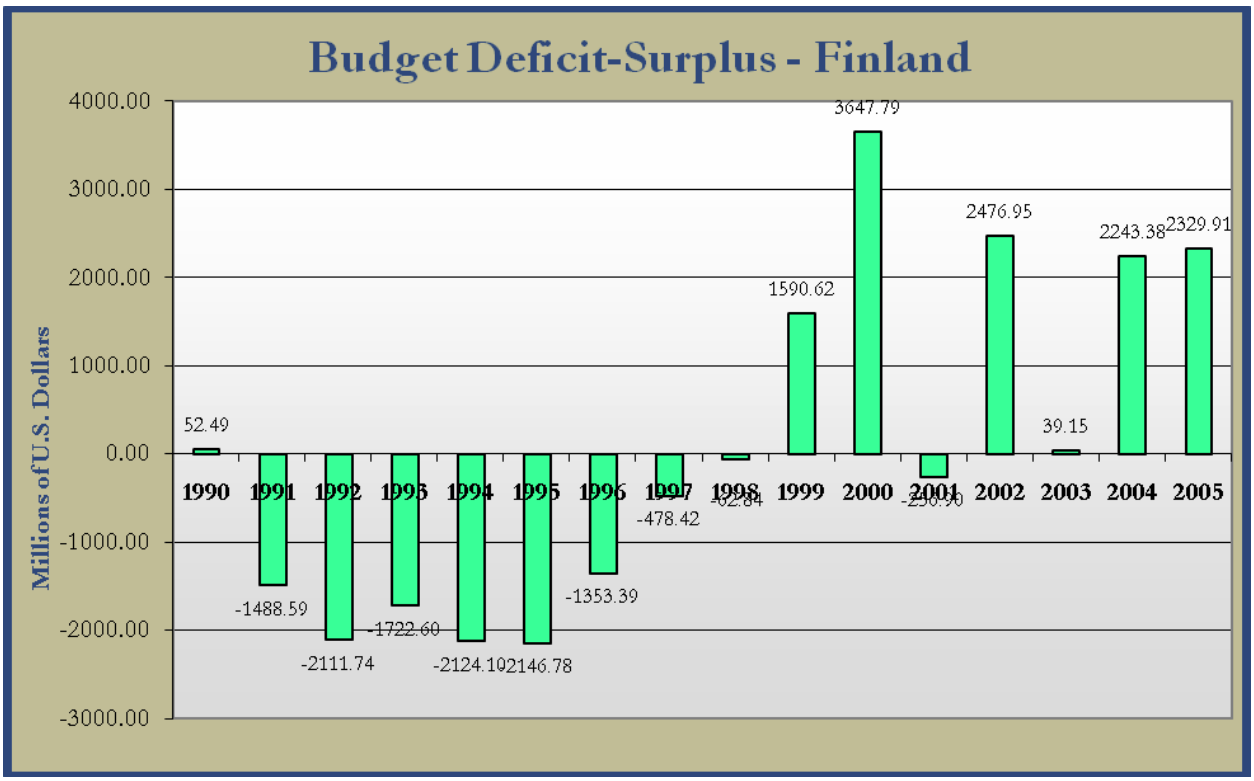
Recession

The recession Finland experienced in the early 1990's was deep, destabilizing, but also liberating. It brought severe hardships to the Finnish economy but within the crisis lay the seeds of Finland's modern high tech economy.

From 1990 through 1993, Finnish GDP in real terms declined by more than 10% and the unemployment rate rose from just over 3% in 1990 to nearly 20%. The country was in the midst of a 'perfect storm' of economic calamities – the Soviet Union, with which Finland had conducted an extensive barter trade, was in collapse; the forestry sector, the traditional backbone of the Finnish economy and a major employer and exporter, entered an era of restructuring due to international competition; and the financial sector, which had been liberalized in the late 1980's, had produced a credit expansion and asset bubble that proved unsustainable and burst at the worst possible time. Compounding matters, the welfare state that Finland had built up over the past several decades was too rigid to cope with the profound changes rocking the Finnish economy and threatened to strangle any recovery before it got started.

As in Sweden, of crucial importance was regaining macroeconomic stability. The financial sector was in very bad shape; both the public sector and many corporations were struggling under heavy debt loads; the currency was collapsing and real interest rates were extremely high. At first, the Finns tried to stave off a devaluation of the Markka by pegging it to the ECU – the European Currency Unit that was the precursor to the single currency. But it soon became clear that the

peg was untenable and the Markka was floated, immediately losing 12% of its value. The devaluation did help to restore some of Finland's export competitiveness, but the structural changes the economy underwent were the main drivers of the recovery.



Finland's Innovation System

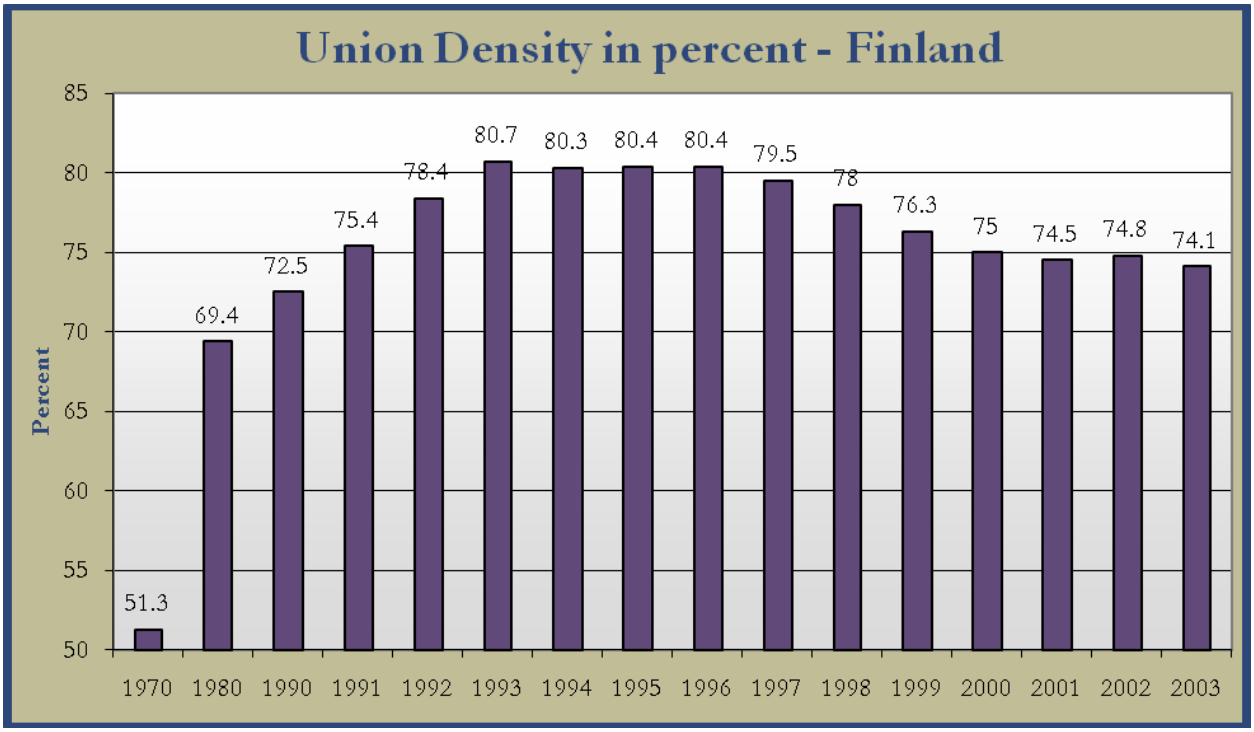
The Finnish state has been extremely proactive and forward thinking with regards to innovation policy and economic competitiveness. Of all the countries in our study, post-war Finland has been perhaps the most successful in creating human capital and then harnessing those skills and creating new technologies and industries. In Finland, this success has not been due to luck or the importation of foreign skills and investment (although these two factors haven't hurt). Rather, the Finnish state has actively promoted the development of modern industries and created a culture of innovation through a series of public policies and institutions that have transformed Finish society from a largely agrarian and natural resource-based economy to one of the most modern and competitive high tech economies in the world.

Post war Finnish economic development can be characterized as having gone through three distinct phases. In the initial aftermath of the war, Finland was compelled to pay the Soviet Union reparations for its invasion of Soviet territory and collaboration with the Germans in the early stages of the war. But the Soviets did not want money – as cash had little value in a Communist state. Instead, the Soviets wanted industrial goods. This was a problem for Finland, in that it was a poor country that could hardly afford to make large restitution payments, but also because Finland was not really an industrialized economy at this point and had very little to offer the Soviets. What little modern business existed was mostly concentrated in the pulp and paper industry.

But the Finns took this hardship and transformed it into an opportunity. Finland embarked on a crash course program of industrialization – it mobilized its savings and the government created a lot of tax and other incentives to invest in new infrastructure, factories and shipyards. Moreover, the Russians weren't exactly customers in the free market sense of the term. They did not demand the industrial goods delivered as reparations by the Finns meet international standards of quality and sophistication, which allowed Finnish engineering and manufacturing industries to slowly improve their skills and technology without competing against established western firms.

In any event, this era of Finnish economic development was characterized by strong state intervention in the economy – the modern vestiges of a social welfare state were established, with large sums being invested in education and health. Savings and investment were channeled by the government to favored industries, and much of the country's basic infrastructure was built or improved. The country's energy sector also experienced strong growth during this period, with Finland establishing both nuclear generating facilities (utilizing Swedish and Russian reactor designs), and an extensive bio-mass generating capacity centered around the forestry sector's pulp and paper mills.

Finland's labor unions expanded markedly during the 1950's and 60's – with the unionized percentage of the workforce rising from 40% to roughly 80% - helped by state encouragement and the development of centralized wage negotiations between labor and the Confederation of Finnish Industry that (with the state acting as a mediator and go-between) continues to this day.



By the 1970's, this initial phase of industrialization was beginning to run out of steam as the oil shocks and increasingly high inflation rates began to upset Finnish macroeconomic stability. A series of devaluations of the Finnish Markka kept the forestry industry internationally competitive (it still accounted for a huge proportion –TKTK% - of Finnish GDP at the time), but were otherwise destabilizing. Finns began seeking new solutions to the challenges of economic development and formed a special government committee including government, labor and business leaders to examine Finland's global competitiveness and suggest a comprehensive strategy for future development. The committee decided to adopt a 'high-technology strategy,' and the country set about building and expanding the infrastructure and institutions necessary to pursue basic research, commercial development and innovation.

The government changed an existing law that had banned collaboration between universities and the private sector and began promoting cooperation. Several new trade deals were agreed with the European Union and the Nordic countries and Finland moved to begin reducing its dependence on the Soviet Union. Spending on education and R&D increased sharply, and the country created two new public institutions to provide funding and support for Finnish innovation.

Sitra was founded in 1967 as the 'Finnish Innovation Fund' with an endowment of FM100 million to invest in technological research and development, particularly in the fields of electronics and energy. In 1983 Tekes, a state agency for funding technology R&D was established. The formation of Tekes led to a clarification and refocusing of Sitra's mission: Sitra evolved into a sort of public venture capitalist, funding not R&D programs but specific startup companies. In addition, it published research and policy papers on innovation and the promotion of high-technology in the Finnish economy.

Finnish Manufacturing Employment

	1925	1938	1960	1974	1990	2000*
Textile. clothing and leather product industries	23,700	45,300	82,500	81,400	34,100	16,800
Saw-milling and other timber industries	47,800	48,900	59,000	66,000	38,800	31,800
Paper and pulp industries	16,200	22,900	39,500	56,600	46,200	39,000
Metal industries[a]	22,500	43,600	97,300	153,100	148,400	145,400
Electric and electronic appliance industries	..	..	19,400	37,200	42,100	69,000
Other industries	38,500	60,700	112,700	171,000	194,300	157,100
Manufacturing industry total	148,700	221,400	410,400	565,300	503,900	459,100

[a] Includes electric and electronic appliance industries in 1925 and in 1938.
* Preliminary figure.
Sources: Hjerppe, Reino et al. (1976); Statistics Finland's National Accounts Database.

Structural reforms were also begun. The Finnish state began divesting public holdings in a few big engineering, chemicals, and wood processing firms and promoting private sector investment in the economy. The telecommunications sector was opened up and the Finnish government, in tandem with other Nordic governments, adopted a series of technical standards that opened up wireless communications for sustained growth. Financial markets were liberalized, and the country experienced a wave of foreign investment as existing industries were

restructured and new businesses, especially in the ICT sector, grew. As the chart below shows, these reforms resulted in a significant shift in the relative employment levels of Finnish industry.

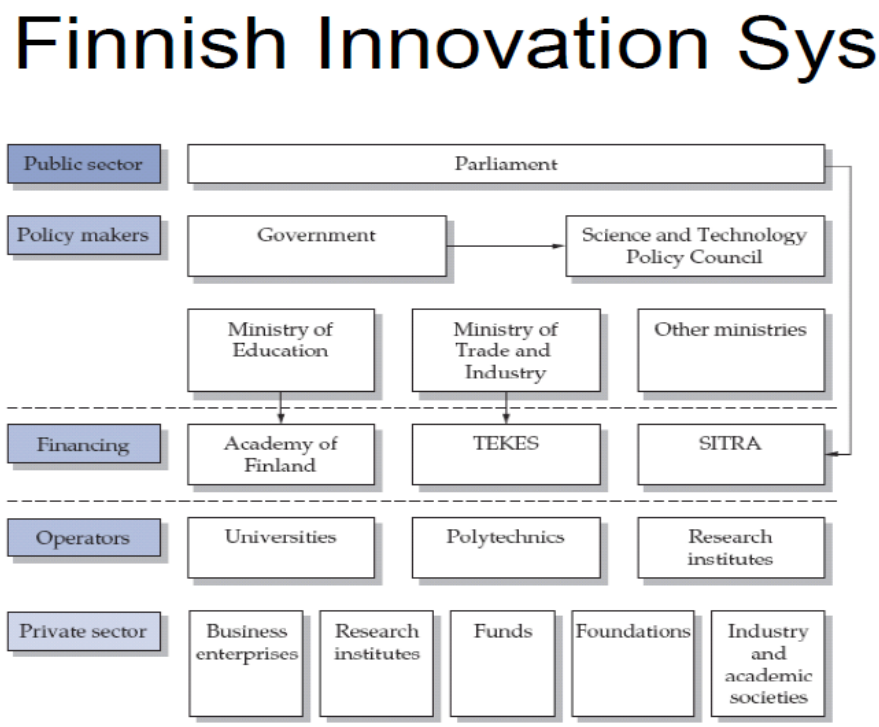
Besides the structural reforms, another important element in the transformation of the Finnish economy was the cooperation of the labor unions. The 1980's had been a period of relatively high labor strife by Finnish standards, with workers in the traditional sectors demanding high pay increases and other benefits, and often going on strike to achieve their goals. But the severity of the recession in the early 90's convinced the unions to moderate their wage demands and job protections and work together with the state and the private sector to rebuild the economy.

The Finnish Innovation System

As mentioned above, one can conceptualize Finnish post-war economic development as having progressed through three distinct phases: from industrialization through technological development through the current phase of innovation. Each of these phases was, to varying degrees, part of a coherent strategy that was carried out by the government in conjunction with academia

and the private sector. One of the keys to Finland's success is the framework within which Finland's economic development strategy is defined, planned and implemented. Finland's 'Innovation System' promotes consensus and cooperation during all three stages of strategy development, and ensures that the resources of the country are focused on achievable goals and allocated efficiently.

The effectiveness of Finland's strategic planning has been enhanced by ability of the country's business and political leaders to conceive of the different sectors of the economy and public sector not as isolated pieces but as integrated parts of a system. Finland's strong growth in ICT, for example, depended on a confluence of factors: government funding of education ensured that the country had a strong base of well educated engineers and scientists; Finland's openness to international trade, its membership in the EFTA and later the EU provided a large market to sell into; the establishment of first a Nordic and then an EU-wide technical standard for wireless communications gave Finnish firms first-mover advantages in the sector; and finally funding from state agencies like Tekes, Sitra and the Academy of Finland pushed R&D work along and helped to establish the country as a center of ICT innovation.



In addition, taking a holistic approach to innovation systems means not dismissing 'low-tech' areas of the economy out of hand. Sometimes low-value added manufacturing operations, for example, play an important role in contributing to the strength and breadth of a particular cluster. Innovation is about improving processes and operations as much as it is about inventing new products and technologies. Thus, maintaining a domestic assembly line might be important because of the R&D or testing work that the line supports. Finland has taken pains to ensure that its grants and R&D funding programs take abroad view of the impact of new processes and technologies on the economy and ensure that traditional industries keep on innovating to maintain competitiveness.

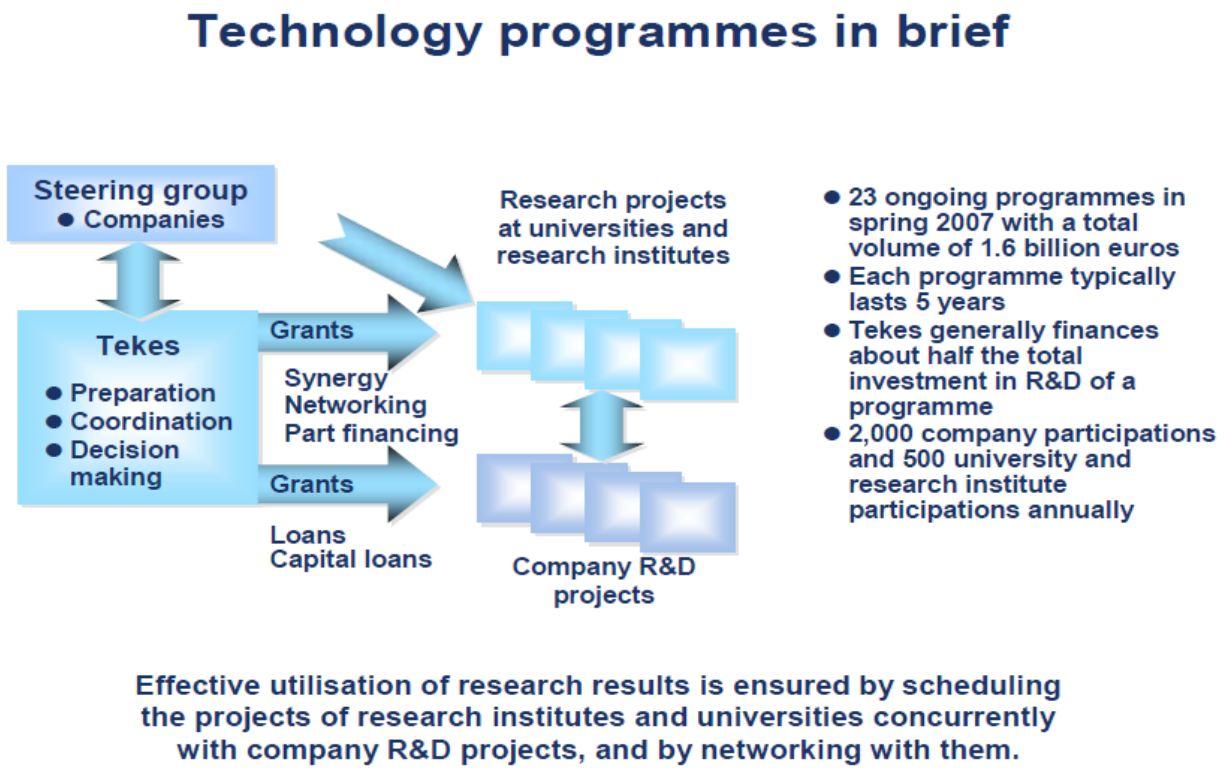
The command center for Finnish innovation policy is the Science and Technology Policy Council. The Council is an advisory body for the government that is chaired directly by the Prime Minister and also includes key cabinet ministers (in particular the Education and Trade and Industry Ministers who serve as vice-chairs of the Council) and senior representatives from academia, private industry and labor. Senior representatives of Tekes and the Academy of Finland also have seats on the Council. The Council provides an informal space for interactions among all the players in the system to reach consensus on important policy goals and the methods for achieving these goals.

Many of the most important initiatives of Finnish innovation policy have emanated from the Council – the decision to create Tekes, the plan to boost national R&D investment, many university level science and technology programs, and many regulatory reforms and liberalizations have been planned and implemented through the Council

Tekes

Tekes, the state agency for funding R&D activities, was founded in 1983 with a mandate to support innovation in the ICT sector and to create a series of national technology projects that involved academia, industry and some government ministries. While Tekes reports to the Ministry of Trade and Industry, it is an independent agency with substantial autonomy – Tekes alone makes its funding decisions. Soon after it began operating, it created a competitive process of bidding for research grants that included both peer review and an analysis of the project's overall impact on the Finnish economy. Tekes tried to support projects

that had the potential for export success, job creation, productivity and value-added increases, and spillover effects on the surrounding communities and industrial clusters.

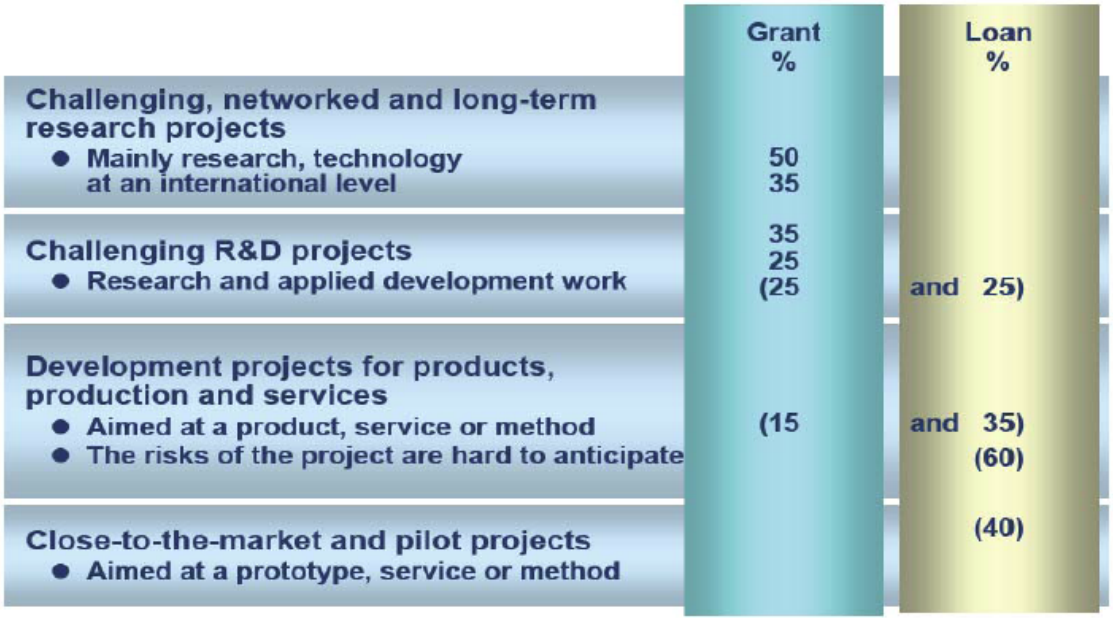


In effect, Tekes was 'picking winners,' making strategic choices to identify specific economic sectors that would build on existing Finnish strengths and penetrate the international marketplace. From the start, Tekes sought an international perspective – in addition to taking advantage of Finland's entry into the European Free Trade Association in the 1960's to promote exports, Tekes also established international offices in Brussels, Washington DC, and Silicon Valley in California (Tekes has since added offices in Beijing, Shanghai and Tokyo). These links helped to encourage Finnish participation in joint international research projects and focus Finnish efforts on commercializing technology and tailoring development work to meet international demand.

At the same time, Tekes identified existing Finnish strengths to build upon. Among others, they identified radio and television manufacturing, a strong forestry sector, machine tools, and a few experts on wireless radio communications. The first National Technology Program was a semiconductor program, but others soon followed. Each program would involve a particular technology or subject area and consist of a series of R&D projects run by academic and private sector specialists. Funding grants were awarded to academics, companies, or a consortium of different researchers. Tekes' competitive bidding process aimed for a 50/50 split between government and private funding sources, ensuring that corporations would have an important stake in the success of the programs, but Tekes would fund projects everywhere from universities to large corporations to small and medium sized businesses. Tekes did not and does not take equity stakes in any of the companies or projects it invests in, but it does give out either grants or loans that must be repaid with the proceeds of the commercial application of the work.

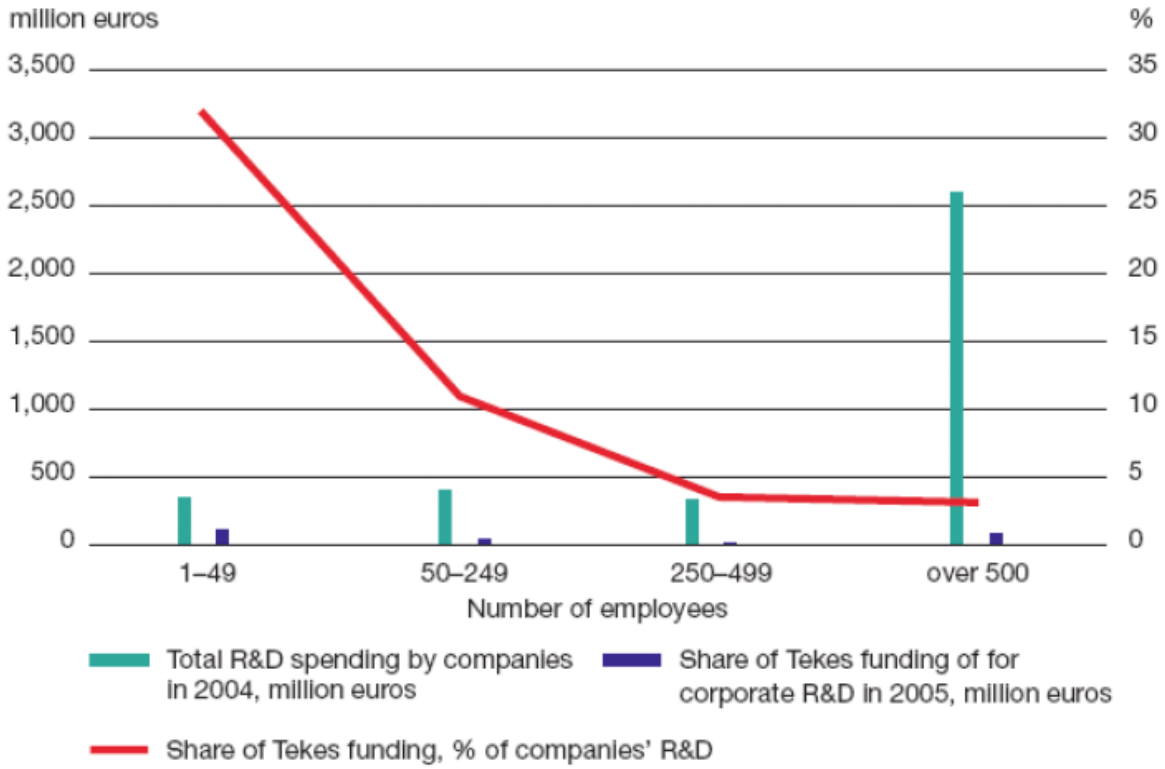
Tekes has played a role in the technology R&D programs of every major Finnish company (including Nokia) since its founding. Tekes has different funding criteria depending on whether the R&D proposal covers basic research or aimed at later stage commercial development. In either case, Tekes will only fund a portion of the project's total cost, ensuring that the firm has a stake in a successful outcome. Basic research is usually funded with a grant, but loans, which must be repaid, become more important as the technology gets closer to commercial application, and the potential for earning a return on the R&D becomes more viable.

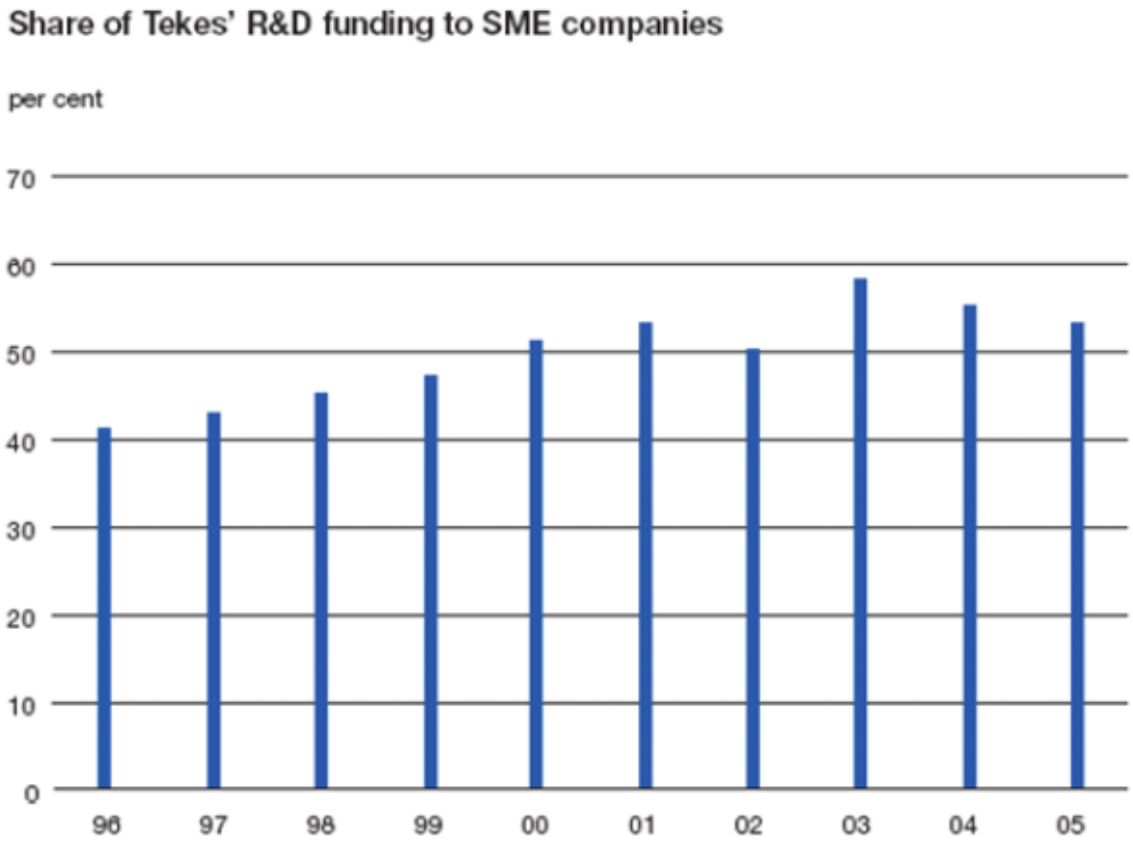
Tekes Funding Alternatives for Large Companies



In the first years, Tekes' budget was only around €10 million annually. And even as Tekes' budget and staff has grown substantially since it was first founded, the institution has tried to remain relatively small and nimble. It has just over 300 permanent staff and is constantly reevaluating its methods and effectiveness. Nonetheless, Tekes has been criticized for spreading its resources too widely. Over 60% of its funding goes to SME's, and last year, for example, Tekes made over €466 million in investments, but to 2,157 different projects, resulting in an average funding size of only €216,000.

Tekes funding relative to R&D expenditure in companies of different sizes





To the smallest companies employing less than 10 employees, Tekes directed approximately 17 per cent of the total funding of companies, i.e. 43 million euros in 2005.
Annually an additional 10–35 million euros was directed towards SMEs through projects in large companies, which increases SMEs share with 5–14 percentage units.

Education

The Finnish education sector is consistently ranked as one of the best in the world. Finnish students score highly in the PISA tests and the World Economic Forum ranked Finland number one in the world in terms of the overall quality of its educational system. In 2003, Finnish students earned a mean score of 539 on the PISA math test, well above the OECD average of 496 and behind only Switzerland, Japan, Korea and Hong Kong. In the science test, Finland earned a score of 548, above the average of 500, and first overall out of all participating countries. As these scores suggest, the real strength of Finland's educational system lies in its primary and secondary schools. Basic education begins at age seven and is free for all.

Until the students reach the age of 16, everyone attends the same type of 'comprehensive school' that teach the same curriculum. Languages are an important component of the Finnish curriculum, and foreign language instruction begins early – all third graders must be studying at least one foreign language, but instruction often begins earlier and may include more than one foreign language at a time. Because both Finnish and Swedish are officially recognized languages in Finland, all students must obtain at least a proficiency in both. In addition, another foreign language is required. Most Finnish students learn English, but some study (sometimes in addition to English) German, French or Russian.

At 16, tracking begins, with students able to choose between college preparatory and vocational upper schools. Unlike Sweden, the courses and curriculums at vocational and college prep schools are substantially different. Graduation from the college prep schools, but not the vocational schools, requires passing a matriculation exam that is a prerequisite for further study. The results of the matriculation exam are often used as a basis for entrance into the universities, as the exam was originally based on the entrance exam for Helsinki University.

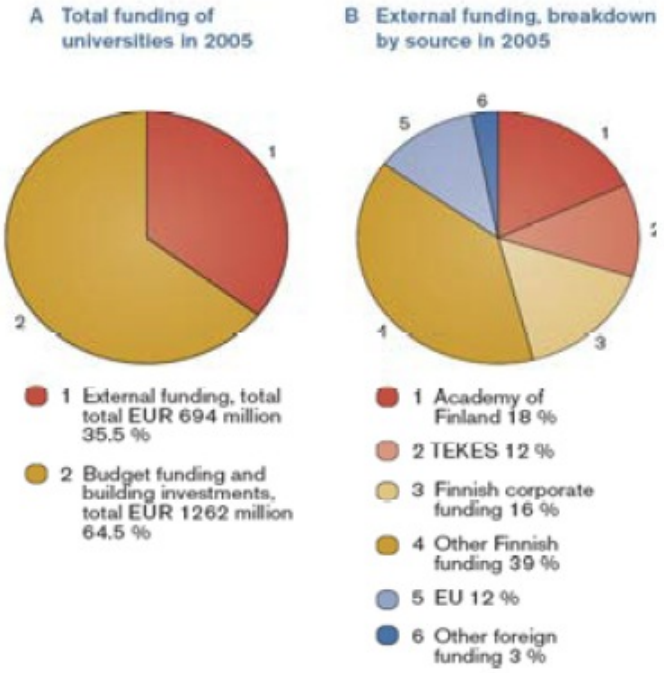
Finland's teachers enjoy a high reputation and there is significant competition among students to enter education degree programs in Finnish universities. In 2005, only 13% of applicants were accepted into Finnish teacher training programs.

Finland's higher education system is divided between research universities and polytechnics that are more practice oriented. Although the polytechnics do not have PhD programs, they often enjoy close ties to industry and participate in cooperative programs with the private sector to ensure they are turning out students with skills that meet labor market demands. Most of the polytechnic schools are owned and run by local municipalities (there are a couple of privately owned schools) and are free of charge. All of Finland's universities are state owned and there are no tuition fees for students (including foreigners). The state also provides housing grants and student loans to cover living expenses for many students.

In general in higher education, Finland has done a very good job of promoting science and engineering degree programs and fostering links between academia and the private sector, but still has room for improvement in terms of the overall

quality and international competitiveness of its universities. As late as 1960, Finland had full universities in only two cities. The country then embarked on a major expansion program that saw the university system grow to 20 institutions in ten cities across Finland. Overall funding levels were increased substantially and the Academy of Finland was reorganized under the Ministry of Education to help oversee the expansion.

Finnish University Funding By Source

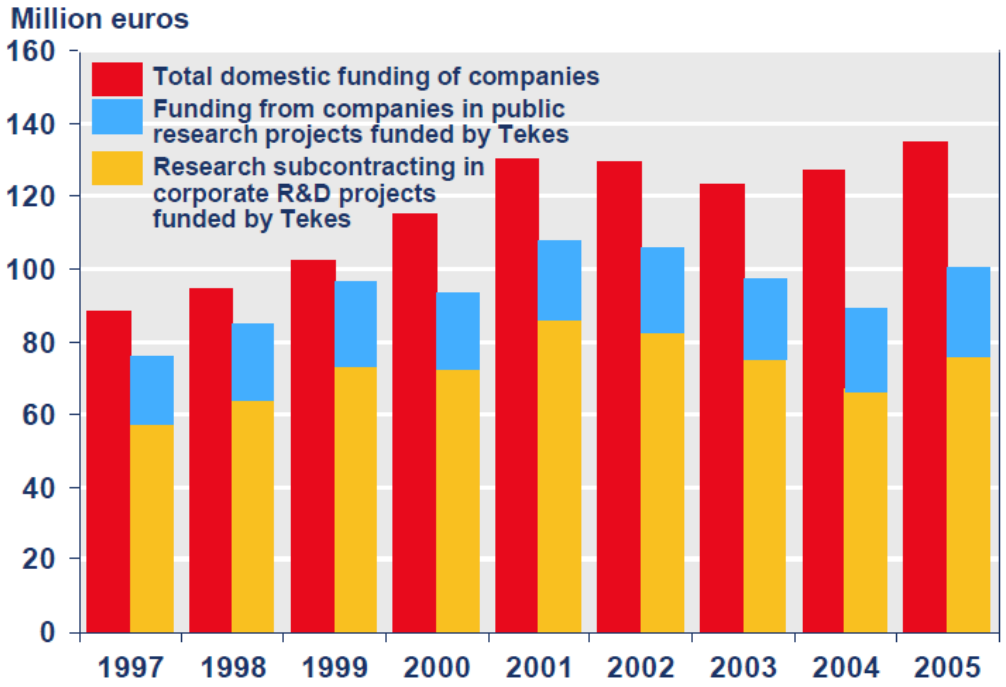


But while the expansion of universities was very successful in increasing the numbers of Finns receiving a tertiary level education, it created universities that were relatively small by international standards and often too small or specialized to achieve the critical mass and interdisciplinary collaboration that mark the world's best research universities. One effort to improve the stature of Finland's universities involves a plan to merge three specialized universities in Helsinki to create one large institution with the breadth and depth necessary to promote interdisciplinary research and stand on its own as one of the best universities in the world. The Helsinki Institute of Technology, the Helsinki University of Art and Design, and the Helsinki School of Economics and Business Administration was all be rolled into a single entity – an 'innovation university' in the words of the plans'

boosters. This merger will likely be mimicked in other areas of Finnish higher education, as the Ministry of Education is eyeing increased cooperation among universities in close proximity to one another, and among polytechnics that teach complementary subjects.

The main funding body for scientific research and is the Academy of Finland, which is a part of the Ministry of Education and also helps to devise the country's science policy. The Academy runs four 'research councils' that are staffed by 10 leading academics from their respective fields. The four councils cover: Culture and Society; Natural Sciences and Engineering; Health; and Biosciences and the Environment. In general, each council aims to identify specific subjects or areas, and then creates a program to fund a series of research projects within that field. One of the more successful recent programs was the 'Telectronics' program which ran from 1998-2003 and disbursed over €7.7 million. The program covered both telecommunications software and hardware, techniques for broadband data transfer, and issues in telecommunications manufacturing supply chains.

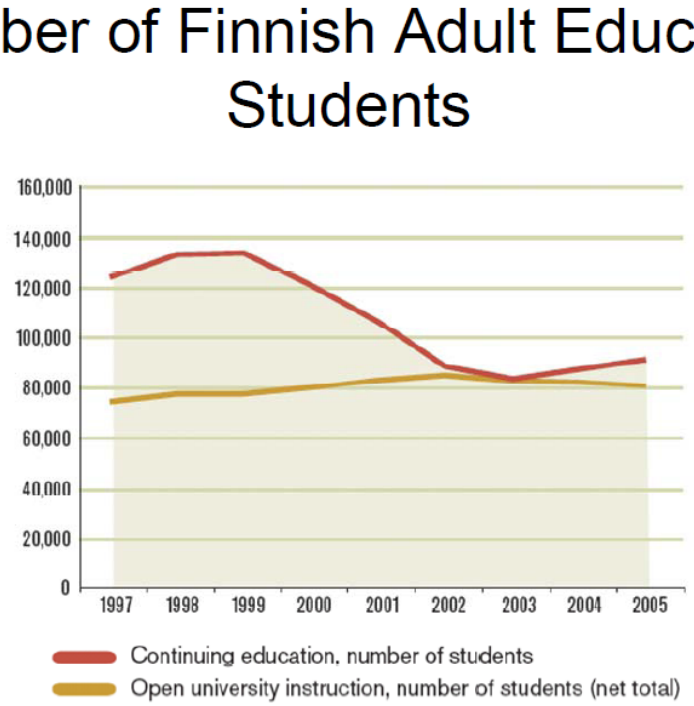
Interaction between universities and research institutes in R&D projects



Sources: Statistics Finland and Tekes

Finland also maintains adult education programs that help retrain workers displaced by job losses, or simply 'up-skill' individuals seeking to improve their careers. Adult education students can take courses either at specialized adult education centers, at universities, or at vocational or polytechnic schools. Finland's adult education participation rates are skewed upwards because it includes some types of education – like Master's degree programs or continuing education programs for professionals like lawyers and architects, that do not directly address retraining for laid off workers or improving the skill-sets of low-skilled workers. Still, the government has built up an extensive and well-funded adult vocational training infrastructure, and there are an extensive array of grants and other financial aid packages to encourage participation in these programs.

Many adult education programs are coordinated with the private sector – vocational schools offer both certificates in specific fields and ongoing instruction that often involves work-study programs where the student apprentices at a private firm concurrently with his studies. Some programs lead to polytechnic degrees that are prerequisites for gaining professional licenses in certain fields. Adult students that actually complete degree programs are of course more likely to reenter the labor force than those that merely take courses – only 7% of those who completed a bachelor's level polytechnic degree in 2002 remain unemployed.



Telecoms

The emergence of Finland in the 1990's as an international ICT powerhouse comes as a bit of a surprise, as the country did not have much of an industrial base in ICT or a tradition of leadership in telecommunications. However, unlike most other western countries, the country also did not have a legacy of an incumbent telecom operator with monopoly powers or a dominant telecom manufacturer. In fact, it had literally hundreds of telecom service providers and depended largely on foreign firms for its telecom equipment. This legacy dates from 1886, when the Finnish Senate passed a 'Telephony Decree' that aimed to keep control of this emerging new technology out of the hands of the Russian government. At the time, Finland was struggling to assert its identity and autonomy within the Russian empire, and it did not want to allow the Russians to control a monopoly telecom provider as it did with the telegraph. The Telephony Decree resulted in the distribution of hundreds of licenses to provide telecom services within Finland and established the basis for a strong, competitive telecommunications industry one hundred years later.

Finland did have state owned telecoms firm – the Finnish Post, Telegraph and Telephone Company (the forerunner of Sonera, which later merged with the Swedish national phone company Telia). But FPTT was not a monopoly operator – it ran the national trunk network but did not control local networks, which saw stiff competition between the numerous service providers. Without any national champion to protect, Finland developed many small, efficient telecom companies eager to adopt foreign technologies and provide internationally competitive products and services. Today, there are still over 40 independent telecom service providers in Finland, but the manufacturing sector has become more concentrated around Nokia and its subcontractors.

Nokia itself has its roots in a Finnish conglomerate that was founded in 1865 as a forestry company. By the 1980's, its ICT related business operations included an electric cable producer, a radio and television manufacturer and a wireless radio laboratory that mainly worked as a supplier to the Finnish military. These military links would prove instrumental in forming the basis of the technologies that are used in mobile phones today. Early tenders and requests for proposals by the Finnish military for mobile communications devices eventually resulted in the country's first mobile telephone network in 1971. While the network proved to be

a bit ahead of its time, it did lay the groundwork for future developments and demonstrated the potential for commercial development of the technology.

Indeed, the most significant outgrowth of this effort was the establishment of the Nordic Mobile Telephone Technical Standard in the late 1970's. This standard was the forerunner of today's global GSM standard and created the largest mobile phone market in the world within a few short years. The adoption of the analog NMT standard was important because it enabled companies to compete over providing new and better products and services as opposed to attempting to develop proprietary technical standards. As the mobile phone market grew in size, companies found it easier to recoup their development costs and develop economies of scale.

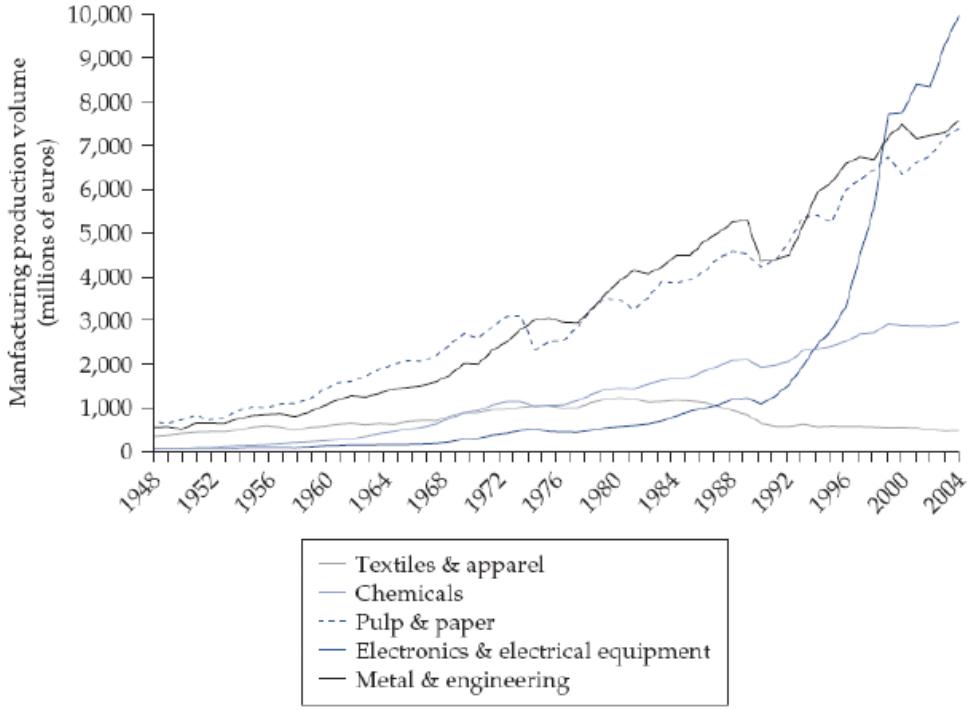
Still, at this early date, the subsequent success of the Finnish ICT sector was hardly guaranteed. Nokia actually teetered on the edge of bankruptcy in the early 1990's – dragged down by its sprawling conglomeration of business lines and the impact of the Finnish recession. Nokia was saved by a new forward-thinking management team led by Jorma Ollila that jettisoned the firm's forestry and other business lines to focus on telecommunications. Ollila managed to recruit many of the best and brightest in Finnish business to join Nokia, and they brought with them expertise in marketing, manufacturing, supply-chain management, engineering, R&D, and other areas that allowed Nokia to draw on the 'best-practices' lessons from a range of different industries and firms.

Nokia made several strategic decisions that proved very important to its subsequent success. First, despite the relatively high costs and small size of the mobile phone market in the early 90's, Nokia realized that its market would not be limited to executives or specialized businesses but rather would become a mass market consumer item. Second, unlike most new technologies, the key markets for mobile phones would not be found in the rich, developed countries of Western Europe and North America, but would instead be in emerging markets. Not only would mobile phones become cheap enough for emerging market consumers to afford, but the lack of existing telecommunications infrastructure in these countries meant there was a huge pent up demand.

This global, mass-market outlook meant that Nokia was well ahead of the game in ensuring its operations had true international depth and reach. The firm's first manufacturing facility in China opened in 1994 and that same year it had captured 35% of global market share in mobile phones. Additionally, Nokia realized that it would have to compete in two business areas – designing and manufacturing mobile phones was not enough, it also had to compete in the market for the routers, switches and underlying infrastructure that allowed the mobile phones to operate.

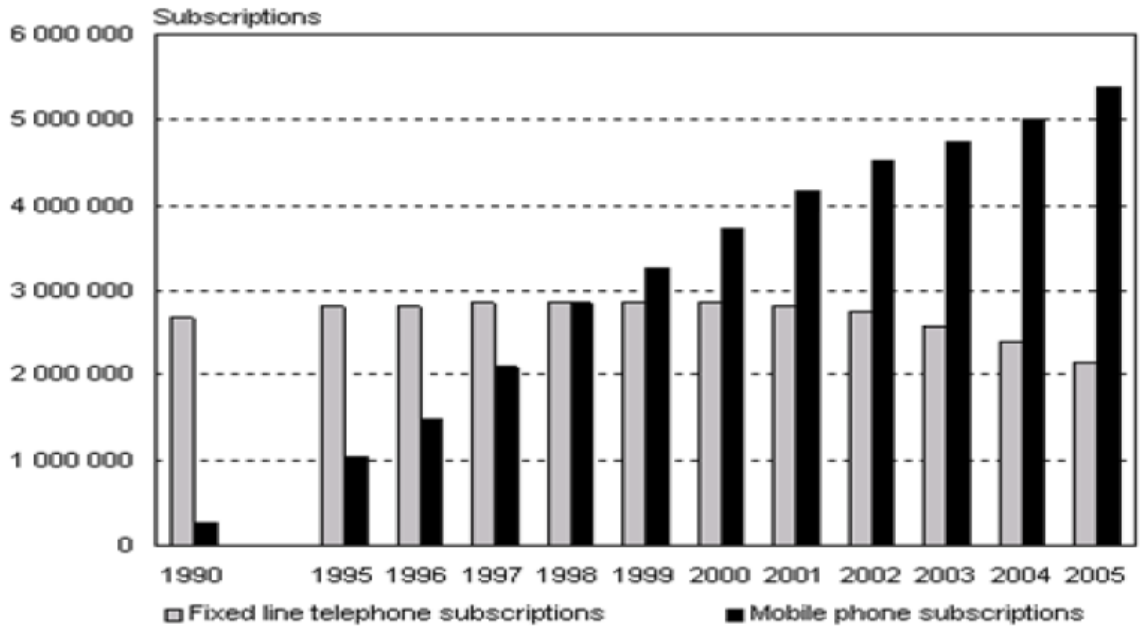
The adoption of GSM by the EU in 1988 was a key step that allowed this strategy to work for Nokia. GSM was a vast step up from the old analog NMT standards because it was digital. But like the NMT, GSM was an open technical standard that promoted intense competition over price and service, rather than battling each other over rival closed, proprietary standards. Nokia could thus quickly build economies of scale based on the GSM standard throughout the world, relying on its previous experience and R&D work. As mobile phones, and Nokia with them, took off internationally, the ICT sector's significance to the Finnish economy expanded exponentially. As the following chart shows, by 1998 electronics and electrical equipment were the largest Finnish manufacturing industry by revenues.

Finnish Manufacturing Production Volume by Industry



At the same time as Nokia was conquering global mobile phone markets, Finland's domestic ICT infrastructure was expanding apace. Mobile phone penetration rates in Finland grew very quickly, and today there are more mobile phone subscriptions than people in Finland.

Finnish Mobile Phone Subscription Growth 1990-2005



The internet also gained early adoption in Finland. Sitra funded the creation of the first data network in Finland, which linked the main universities together in 1971, well before modern communications protocols like TCP/IP had been invented. The first commercial internet service provider was launched in Finland in 1993, and Finnish software writers and coders were important participants in the development of many internet technologies like Internet Relay Chat (IRC), and even more significantly, the open source model for software. Linus Torvalds, the creator of the Linux operating system, was one of the first people to utilize an open-source model while he was a student at Helsinki University in 1991. He did so by posting the code to his new operating system on a Finnish server along with the request that other coders join him in helping develop the software. In the years since, Linux has had tens of thousands of programmers work on its code, and has emerged as an increasingly viable alternative to Microsoft Windows or the Apple OS.

Using High-Tech to Boost Traditional Industries

Despite the headline grabbing emergence of Nokia and the ITC sector as engines of Finnish growth over the last two decades, a large proportion of Finnish jobs and economic production remain in 'traditional' industries – especially the forestry, shipbuilding, chemicals and energy sectors. These sectors have faced intense challenges from international competitors – often developing countries with much lower labor costs and tax regimes. And yet Finland has managed to leverage technology and sustained productivity increases to keep these industries internationally competitive and exploit new niches where midsize Finnish firms can dominate the global marketplace.

Take, for example, the links that Finland has built between the forestry and energy sectors. Paper and saw mills are very energy intensive, but are often located in remote rural areas away from the national power grid. Mills also produce a lot of scrap and waste materials – like the sawdust and bits of wood left over after the mill saws trees into boards and planks. But by using this waste as bio-fuel to power on-site electricity generating capacity, Finland has managed to solve both of these problems in one fell swoop. &0% of the energy used by the forestry sector now comes from wood-based fuels. It has also gained a first-mover advantage in an industry set for explosive growth as high oil and gas prices make other sources of energy more competitive and as worries over global warming are prompting a wave of new investments and tax incentives into renewable energy production.

The forestry sector used to dominate the Finnish economy, and by some estimates, still accounts for nearly 30% of GDP when all the service providers, sub-contractors and manufacturers of forestry and paper machinery are taken into account. Unfortunately, the seminal importance of the forestry sector led Finland indulge in many economic policies throughout the 1950's, 60's, 70's and 80's that, while benefiting the forestry sector, ultimately harmed other aspects of the Finnish economy. Periodic currency devaluations, state subsidies, and import substitution policies protected the sector from international competition, but became increasingly out of step with the interests of the rest of the Finnish business community. By the time the recession of the early 1990's hit, the country knew it could not go on coddling the forestry sector and that it must be left to its own devices in the international marketplace.

But the real story here has proved to be Finland's ability promote productivity growth in its forestry sectors and adapt to a more competitive global environment. Technology and education have played leading roles here: Fully two-thirds of all the forestry engineers in Europe graduated from Finnish universities; special degree programs exist for nearly every type of forestry related career in Finland, these programs include certificates that can be earned in vocational schools through bachelor's degrees in colleges to PhD programs in Finnish universities. And as in other areas of the Finnish economy, R&D work takes place in private companies, in academia, in government ministries, and in special research institutes that promote collaboration among the three groups.

One notable example of Finland's ability to transform the traditional forestry industry into a center of innovation involves a company called Ahlstrom. Founded in 1851, it grew into a forestry conglomerate with fingers in everything from wood products to pulp and paper. In the 1970's, the company was trying to improve productivity at its paper mills and started experimenting with computerized control and automation systems at its plants. These efforts were centered on the town of Varkaus in rural Finland, where the company established an R&D center and a small production unit, and soon proved to be very successful in increasing efficiency at the mills. So much so, in fact, that Ahlstrom began selling the system to competitors and exporting it internationally. In the early 1990's, however, as the Finnish forestry industry entered a downturn, Ahlstrom decided shed some of its business lines and refocus on its core competencies. The computerized control and automation business was sold off to Honeywell, an American multi-national. But instead if simply taking the technology and integrating it into its own products, Honeywell found that the specialized knowledge that had been built up in the town of Varkaus was of such a high quality that it made the town the center of its global R&D facilities in the field of computerized control and automation for paper mills.

An important aspect of the Finnish forestry industry is that much of its employment and wealth creation is concentrated in rural areas. While the 1980's saw a substantial decline in employment in the forestry industry, the restructuring helped the industry to survive and remain globally competitive. Forestry plays an important role in ensuring that economic development in Finland is geographically diversified, and because of land reforms carried out by

the Finnish state in the first half of the 20th century, private landholdings of forests is high in Finland. Most Finnish farms have extensive holdings of forests, and farmers and other private owners supplement their incomes by providing the bulk of the timber supplied to the pulp, paper and sawmill industries. Less than 30% of Finnish forests are government owned, the rest are controlled either by farmers, individuals, or private companies.

Maritime Sector

One of Finland's most important traditional industries is shipbuilding. Although the very first shipyards were built in Finland in the 1700's, a modern shipbuilding industry did not appear until the 20th century. The Russian Imperial navy commissioned ships from Finnish shipyards in the early part of the century and then, in the 1930's, Finnish shipyards were involved in the construction of German U-boats, as the Versailles Treaty had banned Germany from building such vessels. The design and financing of the submarines of course hailed from Germany.

This sector underwent a major expansion after World War II as part of the effort to pay off Soviet war reparations. Due to the tensions of the Cold War, it was necessary for the Finns to develop an integrated shipbuilding industry, with all of the subcontracting and outfitting done by Finnish firms, in order to avoid restrictions on the export of sensitive maritime goods from the west to the Soviet Union. As a result, the Finnish shipbuilding industry today might better be characterized as a 'maritime cluster' than just a number of old-fashioned shipyards. In addition to shipbuilding and repair, the companies in this cluster make engines and propulsion systems, electronic devices, storage containers, cranes, and operate ports and shipping lines. The Finnish maritime sector is broad and deep in the sense that almost every major component that goes into making a modern cruise vessel or passenger ferry can be made domestically, often by small or medium sized companies that specialize in particular niches.

In the 1980's and 90's, the Finnish maritime industry underwent a period of crisis and consolidation. While several older shipyards were closed and many workers were laid off, the industry was successfully restructured. The major Finnish shipyards are now part of an international portfolio controlled by Aker Yards, a

Norwegian based shipbuilding company. The Finnish yards specialize in cruise ships, passenger ferries, icebreakers, naval ships (they are the main supplier to the Finnish navy) and maritime support vessels and carry out work in all phases of production from design to engineering to construction to outfitting. But these yards depend on a network of suppliers that extends throughout Finland. There are over 2,500 companies in the maritime cluster which employ roughly 47,000 people. These people are increasingly skilled engineers, designers and professionals as opposed to the welders and manual laborers of yore. Increasingly, the construction of hulls and other types of low-value added construction are being transferred to shipyards in Eastern Europe or Asia, necessitating a move up the value chain by Finnish companies. Luckily, the design, construction, outfitting and operations of post-panamax vessels like the biggest new cruise ships has become much more complex, requiring the kind of expertise and human capital that Finland has been developing. Tekes has been an important source of support in this effort to move up the value chain. As the following chart shows, the metals and machinery sector has been either the first or second most funded industrial sector by Tekes for the past decade.

The sector is also one of Finland's major exporters. The country has commanded an average of one-fifth of the world's total market for passenger ships in recent years, making cruise ships scheduled to ply the Caribbean, and car and passenger ferries that work the Baltic and North Seas. In 2001, the maritime sector made over €4 billion worth of exports. In addition, over 80% of Finland's exports are ship-borne, so the ports play an important part of the story of the international competitiveness of the country's forestry, oil and chemicals sectors.

Energy

With its remote location, harsh winters and lack of domestic energy resources like oil and coal, Finland has been forced to use technology and innovation to help meet its demand for energy and ensure the safety and security of its population. Thanks to sustained efforts in these areas, the Finnish economy now stands to benefit (instead of suffer) from rising prices and competition over diminishing energy resources in the rest of the world. Finland is the global leader in bio-mass electricity production, a major producer of electricity from nuclear power, and even an exporter of oil products thanks to sophisticated refineries that specialize in turning high-sulfur oil from Russia into gasoline, plastics and other products.

One of the most unique features of Finnish energy production is its reliance on district heating in its urban centers. District heating is a very efficient way of utilizing energy – a modern natural gas-fired power plant, for example, can recover up to 92% of the total energy content of the gas by producing both heat and electricity. The way it works begins with a gas fired co-generating facility located in or near a city or particular neighborhood. When the plant burns natural gas to produce electricity, it also produces a prodigious amount of heat. This heat is captured using a series of steam and water pipes that are in turn connected to every house and building in the vicinity. So instead of having individual (and hence inefficient) furnaces in each building to produce heat, entire neighborhoods can rely on an individual generating plant for all their heating and electricity needs. Further efficiency gains are made through strict regulations that mandate the use of insulation special building techniques in all structures.

Finland is also a major producer of nuclear power. Outside of France, Finland is the only European country currently building new nuclear generating capacity. Finnish nuclear plants utilize Swedish and Russian reactor designs and tend to be located away from the major urban areas. For safety reasons, they cannot used for district heating and are used only for generating baseload capacity.

Approximately 25% of all Finnish energy production (including heat and transportation) is nuclear. Oil accounts for another 25%, natural gas 15%, hydro 10% and bio-mass 20%. Total oil use has actually gone down since 1980, when the oil shocks of the 1970's inspired Finland to develop alternative sources of energy. Most Finnish oil and gas is imported from Russia, which maintains two pipelines that run into Finland.

Finland deregulated its electricity markets in the 1990's, a reform that has a mixed record of success. Prior to the liberalization, Finland has several electricity generating companies that were owned either by the state or local municipalities. The generating companies were privatized, but the national grid operator – which maintains the transmission lines – was kept heavily regulated. It is owned by a consortium of the state, the private power companies, and pension funds. The liberalization was complicated by Finland's reliance on district heating and the challenge of integrating local transmission wires with the national grid. District heating depends on having a monopoly supplier, and so today the privatized

descendents of the municipal power companies maintain their monopoly on district heating but sell electricity into a competitive market. In other words, if you are a homeowner in Helsinki, you must purchase your heat from Helsinki Energy Works, but you can buy electricity from any one of several competing electricity generators.

Unfortunately, despite various studies that predicted liberalization would lead to lower electricity prices, this has not occurred. Previously, Finnish regulators had mandated that all electricity generators maintain an extra 10-15% of extra generating capacity to ensure the safety and reliability of the overall system. After the liberalization, the newly deregulated generating capacities had a fiscal responsibility to their shareholders to increase the efficiency of their operations, so all this extra capacity instantly came onto the market, and prices did initially come down. But the economy was growing quickly – recovering from the recession in the early part of the decade, thus spurring demand. So this extra capacity soon disappeared – which suited the newly privatized companies, as their margins and share prices (not to mention their managers' compensation packages) all increased – and nobody wanted to step up and take responsibility for building and maintaining the extra capacity necessary to ensure the safe and efficient operation of the system.

So the net result of electricity liberalization has been that retail and wholesale prices have gone up and the regulators and generating companies have not managed to come to an agreement over how extra capacity should be built into the system and who should pay for it. Still, it is too soon to give a final verdict on the results of this experiment – building new generating capacity is both capital and time intensive, and the complexities of operating real time electricity markets are daunting and will perhaps improve as the various players gain more experience (and Finland has avoided any Enron style meltdown thus far). In addition, Finland's efforts are part of Nordic-wide effort to deregulate and create one big pan-Nordic power market. Once more interconnections are built between Finland and the other Nordic countries, a more efficient market could result.

Lessons for Mexico

Finland has an extremely well organized public infrastructure for promoting R&D and innovation generally. From the Science and Technology Council through to Tekes, Sitra and the education system, Finnish policy makers are able to set goals, make detailed plans, and implement them with impressive speed and efficiency thanks to the strength of these institutions. These institutions are inclusive and consensus driven in that they include participants from the highest levels of business, academia, labor and government, and are thus able to get all of these sectors to 'buy in' to the development goals and work cooperatively to achieve the desired results. Further, Finland has effectively integrated high-tech into the lower tech sectors, such as the lumber and paper industries. This is one area in which Mexico can certainly look to Finland's example. Bringing low-tech and service industry up to a level of global competitiveness requires encouraging the high tech sector's spillover effects into other areas of the economy.

Finland has proven particularly successful at promoting strong links between universities and the private sector, building a science and technology focused educational system that is good at preparing students for private sector jobs and takes into account industry's long term needs for skilled engineers, technicians and business managers.

In short, Finland is an excellent example of what a 21st century industrial policy looks like. A forward thinking industrial policy is not about protecting existing industries or having the state manage the economy. Rather, it is about promoting new technologies and innovations that have the power to create brand new industries or help existing ones move up the value chain by transforming themselves into more advanced, more competitive businesses. It does so by investing in human capital and encouraging cooperation between business, academia, labor and the public sector. As the growth in Finnish GDP per capita shows, these policies have worked.

SINGAPORE

Background

When Britain's Sir Stamford Raffles arrived in 1819, what would become Singapore was no more than a small village of 120 fishermen. But the trading post that Raffles created gradually became an emporium that attracted people from all over Asia and especially from China by offering opportunities for a better life that did not exist in their home countries. Singapore eventually became not only the key entrepot and economic hub of Southeast Asia with over a million people of various ethnic and racial backgrounds, but also Britain's major military base in the region as well. Indeed, so important was it that in his memoirs Winston Churchill described the fall of Singapore to the Japanese in 1942 as perhaps the single most devastating blow of World War II for him.

Although it is located at the tip of the Malay Peninsula, Singapore was long governed by the British as part of the India jurisdiction rather than as part of the colony of Malaya. As preparations were made for the independence of Malaya, however, Singapore became a self-governing territory in 1959 and a certain Lee Kuan Yew was elected as the first governor. At the time, the communist party was very strong and Lee's socialist People's Action Party allied with them to win the election and govern. Once elected, however, Lee moved to isolate and eventually crush the communists. Because its economy was tightly linked to that of Malaya, Singapore joined itself to Malaysia when the former colony became independent in 1963.

However, this proved to be a difficult union. While Singapore was 75 percent ethnically Chinese, Malaysia was 65 percent Malay and was committed to maintaining Malay dominance by means of political and economic measures that were preferential to Malays. Bloody race riots occurred regularly and in August, 1965, Singapore parted from Malaysia and became an independent city-state. With a land area of only 700 square kilometers, a racially and ethnically mixed population of 2 million people who had no sense of identity with a country called Singapore, hostile neighbors who were practicing openly confrontational policies, no natural resources, unemployment of 14 percent, and a per capita GDP of $400, the new nation's prospects did not look good. There were two overriding priorities – security and jobs.

By definition, an independent country is not independent unless it can control its borders and provide security to its citizens. During their rule, the British had recruited mostly men of Malay ethnicity to man the police and security forces. This was in large part because Chinese tended to shun military duty. Indeed, a well known saying at the time was: “hao han bu dang bing, hao tie bud a ding” (a good lad does not become a soldier, good steel does not become nails.). Wise as this may have been, it meant that at its founding as an independent country, Singapore had few security forces and those that were in place were sometimes actually under Malaysian command and often subject to competing loyalties. In view of the “konfrontasi” policy of Indonesia and the strong sentiment among some Malaysian leaders to regain control of Singapore, it was necessary for Singapore to create its own armed forces from scratch. But for this it would be necessary to have assistance from outside since no one in Singapore had any expertise.

While assuring security was the immediate first necessity, the all absorbing passion of Singapore’s leaders for the next forty years was to be jobs and economic development. Indeed, these leaders really saw no difference between security and jobs. In their view there could be no security if there were not enough jobs. They also saw economic development as a way to achieve defensive power through technological and productive superiority. Beyond this, they had the driving passion of the once colonized to prove that Asia could be first world too. In the discussion here, we will discuss the policies, practices, and strategies that enabled Singapore to go from a per capita income of $400 in 1965 to over $30,000 today. But it is very important for the reader to understand that central to everything was the absolute dedication of Lee and his team to take Singapore from the third world to the first—not only to the first, but to the top of the first.

This was their highest priority and anything that was undertaken was undertaken to serve this goal. In short, they wanted to compete and win.

Legacy and Strategy

We have already noted that Singapore’s prospects seemed at first glance to be not very promising. But beside the negatives noted above there was also a list of positives. Location was one of them. Raffles had chosen Singapore for his trading

post because of its deep water port situated at a natural crossroads on the sea route from East Asia to South Asia, the Middle East, Africa, and Europe. In 1965 as globalization was rapidly accelerating, this location was all the more strategic and valuable. Moreover, while it is generally accepted that tropical areas face economic disadvantages because of the greater prevalence of diseases and the need to move more slowly, it is also a fact that proximity to the sea is a huge economic advantage everywhere in the world. So, on balance, Singapore's location was a significant plus.

Nor was it just a matter of the specific geography. As a result of its convenient location, the British had made it a center of processing for imported rubber, tin, and palm oil from neighboring areas. This led to development of ancillary industries such as shipping, insurance, banking, and communications infrastructure. A merchant tradition and the constant flow of peoples of all ethnic backgrounds and religions had created a community with facility for languages and for cross cultural dealings that was alert to opportunity and with energy and the spirit of enterprise. In addition, there was a strong British legacy that included a functioning and relatively high quality civil service, political and legal institutions that upheld the rule of law, and the best schools in the area whose graduates went on to Oxford and Cambridge and came back to form an effective business and government elite. Of course, the English language was a unifying element and the physical infrastructure of roads, communications, port and airport facilities, electric power generation, and water supply were relatively good as befitted the military, commercial, and administrative HQ of the British Empire in Southeast Asia.

But this hub had been cut off from its natural hinterland of Malaya and Indonesia. On the one hand it was totally dependent on the outside world for food, energy, and drinking water. On the other, it was no longer receiving its normal flows of raw materials and semi-processed goods for further processing and onward shipment because Indonesia and Malaysia sought to divert such flows to their own ports and processors. As unemployment climbed toward 14 percent and housing remained in critically short supply, the already militant and communist dominated labor unions became even more confrontational than normal and thousands of work days were lost to strikes and industrial actions. The situation required some completely new "out of the box" solution, and at this moment Dutch economist Dr. Albert Winsemius arrived on the scene to say he had it. Lee

was baffled when Winsemius explained that the government should under no circumstances remove the statue of Stamford Raffles from the center of the city. But Winsemius explained that the solution for Singapore was to attract technical, marketing, managerial, and entrepreneurial know how from America and Europe. Unlike Hong Kong to which many Chinese entrepreneurs and business leaders had fled from Shanghai and elsewhere in mainland China, Singapore did not have these kinds of people and their skills. So the idea was for Singapore to become a kind of manufacturing and export platform for western companies anxious to cut costs by taking advantage of inexpensive labor. But, explained Winsemius, the western leaders would be watching the Raffles statue as a sign of whether the new Singapore government would be friendly to foreign business or out to make anti-colonial nationalistic points. Needless to say, the statue stayed and the new strategy was fully embraced. Indeed, Lee extended it in two key ways.

It was generally believed at the time that multi-national companies (MNCs) would only do labor intensive, low value added work in places like Singapore. But Lee had learned during a sabbatical at Harvard that fast, reliable, and inexpensive air and sea transport made it possible to move any kind of industry to a new location if there were skilled, disciplined workers and a stable, efficient government to facilitate the process. So Singapore's strategy became to attract MNCs that would transfer technology and training and constantly upgrade their operations. Since the Japanese, Hong Kong, and Korean businesses were hesitant about this, Singapore targeted the Americans. Lee noted that Israel had been cut off from its hinterland and had solved the problem by leapfrogging the Arabs to trade and do business with America and Europe. He determined to do likewise. But Lee said he also wanted to go beyond this and do something the Israelis couldn't do because they were at war with their neighbors. He wanted to create a First World oasis in a Third World region. He reasoned that if Singapore could establish First World standards in public and personal security, health, education, telecommunications, transportation, and services, it would become a base camp for entrepreneurs, engineers, managers, and other professionals who had business to do in the region. Lee says in his memoirs: "This meant we had to train our people and equip them to provide First World standards of service. I believed this was possible, that we could re-educate and reorient our people with the help of schools, trade unions, community centers, and social organizations. We had one simple guiding principle for survival: *Singapore had to be more rugged, better organized, and*

more efficient than others in the region. We had to make it possible for investors to operate successfully and profitably in Singapore despite our lack of a domestic market and natural resources."

Economic Development Board (EDB)

To drive this MNC led industrialization and export led strategy, Winsemius suggested the establishment of a one-stop agency so that a potential investor need not deal with a multitude of different administrative bodies. Thus the EDB was established in August, 1961 to take the lead in attracting investment from MNCs and to sort out all of such investor's requirements with regard to things like land, power, water, and environmental and safety needs. To staff the EDB, its first Chairman, Hon Sui Sen, chose an Israeli, E.J. Mayer, to be his first Director. These two leaders were given the choice of the brightest students who had been awarded government scholarships to study at universities abroad and were now returning to begin working in Singapore. Thus the EDB was formed from the beginning to be an elite corps with great esprit that would drive the building of Singapore's future. Eventually, many of this early group rose to rank among Singapore's top leaders. But they began by focusing on four industries recommended by Winsemius – ship-breaking and repair, metal engineering, chemicals, and electrical equipment and appliances.

The first efforts established a pattern. EDB built the Jurong industrial estate which eventually extended to 9,000 acres with roads, sewers, power, gas, and water all laid out. Within the park industrial sites were made available to potential investors for a nominal rent. In addition, investors got tax-free status for five years that was later extended to ten years after 1975. There were also provisions for training labor and for the Singapore government to take equity positions as a partner in the new investments. Of course, financial and other assistance to promote exports was also liberally available. The start was slow. Initially, any investment was welcomed. One early effort was a sawdust plant and another involved fish hooks. Several failed. An important success came in 1967 when Shell Oil committed to establishing a refinery, and then a major break came in October, 1968 when Texas Instruments (TI) agreed to establish a plant to assemble semiconductors and was able to get it up and running within 50 days of making the decision. TI was quickly followed by National Semiconductor, and shortly

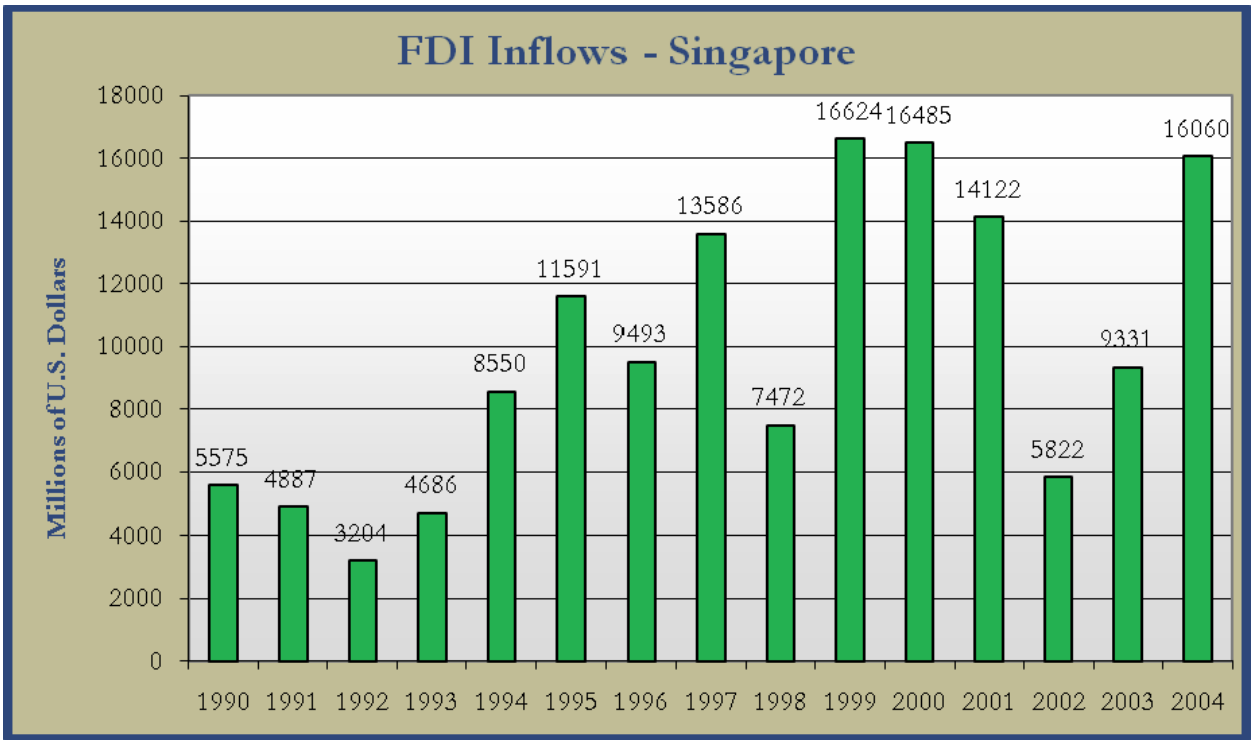
thereafter, Hewlett-Packard joined the party as well. From here it was all downhill. In the 1970s GE set up six different facilities and became Singapore's largest employer. When British forces finally left Singapore in 1971 (after a sojourn of 152 years), 70,000 people who depended for work directly or indirectly on the British bases lost their jobs. Yet unemployment did not rise because these workers were immediately soaked up by the booming U.S. MNCs. Singapore had taken off.

(Little things can mean a lot: In his memoirs, Lee Kuan Yew notes that the CEOs of companies considering investment in Singapore would often visit him. He recounts that he thought the best way to convince them to invest was to ensure that the roads from the airport to their hotels and to his office were neat and lined with shrubs and trees. Said Lee, "without a word being said they would know that Singaporeans were competent, disciplined, and reliable, a people who would learn the skills required soon enough.")

Thus by the early 1970s the challenge was no longer jobs, but what kind of jobs. EDB began to become selective about the kinds of MNCs and investment it sought to attract. From about 1973 to the early 1980s, the theme was *technological catch-up,* and the focus was on attracting investment from skill and technology intensive sectors such as electronics, pharmaceuticals, computers, precision engineering, and other industries that generated higher value-added per worker. In addition to the provision of ready-made industrial infrastructure, the main incentives were targeted exemptions from taxes on profits on specific investments or on income streams from certain products or from exports. Also very important was the establishment of state subsidized training centers that were operated jointly with the MNCs to build engineering and other skills.

As wage levels increased in the 1980s, EDB focused increasingly on capital intensive production such as semiconductor wafers and petro-chemicals. After the recession of 1985 revealed the danger of over concentration in a few industries, there was also an emphasis on diversification into such things as air transportation, logistics, bio-technology, R&D facilities, and attraction of corporate regional headquarters. This move toward a more technology and knowledge-intensive economy continued through the 1990s. Significantly, Singapore and EDB did not abandon or acquiesce in the off-shoring of older

production. Rather, great effort was made to upgrade production and to move from mere production to complex production, design, R&D, and to overall logistics management. Thus, Singapore remains today the largest disk drive manufacturing country despite having much higher wage levels than other competing countries. The logical extension of this trend since 2000 has been to drive toward an *integrated innovation economy* based on what is known as the CORE strategy.



One cannot speak with a high ranking Singapore official or businessperson today without hearing the acronym CORE that summarizes the key elements of Singapore's current strategy. They are: Connectivity – Openness – Reliability – Enterprise.

Singapore aims to maintain itself as the key connecting hub in Asia. The 27 million containers handled annually by the Port of Singapore make it the world's busiest port and dwarf the 10 million handled by Rotterdam. An example of the combination of the four elements is the fact that Australian producers ship ice cream to Japan via Singapore. Singapore has also become a major gateway to India because it can get cargo to destinations in India faster than Indian ports. Singapore also clears 2,000 flights a week through Changi Airport to 50 cities in

China and has a total Internet bandwidth of 26 terabits per second. While maintaining its legendary openness and reliability, Singapore is fostering development of venture capital groups while also trying to attract such groups from abroad. It is aiming to establish clusters that will promote innovation but that will also focus on integrating the entire value chain. Since technologies are converging, Singapore is providing inter-cluster linkage. Thus, the electronics cluster is closely linked to the plastics cluster. The iPod is produced here and, of course, combines plastic packaging with electronics. Other areas of opportunity and focus include, making Singapore a center of business education, software development, water treatment, advanced medical care, and interactive media activity. Firms like Lucasfilm, for example, have been among recent investors and are expected to generate 3 percent of GDP by 2018. There is also an effort underway to make Singapore into the regional hub for private banking, tourism, marketing, and biomedical analysis.

To accomplish this, EDB has a high quality staff, recruited from among the top students who are awarded government scholarships to study at prestigious foreign universities. These students return after graduation to serve in the elite government agencies. Although formally a division of the Ministry of Finance, EDB has an independent budget and makes independent investment decisions. Its 19 foreign offices act as a kind of super commercial diplomatic corps constantly scanning the business landscape for attractive companies and technologies to be attracted to Singapore.

GLCs, Temasek, and GIC

The main thrust of Singapore's get rich strategy was to industrialize and move up the scale of skill and value added by persuading MNCs to transfer production, development, and eventually R&D to the island city state. The main agency driving the export led growth strategy was, of course, the EDB. But its work would not have been successful without the support of a myriad of other agencies and policies that coordinated and integrated with work with that of EDB so that Singapore presented the most attractive complete package.

But the development of Singapore has not been entirely a matter of inducing foreign MNCs to invest. EDB also spawned a large number of indigenous enterprises. Thus National Iron and Steel Mills, Neptune Orient shipping lines,

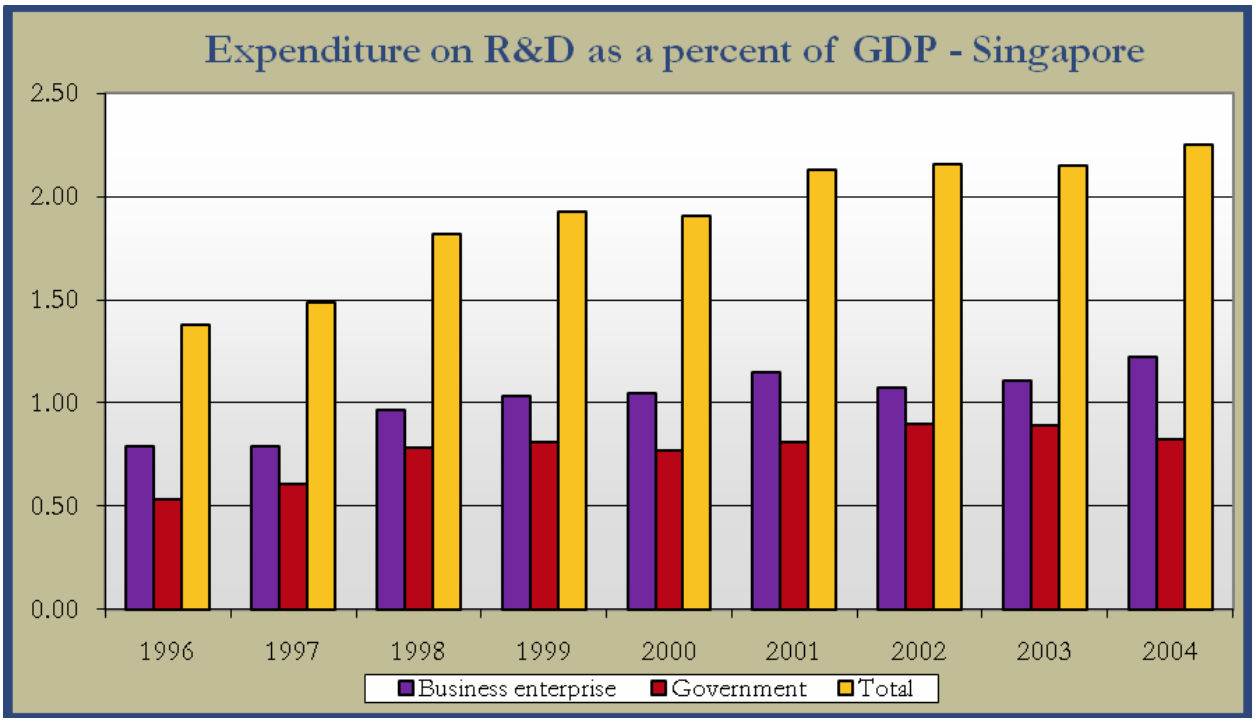
Singapore Airlines, Singapore Petroleum Corp., Singapore Technologies, Insurance Corporation of Singapore, SingTel, and other corporations were established by the government. But the model was strictly a commercial one. These entities were not founded to be government subsidized enterprises, but were founded for purposes of making a profit. If they did not, they were shut down. So the EDB provided seed money – often through the Development Bank of Singapore (DBS) which was then a part of EDB but later became an independent bank - but no long term subsidies. Eventually, many of these enterprises such as Singapore Airlines sold shares to the public and so became Government Linked Corporations (GLCs), but not wholly government owned corporations.

Eventually Temasek Holdings was created 1974 as an independent but government linked investment management firm to manage the government investments in these entities that EDB and DBS no longer wished to manage directly. As a result of the great success of many of these companies over the years, Temasek now manages a portfolio of 129 billion (US$ 80 billion). The group has a board of 12 members of whom one is from the government. It is self-funding and earns 18 percent on equity with its investments being one third in Singapore, one third in the OECD area, and one third elsewhere in Asia and in emerging markets. Not to be confused with Temasek, is the Government Investment Corporation of Singapore (GICS) created in 1981 as Singapore's budget and trade surpluses were creating enormous reserves that needed to be professionally invested. Whereas Temasek invests heavily in equities, GICS favors U.S. Treasury bonds, real estate, and some equities.

RIEC, NRF, ASTAR

Although it has a great deal of independence, EDB is not autonomous. Overall guidance for the new innovation economy is developed in the Research, Innovation, and Enterprise Council (RIEC) which is chaired by the Prime Minister and includes all key Ministers as well as important academic and business leaders including non-Singaporean leaders of MNCs with operations in Singapore. The purpose of this body is to advise the government and set guidelines for Singapore's research and development policies and strategies for transformation into a knowledge intensive, innovation economy.

Linked to this body is the newly formed National Research Foundation which is located in the Prime Minister's office and acts as the secretariat for the RIEC. Its job is to coordinate and integrate the activities of the different research activities in order to provide a coherent strategic overview of R&D activities and strategies. It also has a budget of about $3 billion over the next three years and thus evaluates proposals and monitors project progress. About one third of R&D spending in Singapore is government funded and two thirds is privately funded, but the government has a significant impact on the whole. Closely related to the NRF is the Advanced Science and Technology Administration (ASTAR). Formerly known as the National Science and Technology Board, it is charged with raising the level of science and technology by fostering world class research in specific areas. It operates as a semi-independent agency of the Ministry of Trade and Industry and is responsible for implementing Singapore's National Science and Technology Plan.

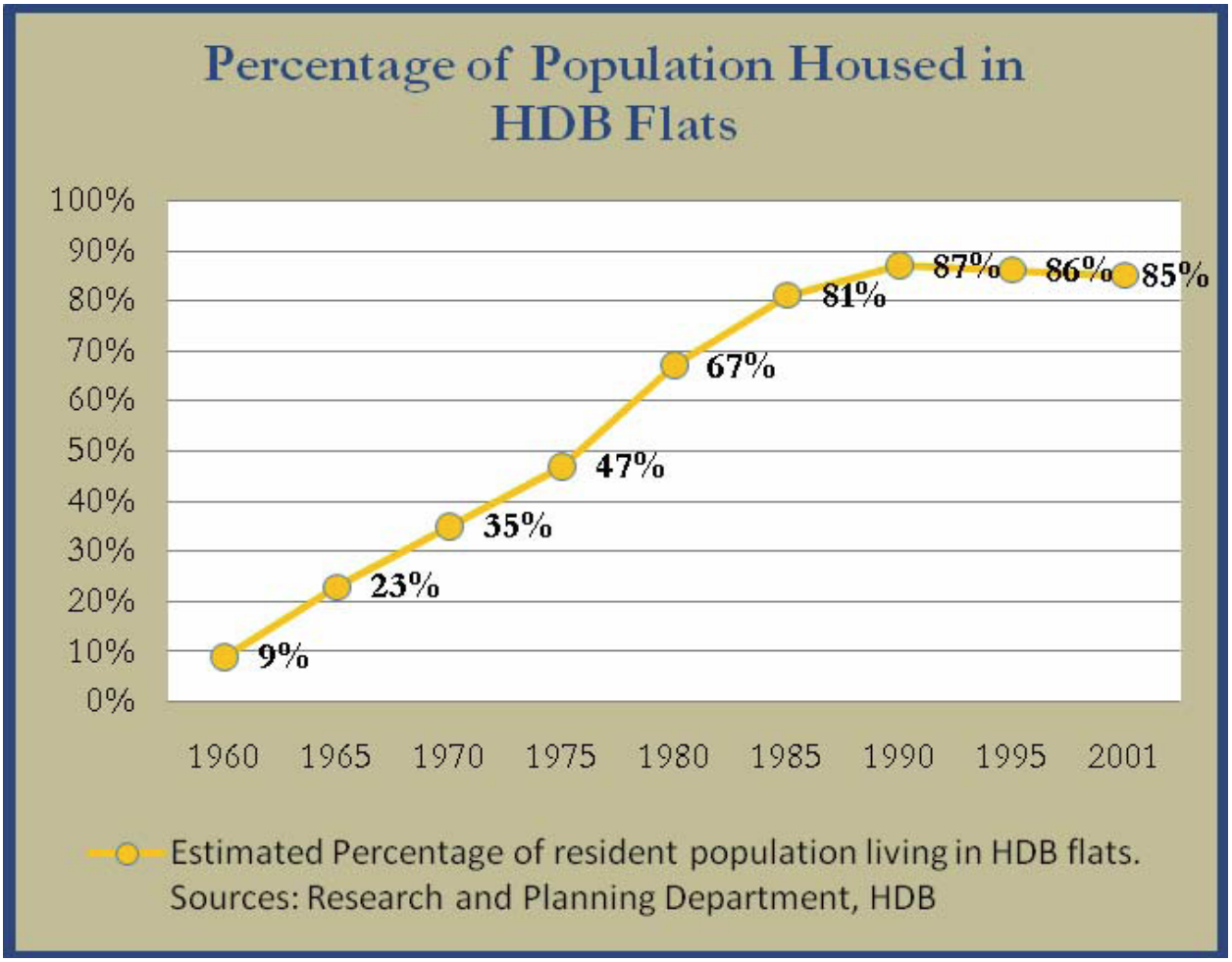


Singapore now spends about 2.3% of GDP on civilian R&D and another .5% on military R&D. The goal is to raise total R&D spending to 3% of GDP by 2010. It should be remembered, however, that Singapore also benefits enormously from the R&D spending of the MNCs who have put major operations in the city state.

Thus, the effective R&D spending for Singapore is probably more like 4-5 % of GDP.

Housing Development Board (HDB)

Before there was an EDB, there was an HDB. In 1965, housing in Singapore was crowded or non-existent. It was common for five families to share a house. Lack of adequate housing was one of the important factors driving unrest and ethnic tension at the time. Lee feared that citizens without an ownership stake in the society would not be politically stable nor would they feel a commitment to defend the society. He therefore made providing better housing and fostering home ownership top priorities from the beginning. The Housing Development board was established to build low cost housing for workers. Laws were also passed allowing the government to buy land at about a third of its market value on the grounds that private land owners should not profit from the increase in value due to publicly funded investments and policies. In time, the government of Singapore came to own about 80 % of the country's land. In conjunction with HDB home building, the Central Provident Fund which had been started by the British as a simple retirement vehicle was expanded into a compulsory savings scheme that would enable every worker to own his own home. The contribution rate to the Fund was gradually raised from 5% of wages (matched by 5% from the employer) to 25% (also matched by the employer). With vast amounts of money going into the fund, it could be used not only for retirement but also to pay for a home down payment. Today, over 93 % of Singaporeans own their homes and about 80 percent are HDB homes. Beyond this success, the HDB was also successful in that it served as the model for the later creation of the EDB.



Society

Long a British colony and born as the result of bloody race riots, Singapore initially had little national identity. Although about three fourths of its population was ethnically Chinese, there were divisions of dialect and regional origin among them. Moreover, the remaining fourth of the population was of Malay and Indian extraction and was not at all integrated into the Chinese society. Indeed, the various ethnic groups lived in their own distinct sections of the city and even tended to work in distinctly separate occupations. To have any chance at creating their First World Oasis in Southeast Asia, Lee and his colleagues had to forge a national identity and social cohesion such that all Singaporeans would feel and act as if they were on the same team. Several policies were of key importance in achieving this.

The first was the decision to promote English as the common language of the Singapore community. This was Lee's decision and he drove it through steadily but not by decree. In fact, by law Singapore had four official languages – Tamil, Mandarin, Malay, and English. But the key decision was to introduce the teaching of English in the Tamil, Mandarin, and Malay schools while also having the other languages taught in the English schools. Because English was the language of business, many parents began to favor sending their children to the English schools. This created a reaction in parts of the Chinese community which began a movement in the Chinese Chamber of Commerce to push Mandarin as the dominant language. This effort gained momentum when it was supported by some of the Chinese language press and universities. Lee faced them all down and continued gradually to shift most of the instruction in the universities to English. His main point was that there could not be ethnic and racial harmony if one of the ethnic languages was dominant. English was, in this sense, a neutral language and therefore acceptable to all. That it was also the language of globalization was an added plus, but not the main reason for adopting it.

The HDB was also a powerful integrator and forger of the new Singapore society. Legislation was adopted stipulating that all public housing developments should reflect the national ethnic balance of Singapore in their local population. Since Singapore was about 75 percent Chinese, 15 percent Malay, and 10 percent Indian, all public housing had to have similar proportions among its residents. Over time, this obliterated the ethnic ghettos and helped create a sense of national and societal identity.

Military service was another great leveling and integrating force. All Singapore men were required to do two years of military service, and this reinforced the need for English as the common language while serving to throw the ethnic groups together on completely common ground.

The final factor was the building of Singapore as a meritocratic society. Critics sometimes argue that Singapore puts too much faith in tests and bureaucracy and there may be some truth to the point. But making entrance to schools, government jobs, and other public institutions conditional only on merit rather than family or political connections has been an absolutely essential element in forging a society of which everyone feels a part. Today, Singapore has built a high

level of religious and ethnic harmony. Its low criminality has not only resulted in a very small prison population but in a high level of personal safety. A high level of social cohesion prevails with a strong sense of Singaporean identity and, of course, a high level of prosperity and opportunity.

At the same time Singaporeans score only #23 on the Satisfaction with your Life index and there is undoubtedly a substantial degree of anxiety among children about less than perfect school grades. More concretely, inequality among Singaporeans as measured by the Gini index is relatively high compared to other countries in this benchmarking exercise. This index score has actually worsened in recent years after improving markedly for a long time. The reason has to do with the bursting of the Internet bubble in 2000 and the ensuing recession as well as with the affects of globalization and the entry into the world economy of the three billion new participants from China, India, and the former Soviet Union. Singapore's lack of a welfare system, of course, means there is no mechanism to smooth out this phenomenon.

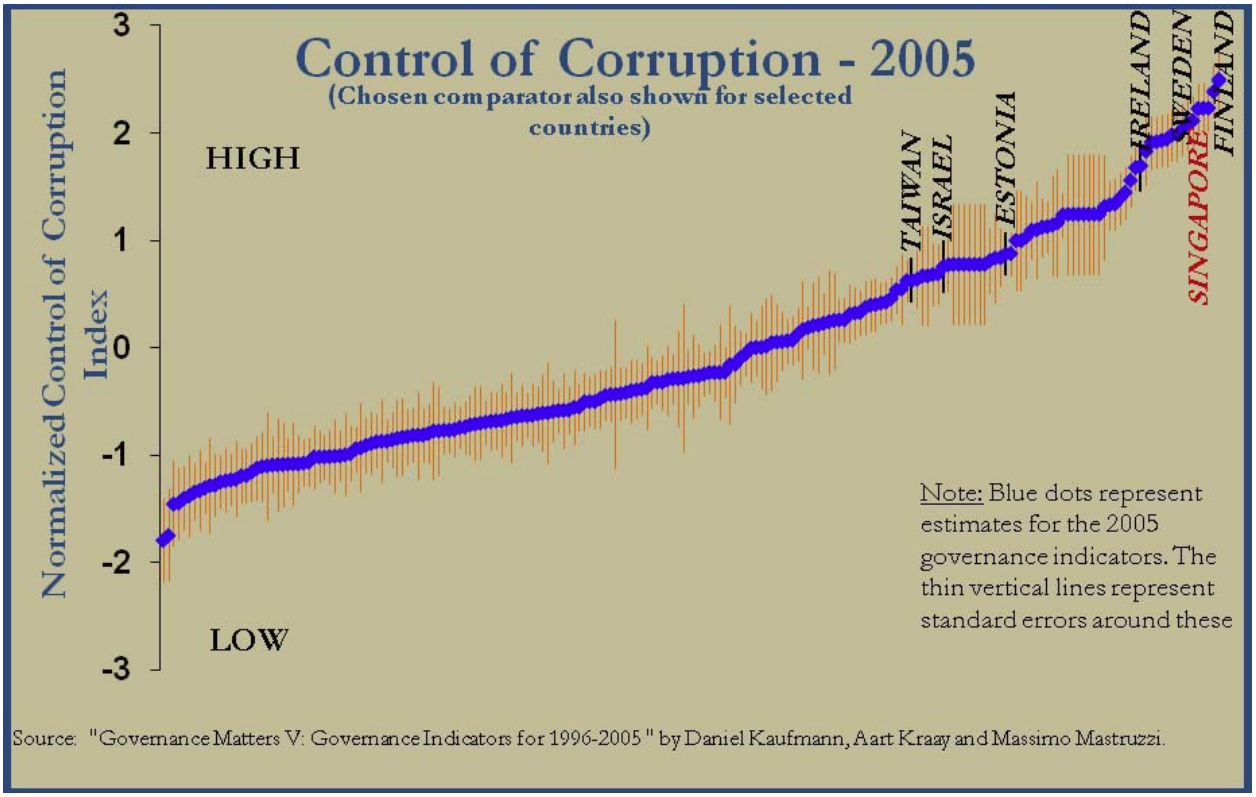
One way in which Singapore is being very creative is in its response to declining birth rates and aging of the population. On the one hand, the government has undertaken to play matchmaker and to encourage Singaporeans to marry and to have more children. On the other hand, it has also begun to promote immigration. Of course there has always been and will always be a large force of foreigners who work as maids and menial laborers. They are on temporary work permits and come and go as demand for labor requires. But in addition to these, the government is now actively promoting immigration of highly skilled people who will come to Singapore and take up residency and eventually citizenship. The objective here is to make Singapore something like the London or the New York of Southeast Asia in terms of attracting talent and youth. This in itself must count as quite entrepreneurial and creative.

Governance

Closely related to creating a meritocratic society is the removal of corruption. Corruption had been a bit of a problem in Singapore prior to 1959. When Lee and his colleagues took office then, they wore white shirts and slacks to symbolize their commitment to purity and honesty in the public service. The old colonial Corrupt Practices Investigation Bureau was strengthened and the anti-corruption

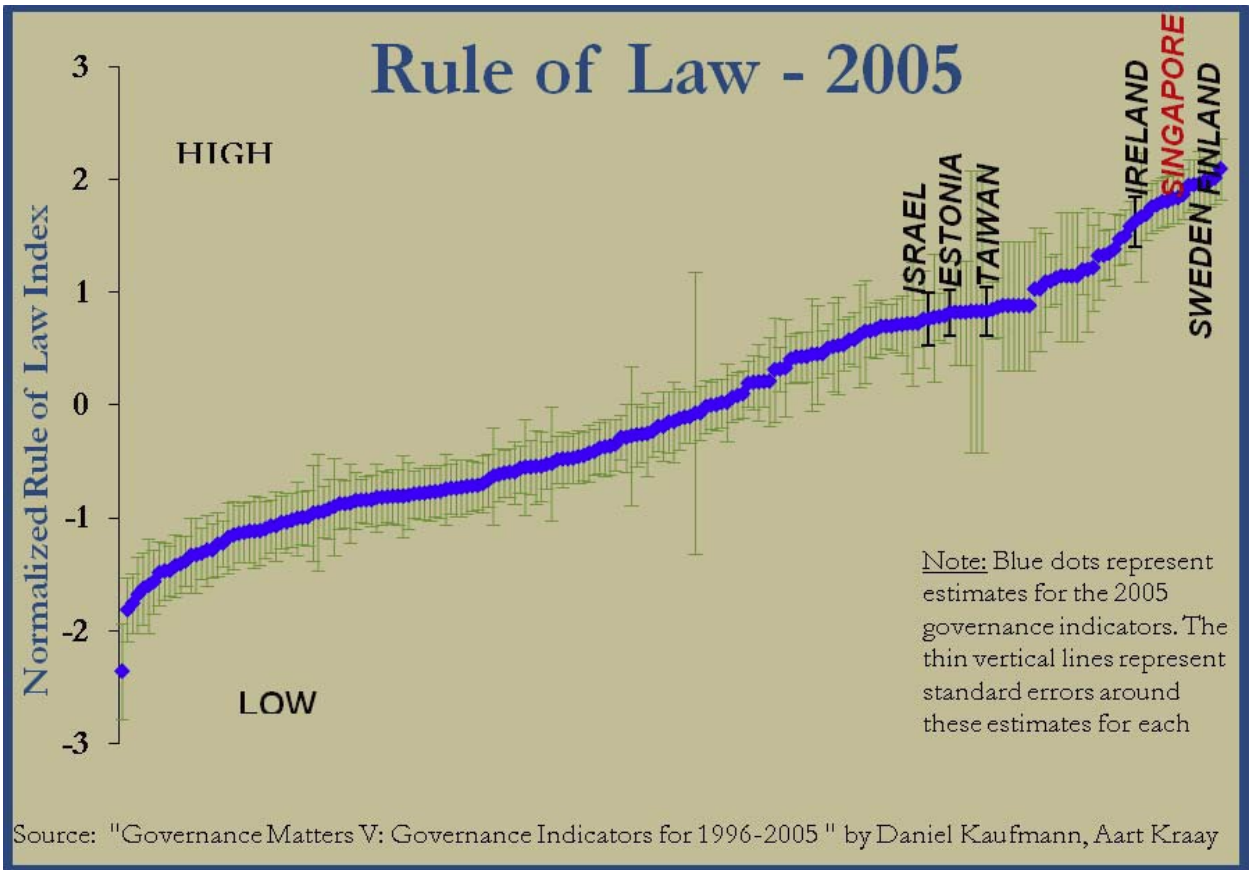
law was broadened to make anything of value illegal as a gratuity. At the same time, the need for permits and approvals was dramatically reduced so as to remove discretionary procedures that could give rise to pay-offs in the first place. A major campaign was launched to go after the biggest offenders. Here the key to success was a new law that allowed the courts to treat proof that an accused was living beyond his means as evidence of having accepted bribes. With this law and the advantage of working out of the Prime Minister's office, the head of the CPIB had great success. High profile cases against ministers implicated in corruption in the early decades made it clear that no one was beyond the reach of the anti-corruption police. Further, any civil servant convicted of corruption not only lost his or her government job and pension benefits, but also risked being unable to find a job in the private sector.

At the same time efforts were made to reduce the circumstances that tend to lead to corruption. Use of market pricing, publication of clear guidelines, and use of merit based procedures for recruitment and promotion all militate against corruption. In particular, elections in Asia are notoriously oiled by freely flowing money. For example, to be elected to Taiwan's legislature some candidates have spent as much as $20 million and in Japan an ordinary legislator has a huge need for cash to send the expected birthday, wedding, and anniversary gifts to constituents. Singapore attacked this problem by making voting compulsory and prohibiting the practice of using cars to take voters to the polls. In other words, getting money out of politics made for clean government. As a result, Singapore is consistently rated among the least corrupt countries in the various competitiveness indexes.



Part of Singapore's high quality of governance is a result of their high quality civil service. From the beginning Singapore has been noted for the high quality of its civil service. Entrance is, of course, by examination. Public service enjoys high status in Singapore and the government encourages good students to try to join the civil service, in part by awarding scholarships for foreign study to such students. Because civil servants can also ascend into the top ranks of the government and become leading ministers or heads of key business entities and, further, can actually effect change, there is a high sense of mission and esprit de corps. A final key element is remuneration. Singapore has always tried to pay its civil servants well, but in 1995 it adopted a law, originally suggested by Lee, that links civil servant pay to pay scales in private industry. As a result, top Singapore officials are as well paid as top CEOs and it is not uncommon for salaries to amount to $1 million or more annually. Thus it is not surprising that the Singapore government is staffed by the brightest and best who in other countries might be investment bankers, trial lawyers, or corporate CEOs. In addition to being of high quality, these bureaucrats also work extremely closely together. They serve with one another on the boards of the GLCs and the research and other institutes and form an integrated web that greatly facilitates coordination, planning, and implementation of policies and procedures.

The rule of law is the bedrock of the Singaporean system. Without equality before the law, the various ethnic groups could not have forged a common identity nor could the country have enjoyed the great economic success it achieved. Formally, rule of law consists of the enforceability of contracts, the effectiveness and predictability of the judiciary, and the incidence of crime. Singapore has one of the world's lowest incidences of crime and contracts are definitely enforceable. The key is the judiciary. Singapore has worked very hard to establish quick and fair justice and has largely succeeded. In fact, its reputation is such that the World Bank holds it up as an example and international rankings put it ahead of the United States and the United Kingdom.



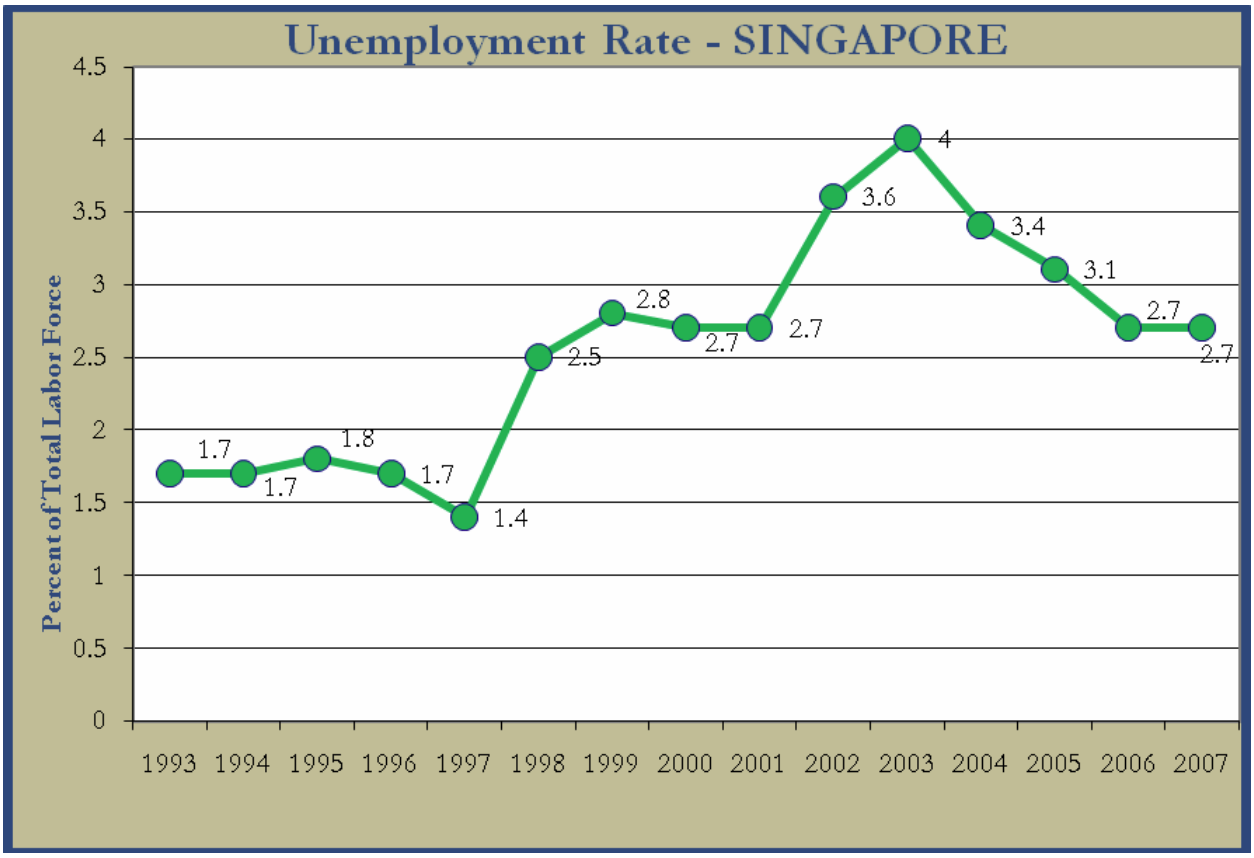
Labor

Singapore inherited its labor unions and their practices and attitudes from Great Britain and in addition they were dominated by communist leadership. Between 1947 and the early 1960s there were continuous strikes and labor actions. Between July 1961 and September 1962 alone there were 153 strikes. Moreover, the demands of labor were unrelated to the circumstances of the economy or the conditions of the enterprises. Labor laws and agreements had begun to warp real economic activity. For example, sanitation workers were paid triple time on holidays and so began to avoid picking up garbage weeks preceding holidays in order to collect the extra time. Ironically, Lee had made his reputation as a labor lawyer and was partly responsible for some of the egregious practices. That was then and this was now, however. By 1969 there were no work stoppages. How did that happen?

The key was a confrontation with the sanitation workers who called for a strike over the New Year holiday. Lee referred the matter to the Arbitration Board which automatically made any strike illegal during the arbitration period. It was a technicality, however, and the union went ahead with the strike. Lee had the union leaders arrested, the courts ruled that the workers had sacked themselves and would have to reapply for their jobs, and the union was deregistered. While the move was perhaps heavy-handed, it did set Singapore on the path to more efficient labor relations by eventually eliminating workdays lost to strikes.

In 1968, a series of legislative acts placed limits on retrenchment benefits, overtime bonuses, and fringe benefits. They also restored to management the right to hire and fire and to promote and transfer while also making it illegal for a union to take an industrial action without a secret ballot and banning strikes altogether in certain public service sectors. In 1972 the National Wages Council (NWC) was established with representatives from the National Trade Unions Council (NTUC), management, and the government to set wage guidelines annually on the basis of economic conditions. Essentially all agreed that wage increases should not exceed productivity gains. In this context it should be noted that the Secretary General of the NTUC has long also been a government cabinet Minister and several Presidents of Singapore have been former labor officials or members of parliament who have been close to labor. In effect, Lee used his own

former labor background to shape the Unions to become a force for competitiveness. In 1982 a major step was taken when the then NTUC secretary-general initiated the change from industrial to company (or "house") unions. This shift was completed in 1984. To show how far things have come, it was the unions who volunteered a wage cut of 15 percent in the wake of the Asian financial crisis of 1997-98 in order to enable Singapore to regain competitiveness.



Singapore has no minimum wage and there is no formal unemployment benefit system. While there are some supports for workers in really dire straits, the system is essentially one of "no work, no pay." Thus workers are encouraged to take lower paying jobs rather than wait if they happen to lose their normal employment. There are no job guarantees at the time of hiring and payments in the event of dismissal are limited. However, there is an extensive system of training and retraining programs and an elaborate program of skills identification and skills recognition. This approach eliminates major unemployment problems

by closely monitoring the needs of the companies that function in Singapore and helping tailor the workforce to meet those needs. The result of this along with strong economic growth is an unemployment rate of about 2.7 percent and an unparalleled record of real wage increases over 40 years.

Health and Welfare

Singapore's slogan is "A fair, not welfare, society." There is no welfare as such. Destitute people may receive some assistance but only after strict means testing that includes family members and only on a very limited basis. Social security and welfare spending amounted to less than 1 percent of GDP between 1990 and 2001 compared to 13 percent for the typical OECD country. Such spending as exists is mostly in the form of incentives to work. Thus the government will top up the salaries of older low-income people who work at least part of the year. The government also looks upon its housing, education, retraining, and healthcare programs as a type of welfare. In addition, taxes are relatively low and the government will pay dividends to all citizens when it profits from taking a GLC public or from other activities. So this is seen as a kind of repayment system that does not entail entitlements and built-in high costs.

The key to the whole system is the Central Provident Fund into which workers now (these rates move around from time to time) pay about 20 percent of their income to be matched by an employer contribution of 13 percent. These are compulsory contributions that also largely explain Singapore's high savings rate. The system began as a retirement scheme, but, as we have seen, became also a housing scheme and later also formed the basis for covering costs of essential health care. As a retirement scheme it is, of course, a defined contribution system. The CPF pays 2.4 percent interest, but individuals are permitted to take some of the money above designated floor levels for private management if they so desire. To date such private management has not beaten the CPF returns. With an aging population, Singapore may face pressure on the fund in the future, but for now retirement payments seem to be comparable to other advanced countries.

The really interesting part is the health care aspect of the CPF. Singapore has an average life span longer than that of the United States but spends about 4.5 percent of GDP on health care as opposed to the 12-14 percent of the United States and other OECD countries. To achieve this, Singapore puts a high priority on prevention of diseases such as HIV, malaria, AIDS, and tobacco related diseases. Government hospitals and clinics provide a very basic healthcare service subject to tight expenditure control. This care is 80 percent subsidized from the government budget. Major use of Information technology dramatically improves efficiency by giving doctors and hospitals instant access to all medical records while reducing the number of necessary clerical staff. Use of expensive tools and drugs is subject to an elaborate system of screens if it is at public expense. Public wards are subsidized by 80 percent, but if a patient wants more privacy he or she must pay for it. An optional low cost program is available to cover catastrophic illness and Medifund provides a minimal safety net for the truly needy. But personal and immediate family responsibility is the fundamental principle. Individuals pre-save through the CPF and may also buy private insurance. Only pre-approved treatments can be deducted from the CPF Medisave account and consultations with private doctors must be paid out of pocket in cash. The state mandates publication of private hospital tariffs to facilitate comparison shopping.

Education

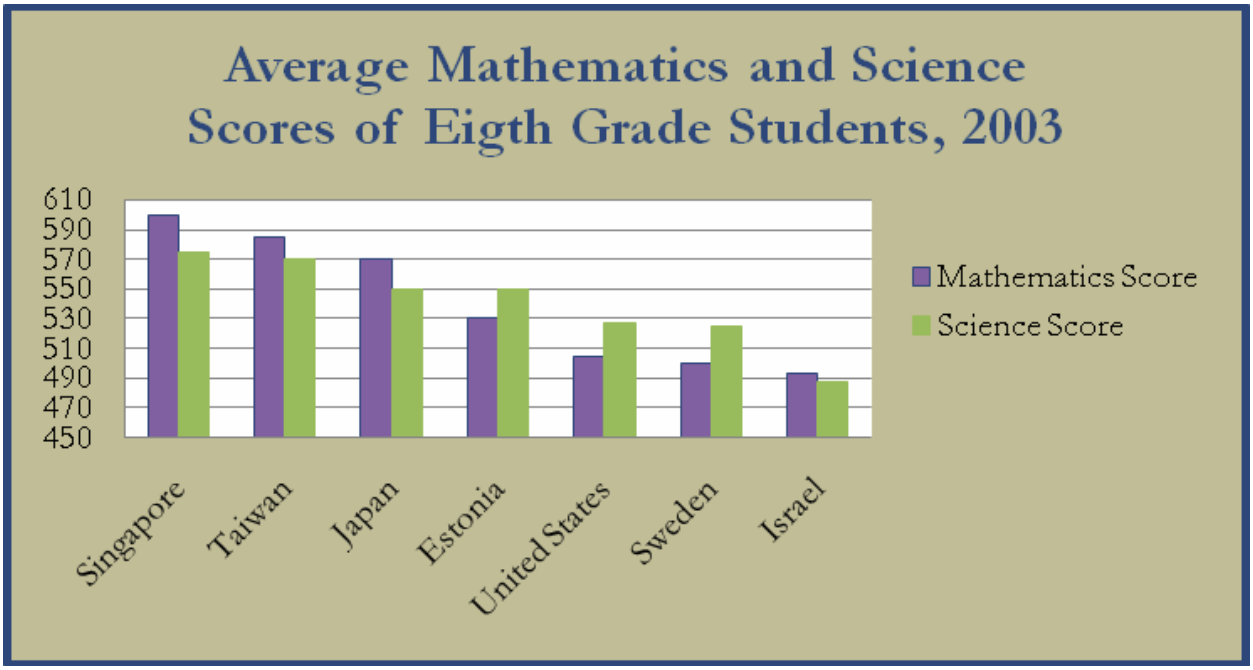
In recent years, Singapore students have been prominent by scoring at the top in comparative international testing. Their performance is especially impressive in science and mathematics. This, however, was not always the case. In 1960 most Singaporeans had little or no education. Schooling was not compulsory and illiteracy was widespread. There was an acute shortage of teachers. One of the first steps of Lee's self-government regime in 1960 was to found a teacher's college and to begin a crash education program by scheduling double sessions so that school went from 7 a.m. till noon and then from 1 p.m. till 6:30 p.m. School rooms were crammed with 55 in a class. Between 1960 and 1965 enrollment doubled. The initial objective was to teach basic skills and large education and training grants and subsidies were made available. Indeed, the prospect of advancement through education was one of the major factors influencing organized labor to moderate its militancy.

Until the mid-1980s, the focus was very much on turning out the skilled technicians and artisans then in great demand in Singapore's booming industrial economy. Efforts were made to avoid turning out unemployable white-collar graduates. Access to various types of education was by examination and strictly merit based. Students were tested often and channeled into areas according to their capabilities with emphasis on engineering and accounting. Only about 10 percent of students went on to tertiary education at polytechnical schools and universities.

From 1985 onward, however, as attempts were made to broaden the economic base so also was there a push to broaden and heighten education. Today, over half of all students eventually go on to university or tertiary polytechnic training. The emphasis, however, is still very much on science and engineering with a majority of students enrolled in those disciplines. The education system continues to be closely integrated with industrial policy so that people have the skills being demanded by the direction of economic development.

The school system is run on a centralized basis with strict curriculum control. There is little variation in school quality from neighborhood to neighborhood and children are permitted to attend the school of their preference depending on their ability to pass the entrance exams. There are special magnet schools that train an elite university bound student body, but there are also opportunities for students in less elite schools to shift to the magnet schools and also to enter the universities based on examination.

Singapore math and science scores are exceptional internationally and Singapore Math has become a kind of international trade mark.

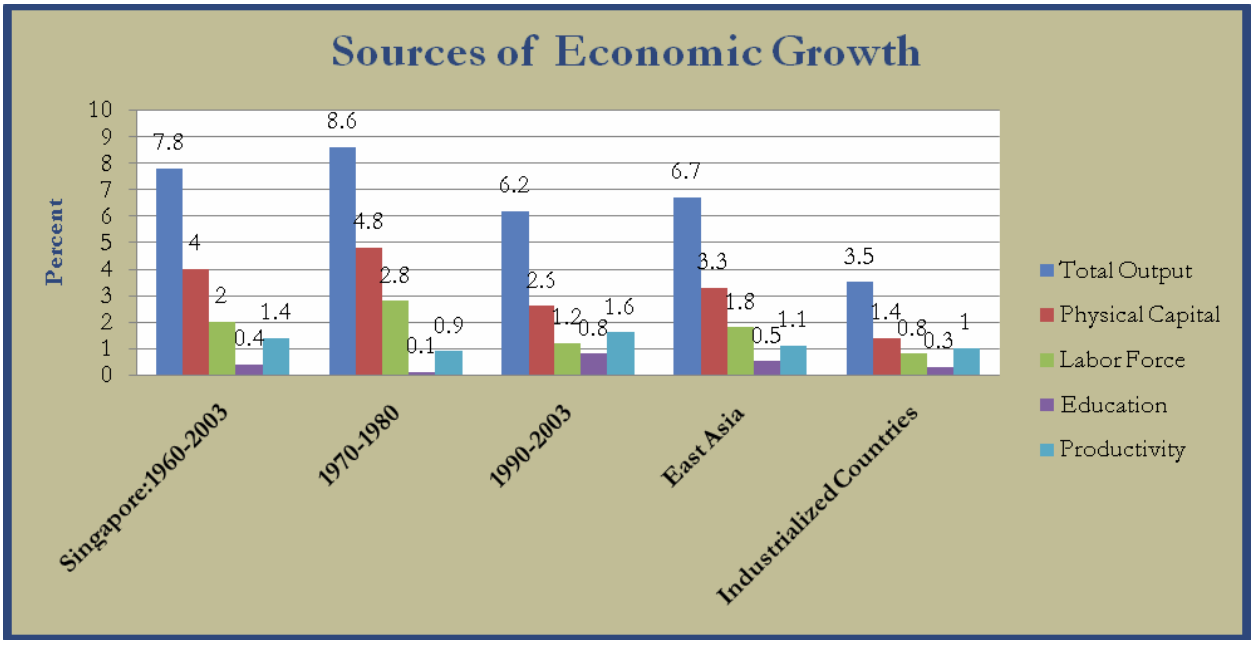


One result is that Singapore ranks third among nations in number of researchers in R&D per million people. Behind this lies the fact that Singapore students have more computers and math and science tools available to them both at school and at home than those in most other countries.

The increasingly critical role of education can be seen in an analysis of the sources of Singapore's growth. In the years until 1980 it contributed only about .1 percentage points of the country's 8.6 percentage points of annual growth. Since 1990, however, this has risen to .8 percentage points of the 6.2 points of annual growth or just under one sixth of the total.

At this moment, it is fair to say that Singapore ranks very near the top of all countries in the quality and breadth of its educational system and particularly in the fit between the needs of its economy and the skills of the work force. One criticism that has been made is that curriculum is too strictly defined and that the system focuses on rote learning and not enough on fostering creative thought. In response, since the late 1990s, the government has been revising the curriculum to emphasize problem solving and creative thinking and has also been sending students specifically to Silicon Valley to intern with Venture Capital firms and start-up companies.

Of particular significance is the way Singapore has handled education of its different ethnic groups. Chinese students have historically scored higher and finished more years of education than their Malay or Indian classmates. But the government has made a concerted effort to involve the families and communities and to make extra effort to improve the performance of the lagging groups and has achieved great success in doing so. So much so that, although they still lag their Chinese classmates, the Singaporean Indian and Malay students far outscore American and many European students on the international tests.

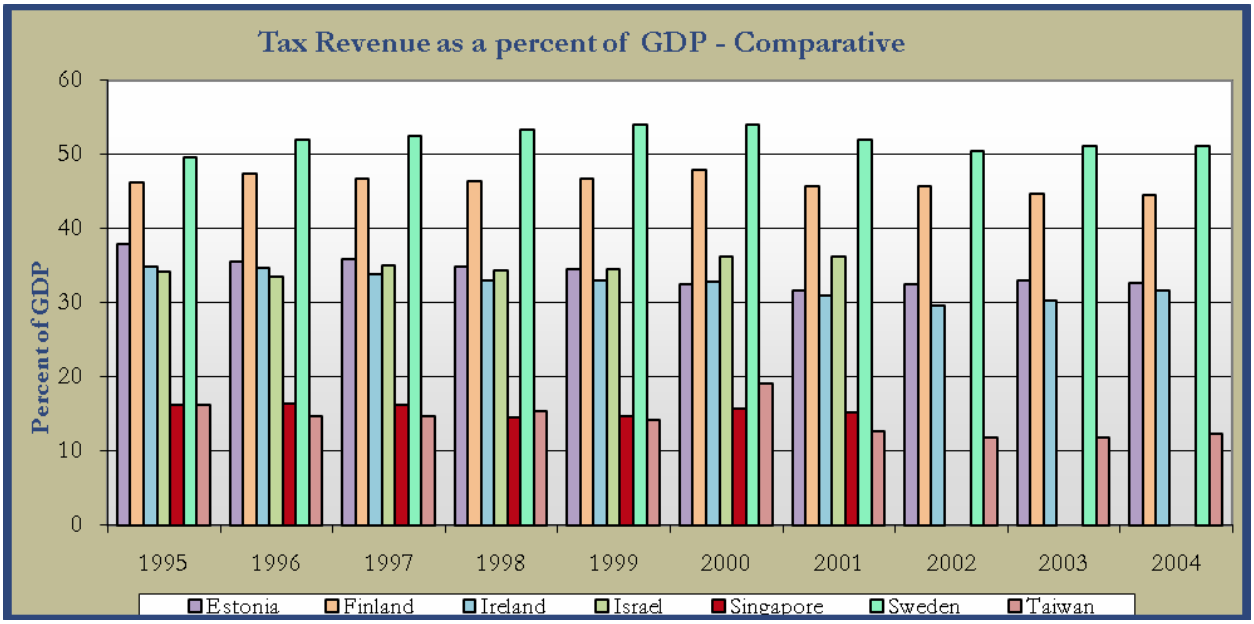


Fiscal and Monetary Strategy

Singapore aims to balance its budget annually, and, in fact, has had an annual budget surplus since the 1960s with the exception of the recession years of 1985-87. Since 1990, the surplus has averaged about 10.6 percent of GDP annually thereby providing a substantial portion of Singapore's savings which is used to invest in infrastructure, housing, and human capital formation. The objective has been to finance both operating and development expenditures out of current revenue while remaining internationally competitive regarding tax structure. This approach has made public debt negligible and thus reduced government interest payments to virtually zero.

We have already seen that Singapore spends less than 1 percent of GDP on social security and welfare compared to 13 percent for the typical OECD country and only about 1.2 percent on healthcare as compared to the OECD average of about 6.4 percent. As a result, even though defense spending is a relatively high 5 percent of GDP, current government expenditure between 1990-2001 amounted to only 14 percent of GDP versus 35 percent in the median OECD country. Against this, total government revenue was about the same as the OECD average at 33 percent of GDP. What is really striking, however, is that revenue from taxes was only 16 percent of GDP as opposed to the OECD median of 31 percent. Singapore obtained revenue of 17 percent of GDP as non tax revenue from government enterprises, lease of land, road use fees, and interest and dividends on government investment. This, of course, was possible because constant budget surpluses have left Singapore with net assets of about 120 percent of GDP.

The really powerful thing is that Singapore has been able to generate this exceptionally strong financial position while dramatically lowering taxes. The top marginal rate on personal income has been lowered from 55 percent in 1965 to 20 percent today while the 40 percent corporate tax rate was also lowered to 20 percent with, as we have seen, much lower rates for certain designated cases. Some of this revenue loss has, of course, been compensated for by a 3 percent goods and services tax (kind of a VAT) and by the road user and other user fees. On the other hand there is no capital gains tax or estate tax, and the overall tax environment remains extremely attractive and competitive.



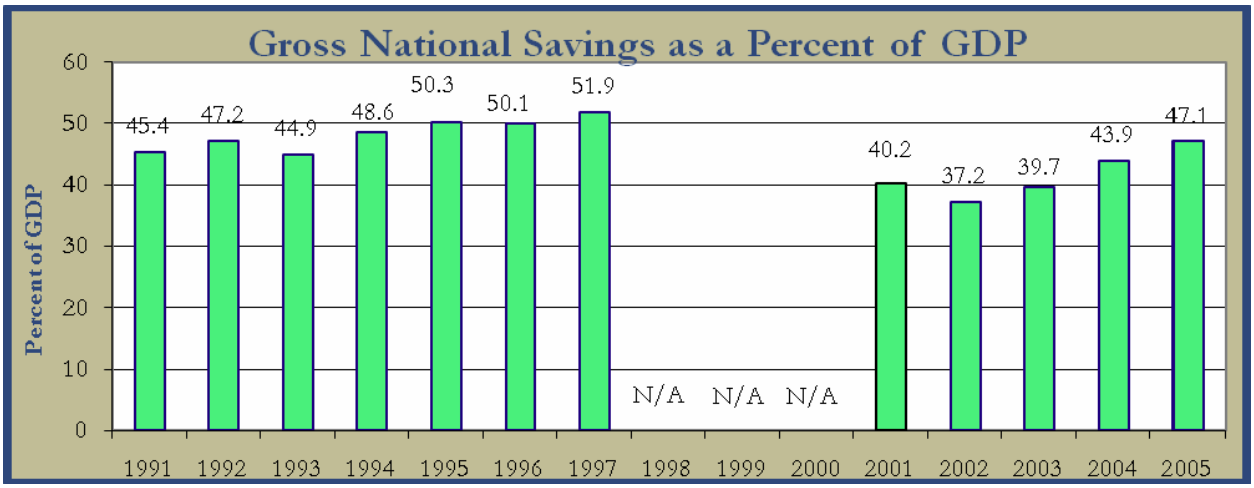
Monetary policy has been equally non-inflationary, with a 3 percent average inflation rate from 1964 to 2004. For most of its history the Monetary Authority of Singapore did not issue currency and operated under a currency board arrangement. In recent years it has begun to issue its own currency but policy has been extremely conservative and anti-inflationary. Of very great importance is exchange rate policy. Here, Singapore engages in currency management or a kind of dirty float both to stabilize its currency and to assure that the Singapore Dollar does not rise enough in value against the U.S. dollar to endanger Singapore's export led growth strategy by making Singapore exports more costly.

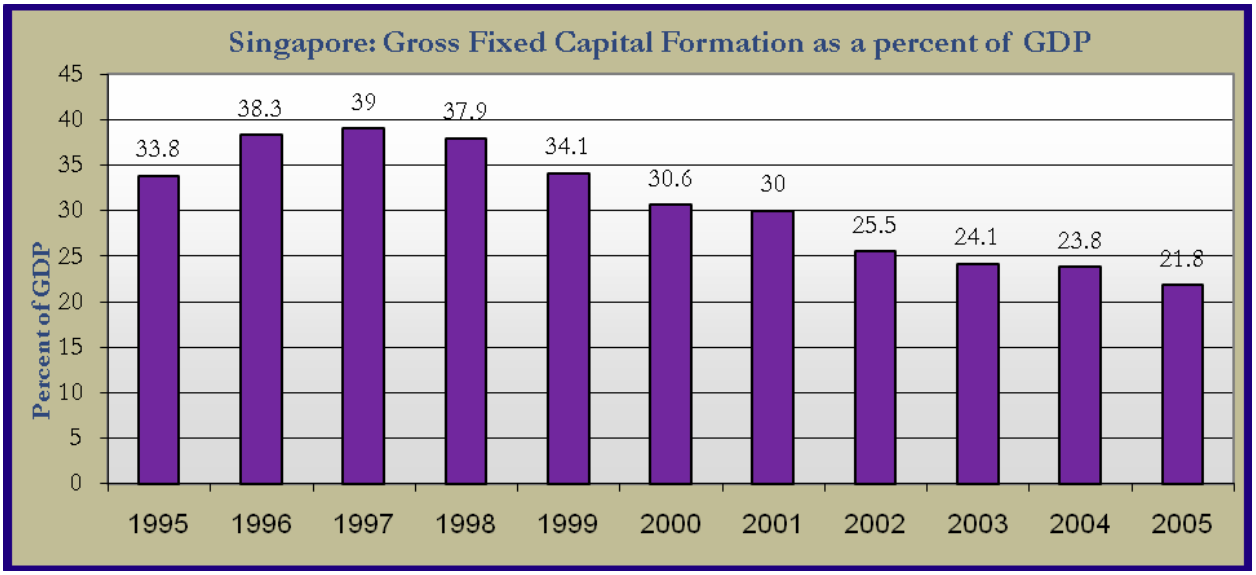
Savings and Investment Strategy

Complementing the prudent fiscal and monetary strategy has been an equally prudent but also aggressive savings and investment strategy. Through a combination of fiscal policy and carefully structured incentives, Singapore raised its savings ratio from about 10 percent of GDP in 1965 to close to 50 percent of GDP today, one of the highest in the world About a quarter of that derives from the savings of the central government as a result of its fiscal policy and budget surplus. In addition, the GLCs and government statutory boards are run, as noted above, on a strictly for profit basis and their profit contribution raises savings by

another 9 percent of GDP. Further, the contribution from the savings of private corporations comes to another 18 percent of GDP. Finally, a number of government policies such elimination of taxes on capital gains, interest, and dividends; refusal to provide very significant unemployment, health, and welfare payments, and mandatory contributions to the Central Provident Fund (CPF) were extremely important. In the case of the CPF, contributions (matched by employers) were raised gradually from 10 percent of wages to 50 percent. All of these measures led to a private savings rate equal to about 9 percent of GDP.

The high savings ratio and the strong push by the EDB to attract foreign investment allowed Singapore to pursue perhaps the most aggressive investment policy the world has ever seen. From less than 20 percent of GDP in 1965, investment was raised to 40 percent of GDP by 1970 and to about 50 percent in the 1980s. Enormous private investments were made in machinery, transport equipment, manufacturing plants, and petrochemical facilities. These were complemented by public sector investment in housing, the Port of Singapore, Changi airport, roads, mass transit, and telecommunications.





From 1965 until 1985, Singapore invested more than it saved and ran a current account deficit which it financed with foreign direct investment and loans from the World Bank and other agencies. Since 1985 it has run an increasing current account surplus. In the last five years investment has fallen off to the 20-25 percent of GDP level while savings has remained quite high. This, of course, has led to accumulation of very large current account surpluses which are now being invested abroad in such things as a technology park in Bangalore, hotels in Vietnam, port and telecommunications facilities in Belgium, and industrial parks in China. The government of Singapore also holds about $300 billion of U.S. Treasury Bonds.

Infrastructure

Singapore started with the advantage of having one of the world's great ports that had been kept at a leading edge of technology and management by the British colonial authority. Since independence the Port of Singapore Authority has invested heavily in equipment, manpower, and technology to keep the Port of Singapore among the world leaders. Its container traffic of over 22 million twenty equivalent units (TEUs) ranks it with Hong Kong and Shenzen at the top of the world's port list. As already noted, it is so efficient that many shippers use it even when simple distance calculations would suggest alternative routings. All of Singapore's ports are managed under one authority which in turn is highly

coordinated with other bodies managing the other key elements of Singapore's integrated infrastructure.

Similarly Changi airport is maintained as one of the worlds heaviest traveled, most efficient, and most user friendly airports. It handles over 20 million passengers per year and is the indispensable hub for air traffic in all of Southeast Asia. It provides free high speed internet connections to all business travelers, quick transfers, shower, massage, and overnight sleeping facilities within the terminal, and fast baggage service along with convenient, inexpensive, fast, and no haggle connections to the city by rail, bus, limo, and taxi.

Singapore's road management system is legendary with the smoothest rush hour of any city on the planet and with much less air pollution generated by road traffic than any other major city. This is accomplished with a number of tools. Foremost is the Certificate of Entitlement which a driver must purchase at public auction in order to be able to drive his or her vehicle. In addition, high taxes on gasoline make driving very expensive. There is also an annual road tax that varies according to the size of the vehicle. Finally there is the Electronic Road Pricing (ERP) system. Overhead gantries scan and automatically deduct a toll from the cash card unit in each car on the roads. Charges vary according to time, place, and class of vehicle. In this way, those who contribute most to congestion pay the highest cost and congestion is dramatically reduced. At the same time, revenue collected from this exercise contributes nearly ten percent of the entire budget. These proceeds in turn fund large public-sector investments.

As a last note on road transport, the electronic and global positioning system for taxis should be mentioned. It makes Singapore's taxi service probably the most efficient in the world.

Perhaps most significant is the sophistication of Singapore's electronic and Internet infrastructure. It is rooted in efforts that began in the early 1980s. At this time, the government recognized the great potential of computers. It established the National Computer Board and gave it the mission of spreading the use of computers as widely as possible both in business offices and factories and in private homes. The Board was led by one of Lee's top lieutenants, Dr. Tony Tan. The strategy was simple. The government first computerized its operations as a demonstration to both businesses and families of how it could be done. Ten

ministries were chosen as the pioneers and $100 million was invested. There were no IT courses at the universities, and they were established at that time. In fact, Cabinet Ministers were among the first to take the new IT courses. In the 1990s similar efforts led to the widest possible deployment of optical fiber wiring to offices and homes and to deployment of high speed internet capability, making Singapore perhaps the most wired city in the world.

As an insight into how Singapore works it is interesting to look at the career or Ko Kheng Hwa, the Managing Director of the EDB. After studying engineering on a government scholarship in the U.K., he returned to work at the Ministry of Defense. Then a Sloan Fellowship took him to MIT where he studied business management. Upon returning to Singapore he joined the National Computer Board and has moved up since to become head of the EDB. This is a typical kind of career and background for a high ranking Singapore bureaucrat. Thus, it is not surprising that Singapore scores near the top in the competitiveness of its physical infrastructure.

Additionally, Singapore's growth has been environmentally sustainable. So much so that is has been labeled "Asia's Garden City." Indicators of water pollution are among the best in the world, and it has avoided the air pollution that plagues Hong Kong and most other cities of developing Asia. This has been achieved only with great effort. In the 1960s, it was common to find cattle in the city center, and the waste of pigs turned the rivers into stinking sewers. At the same time, Singapore was totally dependent for water on rivers controlled by a sometimes unfriendly Malaysia. Through massive engineering works, development of extensive facilities for catching rainwater, and dedicated effort over many years, Singapore has turned the putrid swamps into gardens and managed to become less dependent on outside water supplies.

Entrepreneurial Strategy

If there is a deficiency in the Singapore arsenal it is in the area of venture capital, start-ups, and entrepreneurial activity. As noted earlier, the business class of Singapore at its foundation was made up largely of traders rather than the entrepreneurs who had migrated from Shanghai to Hong Kong. In lieu of home grown entrepreneurs, Singapore concentrated on a strategy of importing advanced manufacturing and technology via MNC investment and becoming

essentially a manufacturing export platform for such MNCs. The Singapore education system was structured to turn out well trained technicians and managers, but did not encourage the independent thinking and creativity that is essential to entrepreneurial activity.

In the early "catch-up" years of Singapore's development that did not matter very much. But as Singapore has become a fully developed country operating at the cutting edge of business and technology, the need for creativity, entrepreneurial imagination, and start-up activity has become more pressing. Characteristically, the government has responded with an array of programs aimed at spurring creativity and venture activity. One with symbolic as well as substantive significance is the Challenger Award under which the government undertakes to fund new business and venture projects dreamed up by civil servants. The Technopreneurship program of the 1990s to encourage entrepreneurship stumbled with the bursting of the Internet bubble as many Singapore start-up firms disappeared. But Singapore has responded by revising school curricula to foster more creative thinking and by creating more incubators and making funding available for venture capital. There are now 160 venture capital groups active in Singapore with $10 billion available for investment. In addition, the government is providing extensive support to local small and medium sized businesses through the SPRING (Singapore Productivity Innovation Growth) program that provides loans, export insurance, and other benefits to SMEs. Finally, coordination between the programs of the universities, the government research institutes, private corporations, venture capital groups, and the EDB is extensive and intimate.

A high level commission has created a vision of the future Singapore as a city developing niches of excellence in a wide variety of areas including tourism, advanced engineering, software design and development, healthcare, tertiary education, financial services, biomedical sciences (Singapore has become a major center of stem cell research), digital and interactive media, and water management technologies.

While it is unlikely that Singapore will suddenly blossom as the next Silicon Valley, its ability to adjust and adapt should never be underestimated. There is good reason to believe that the city-state will continue to find ways to maintain its vitality and growth.

Lessons for Mexico

In our view, Singapore is one of the most successful countries of the past forty years in terms sheer growth and development. Singapore's government has a single-minded dedication to engineering a competitive, first world oasis in Southeast Asia. The top priority of Singapore's leaders over the past forty years has been to make Singapore competitive. This has meant using a variety of policies and incentives and exhortations in a tightly integrated and coordinated way to bring every possible measure to bear in achieving the goal of competitiveness. We find that studying three of these specific policy areas will be most beneficial for Mexico.

First, Singapore has an incredibly high quality of governance. Numerous precautions have been established to eliminate corruption and create a spare and easy to navigate bureaucracy. The smartest and best Singaporean students are recruited to the public sector—they are paid *very* well but are also subject to extremely strict measures if caught in any indiscretion. Permits and licenses have been eliminated on many levels, also eliminating methods for government employees to extort bureaucratic processes for profit. This level of governmental transparency and quality makes Singapore an extremely attractive investment arena.

Second, the Economic Development Board has been crucial in Singapore's successful development. The EDB has autonomous authority to attract outside investment and lure MNCs to establish operations in Singapore. The scope of the EDB's power ranges from ability to offer tax holidays and land grants to arranging infrastructure and worker retraining programs that benefit incoming corporations. Further, the EDB's overarching plan for Singapore has been methodically followed for almost 40 years. This sort of long-term focus on a specific development plan is obviously extremely successful in this case. Replicating a similar organization in Mexico could help streamline the country's development, in a way that the Chief Scientist's office is unable to do, with its ability to manipulate multiple areas of the investment environment.

Finally, the quality of Singapore's infrastructure is absolutely top-notch. It would be very difficult for the EDB to attract the kinds of high-tech, knowledge intensive industry they want to attract if their infrastructure was subpar. Investing in the best electrical and internet grids, easy to navigate roads and high quality transportation helps assure that the best corporations with the highest value added products relocate to Singapore.

TAIWAN

Although modern Taiwan is a relatively small state with an ambiguous status as a sovereign nation, it punches well above its weight in international economic affairs. Although denied representation at the UN and other international organizations because of the conflict with mainland China, Taiwan sits at the center of a web of international supply chains, and Taiwanese businesses are both major exporters and investors. This international orientation has long been at the core of Taiwan's economic development strategy – which has succeeded in transforming an impoverished island with a predominantly agricultural economy into a developed country with world class companies producing leading edge of technologies in just two generations.

Few countries have managed to take advantage of the opportunities afforded by globalization and technological innovation as rapidly as Taiwan. Taiwan has modernized in the face of a consistent and daunting security threat; it has combined state led industrial policies with a freewheeling entrepreneurial culture that has created lots of successful small and medium sized companies; and it has fostered and promoted the development of indigenous technologies and human capital that have enabled the country to become a hotspot of innovation and high-tech industry.

Historical Background

From the beginning, Taiwan's identity has been shaped by international trade and investment. Taiwan's original inhabitants were Malay-Polynesian, and for most of its early history the island remained cut off from the centers of power and civilization in East Asia. Occasional visits by pirates and traders from China and

Japan were Taiwan's main source of contact with the outside world until the Dutch established a trading post on the southern coast of Taiwan in 1624. At first, the Dutch and later the Spanish used Taiwan as a trading entrepot for their merchant activities across Asia, but soon began encouraging the migration of Han Chinese to the island to cultivate rice, tea and sugar for export to China and Japan.

In 1662, the Dutch were expelled from Taiwan by a Chinese army and the island spent the next two hundred years as a province of imperial China. During this time, international trade was discouraged and the island's economy stagnated. When Japan gained control of Taiwan in 1895, they set about developing the island as a source of agricultural goods for the Japanese home market. In 1905, the Japanese instituted a limited land reform, a first step in Taiwan's transition from a feudal society into a modern economy, and the colonial administration made significant investments in Taiwan's infrastructure, particularly roads, irrigation and electricity generation, in order to facilitate the development sugar and rice production for export. They also improved the institutional infrastructure, promoting primary education, organizing farmers associations and agricultural research institutes to spread new farming techniques and boost crop yields.

By the second half of the 1930s, as Japanese military expansion put strains on the domestic economy, the first efforts at industrializing Taiwan were begun. In order to support the Japanese war efforts, many defense related industries were established on the island, including aluminum and steel, machinery, weapons and chemicals. The Taiwanese also developed various light industries producing for domestic consumption after wartime disruptions prevented the import of many manufactured goods from Japan. Thus, prior to the post-war takeoff of the economy, Taiwan had already laid much of the groundwork for expansion.

After Mao's communist forces expelled the Kuomintang from mainland China in 1949, a wave of over two million refugees descended on Taiwan. These refugees included many merchants and traders, as well as much of the elite of pre-war Chinese society. These people brought with them a lot of human capital – the technical skills and know-how that would prove so crucial to Taiwan's later economic development. By the early 1950s, over 60% of Taiwan's population was literate, and the security threat emanating from the mainland helped to promote

a sense of shared sacrifice and community that smoothed over the divisions between the 'indigenous' Taiwanese and the refugees from the mainland.

That said, control of the state was firmly in the hands of the Kuomintang party in general and Chiang Kai-shek in particular, who ruled under a decree of martial law until 1987. But while Taiwan was under authoritarian rule and political dissent was not tolerated, from an economic perspective, the government encouraged entrepreneurial activity and made efforts to ensure an equitable distribution of wealth. The focus on economic development was also a question of survival, however. In 1950, the economic situation was dire. Per capital GDP was about $108, over half the people worked on farms, inflation was running at a rate of over 600 percent, the balance of trade was in huge deficit, foreign exchange reserves were non-existent, and the whole economy was heavily dependent on U.S. aid contributions that amounted to nearly 10 % of GDP. It was clear that if Taiwan was to survive the strategic challenge from mainland China, the economy would have to be revived.

One of the most important economic reforms enacted by the government was a land reform in 1949-1953 that redistributed land in favor of lower income groups and tenant farmers who had previously labored for feudal landlords. The fact that the government was controlled by émigrés from the mainland with no ties to the indigenous landholding elites was an important factor in the success of the land reform, but so too was the ingenious method by which the state carried it out. Instead of simply expropriating the land and handing it over to the peasants, the state gave the previous landlords equity stakes in the existing Taiwanese industries that had been inherited from the Japanese colonial era. At a stroke, the state transformed feudal landowners into industrialists and peasants into entrepreneurs.

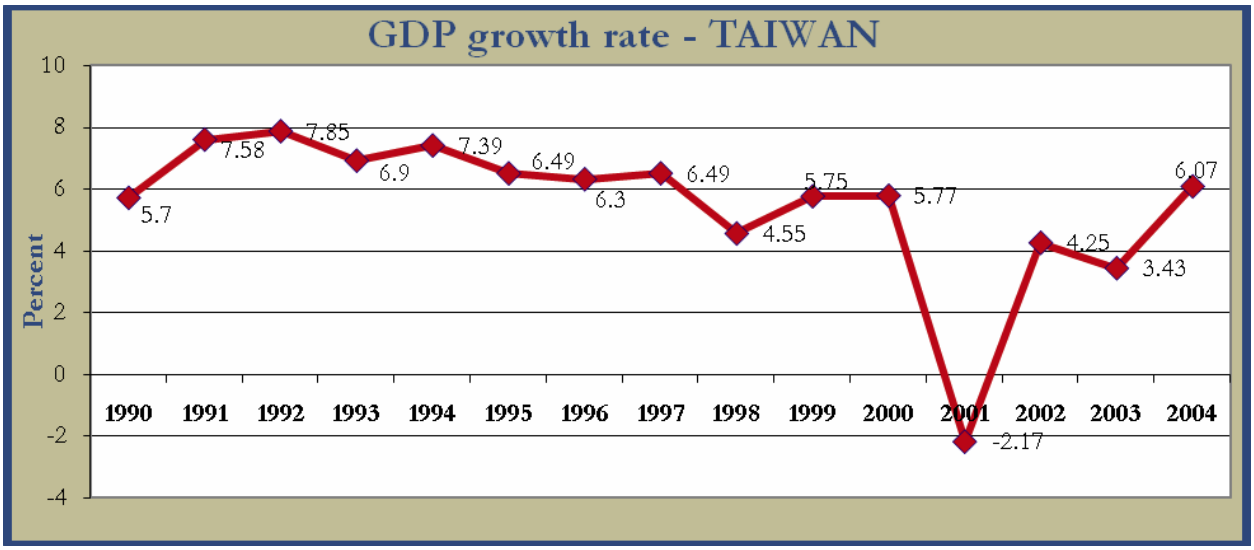
Land reform was followed by efforts to expand rural access to credit and technology, as well as a concerted state led effort to rapidly industrialize. Land reform proved crucial to mobilizing the rural agricultural sector, which provided the major source of savings and investment capital that funded the industrialization of the island in later years. By 1951 production was back to pre-war levels and by 1952-53 inflation had been brought under control and the situation stabilized. From these unlikely beginnings Taiwan recorded the world's

second fastest economic growth from 1952-2005 with an annual average real rate of increase of 7%, just behind Singapore's 7.5%.

Taiwan has gone through three major phases in its economic development. The first, the import substitution phase, was relatively mild and short lived by the standards of other developing economies and soon gave way to an export led growth stage that saw explosive growth.

Industrial Policies and Strategic Planning

The first phase of Taiwanese economic development began with the introduction of the first four year development plan in 1953. Along with the land reform program, an import substitution program aimed to balance the yawning trade deficit. Tariffs were raised on imports of most goods while special assistance was given to help establish the textile, shoe, and other light manufacturing industries that were relatively labor intensive. The approach was straightforwardly interventionist. The government identified promising investment opportunities and invited particular businessmen to participate - arranging low-interest loans and foreign aid funds for those who accepted the invitation. Textiles were especially favored with the government itself supplying cotton and materials to the factories and then buying all of the output. All the firm had to do was run the factory.



The structure of Taiwanese industry was composed of two tiers - several large state owned or formerly state owned companies dominated certain industries like cement or power, but many small, family owned contractors and sub-contractors made up a second tier that often supplied the giants. As the textile industry developed, many of these companies became contract producers for U.S. and other foreign companies that marketed under famous brands.

The institutional mechanism for devising and implementing Taiwan's development strategy was the Economic Stabilization Board. This agency evolved into the Council for U.S. Aid to guide the allocation of American aid funds, and eventually became today's Council on Economic Planning and Development which includes all the key government Ministers and has an elite staff and sizable budget of its own. In conjunction with the Industrial Development Bureau of the Ministry of Economic Affairs (which has the power to make grants and award tax incentives), it can be thought of as Taiwan's version of Singapore's Economic Development Board.

The second phase came in the 1960s. While Taiwan's land reform had laid the groundwork for a modern capitalist economy, the Taiwanese were not satisfied with the results of the import substitution program and decided to shift to an export led growth approach. The NT$ was devalued by nearly half to make Taiwanese exports competitive on world markets and a series of tax rebates on imported raw materials and components and low interest loans for export sectors were introduced. In addition, the first Export Processing Zones - essentially industrial parks where red tape requirements were centralized and lightened and tax treatment was especially favorable – were established. These zones proved to be so successful that they led to the gradual extension of similar incentives beyond their boundaries so that eventually the whole island of Taiwan became one big export processing zone that attracted large amounts of foreign investment. FDI and domestic investment were further stimulated by the Statute for Encouraging Investment in 1960. This program provided a range of tax holidays, tax ceilings, tax deductions, special depreciation rules, and other financial incentives to encourage investment in selected industries.

Throughout the 1960s, Taiwan remained a sort of hybrid economy. The 'commanding heights of the economy,' like the energy, steel and military-industrial sectors, were largely state owned and benefited from heavy state

intervention. The government decided that it wanted to develop domestic steel, chemical and shipbuilding industries, for example, and so it set up state owned firms in these sectors. The banking system was viewed as a means of directing lending to favored industries, and the 'invisible hand of the CEPD' guided industrial policy, picking winners and losers. But at the same time, many small to medium sized enterprises were popping up as sub-contractors to the big state owned firms or were carving out new niches in the textile, electronics, and footwear sectors. These SMEs ensured that economic power and authority was not overly concentrated in the hands of the state and produced the most egalitarian income distribution of any of the Asian Tiger economies. SMEs were also the backbone of export-oriented development, transforming the structure of the Taiwanese economy from a largely agricultural base to an industrialized economy with a strong export manufacturing sector.

Taiwan explosive growth continued during the 1970s. Policy makers increased their efforts to promote heavy and intermediate goods industries such as steel, petrochemicals, and shipbuilding and move up the value added ladder to more productive and profitable sectors. Taiwan also underwent a major upgrading of its infrastructure. Large sums were spent on building new ports, airports, and highways, and linking the major population zones on the west side of the island. At the same time, the government also established the Industrial Technology and Research Institute (ITRI) and the Electronic Research and Service Organization (ERSO) to boost the technical skills of Taiwanese industry and promote domestic spending on research and development.

An interesting contrast between Taiwan and the economic development strategy of Singapore was that, while Taiwan welcomed foreign investment and gave it various financial incentives, the Taiwanese authorities (unlike the Singaporeans) did not give MNCs any benefits not available to domestic firms, and did not pursue foreign MNCs with the intensity of Singapore. Rather, the government put great emphasis on establishing Taiwanese firms and Taiwanese expertise and technology.

By the early 1980s, Taiwan's exports were booming and the country was piling up enormous current account surpluses as a result of its strong incentives for savings, its undervalued currency, and its heavy emphasis on export oriented investment. But the oil crises of the 1970s had raised production costs in

traditional industries as had the rising wages that inevitably accompanied the rising productivity of Taiwan's workforce. Now the huge trade surpluses gave rise to charges of unfair trade and to pressure for a revaluation of the NT dollar which was eventually allowed to slowly appreciate. All this reduced Taiwan's competitiveness and led to the development of a new strategic plan, ushering in the third phase of Taiwanese economic development.

In order to boost its international competitiveness, Taiwan began to lessen its reliance on state planning and control and shifted its attention from traditional heavy industry towards science and technology sectors. In this fourth stage of its economic development, Taiwan introduced a series of liberal reforms, freeing interest rates and introducing other market based incentives in the financial sector, and beginning a process of privatization that reduced state holdings in major companies. But Taiwan did not abandon government intervention in the economy.

The government's Science and Technology Development Program led to the foundation of the Institute for Information Industry and the Hsinchu Science Industrial Park in 1981. The Science Park was modeled in part on the former export processing zones – except that it was focused on helping and providing financial incentives to technology companies specifically. It quickly became a magnet for high tech companies from around the world. Both the Institute and the Science Park played crucial roles in the development of Taiwan Semiconductor Manufacturing Corporation, and in the evolution of Taiwan into the world's largest producer of semiconductors.

Taiwan in the 1980s was well placed to benefit from of advances in information technology and communication. Previous investments in the educational system and in human capital more broadly meant that a large cohort of young people with high degrees of technical training was preparing to enter the work force. Thus, Taiwan had an abundance of young, well trained, and relatively inexpensive engineers at a moment when technology industries were globalizing rapidly.

Taiwan was also attractive to investors because its corporate tax rate of 25 percent was favorable, its policy environment was stable and predictable, corruption was not a big problem, the exchange rate was kept undervalued to keep Taiwan's exports competitive, there were a large number of small and

medium sized companies with solid engineering talent to act as contractors and sub-contractors, and infrastructure (especially ports and airports) was relatively good. But the role of the state in providing crucial funding and support for the nascent semiconductor industry should not be underestimated.

Taiwan Semiconductor Manufacturing Corporation

TSMC is one of the great industrial success stories of the past twenty years. Its tale provides a microcosm of the Taiwanese experience – interweaving strands of entrepreneurialism, innovative business practices, excellence in engineering, and state led industrial policy resulting in a world-beating corporation that is now the second or third largest manufacturer of semiconductors in the world.

The tale begins with a meeting of Taiwanese bureaucrats and an ex-pat Taiwanese engineer working for IBM in the early 1980's. The engineer happened to mention that he thought the semiconductor industry was poised for rapid growth. He had seen the glimmers of the personal computing revolution at IBM and knew that a large expansion in semiconductor manufacturing capacity would be needed to underpin the growth of the consumer market for PCs. The Taiwanese bureaucrats thought this sounded like a good opportunity, and ran it up the flagpole to the Chairman of Taiwan's Science and Technology Development Council, K.T. Li. Li was soon sold on the idea and enlisted the state-funded Industrial Technology Research Institute (ITRI) to support the development of a domestic semiconductor sector in Taiwan. As early as 1975, ITRI had set up a production line using technology licensed from RCA. But by 1985, the line was still running this same technology, which by now was three generations out of date.

As luck would have it, at this time another ex-pat Taiwanese engineer named Morris Chang had just retired from his position as President of General Instrument Corporation in the U.S. and was looking for something to do. He was soon recruited to lead ITRI by K.T. Li and charged with creating a plan for developing Taiwan's semiconductor industry. This was a daunting task. Taiwan didn't seem like it had many competitive advantages in the semiconductor industry. Its limited experience in the sector depended on out of date technology and it had no sales, marketing or managerial experience in semiconductors. But Morris Chang did. He had spent 35 years in the industry – first at Texas

Instruments, and then later as head of General Instrument. And he soon hit upon a plan that would transform the global semiconductor industry and establish Taiwan as a semiconductor manufacturing powerhouse.

By the mid 1980s, with the costs of building new semiconductor fabrication plants rising exponentially with each new generation of technology, the number of firms with the available capital to fund new production capacity was dwindling. U.S and Japanese companies dominated the industry, but only large, established firms with access to the capital markets (or in the case of Japan, close relationships with Keiretsu banks) could find the funding necessary to keep building ever more expensive fabs. But the commercial applications for new types of semiconductors was continuously expanding, as new types of integrated circuits and chips were required to power new electronic devices like computers, mobile phones and other electronic equipment. So even as the industry appeared to be consolidating, there were scores of talented engineers working for small technology companies who were itching to get new semiconductor designs produced, but lacked the capital to build manufacturing facilities.

It was here that Chang saw an opening. Instead of competing head to head with the established players in the industry, Chang would create a semiconductor foundry. In other words, Chang's foundry would not first design a chip and then construct a fab to manufacture it, but instead would build a fab to manufacture chips on a contract basis for outside firms that would manage the design, marketing and sales of the chips on their own. This strategy played to the strengths of Taiwan, which had lots of skilled and hard-working young engineers with manufacturing know-how, but no sales or marketing expertise and no access to the latest technologies.

In retrospect, it is clear that this was a brilliant idea, but at the time Chang still had a lot of convincing to do. Although he had state support from the government of Taiwan, no private Taiwanese investor was willing to back his venture at the time. So Chang launched TSMC with $110 million worth of funding from ITRI and a mandate to go out and find the rest of his start up capital from private sources. It was clear that TSMC needed a multinational corporation to partner with, so Chang set about contacting all the existing firms in the sector. Nine months later in 1987, he had convinced Philips Electronics to come on board and provide some of the capital and technology TSMC needed to get started.

At first, TSMC's only customers were Intel, Motorola and Texas Instruments, who used TSMC's fabs only when they ran out of capacity at their own facilities. But Chang had foreseen, and his business model allowed for, the rise of the fabless semiconductor company. By the early 1990s, scores of new firms that designed, marketed and sold, but did not manufacture, chips had been established, and they worked closely with TSMC to get their designs produced. As TSMC established partnerships with these firms, they gained more and more expertise, and by the end of the decade their manufacturing process technologies had caught up to or surpassed the industry leaders in the U.S. and Japan. Moreover, with so much demand for their services (TSMC was reportedly making net margins of 25-30% at the time), TSMC could funds its expansion through cash flow, and did not need to go back to the state for more subsidized capital.

The success of TSMC proved to be a boon not just for the employees and investors in TSMC, but for the economy of Taiwan as a whole. Many new competitors and supplier firms were spun off from TSMC, so that by 2007, no less than 51 semiconductor fabs had been built in Taiwan, with another 15 on the drawing boards. Taiwanese technology firms expanded into related fields like laptop computer assembly and flat panel display production, and a high-technology revolution moved the whole economy up the value added ladder.

Current Strategy

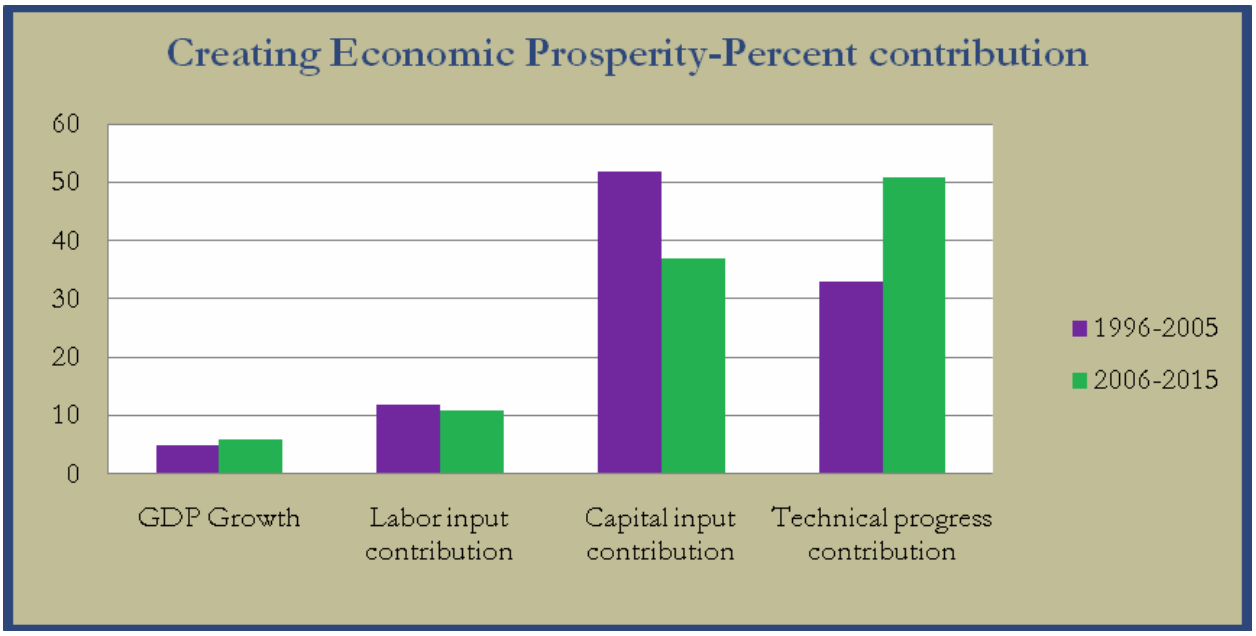
While it was gaining this strong position in high tech manufacturing, however, Taiwan was also achieving an important transition to becoming a more services and knowledge oriented economy. This had been indicated in a number of plans and programs including the Six Year National Development Plan of 1991, the Plan for National Development into the Next Century of 1997, the Plan for a Knowledge-based Economy of 2000, and the Global Logistics Plan of 2000 that all aimed to make Taiwan into a Green Silicon Island. The results were that while manufacturing, led by heavy manufacturing, was nearly 40 percent of GDP and services about 47 percent in 1985, by 2005, manufacturing had declined to 21 percent of GDP and Services had climbed to nearly 74 percent. Yet, all the while, Taiwan companies retained leadership in older industries by integrating new technology and developing services around the logistics, design, and management for production facilities now located abroad.

This focus on supply chain management and the efficient operation of manufacturing enterprises had served Taiwan well as it transitions away from low-skilled manufacturing work. A good example is the footwear industry. In 1983, Taiwan was the world's top producer of shoes. By 2005, most of this production had moved to mainland China, Indonesia, and other cheap labor

locations. Yet it is largely Taiwanese companies who manage these factories and the run the logistics operations that integrate these factories into global supply chains. Take the Nike plant outside Shanghai for example. The factory is owned by Nike, but is managed under contract by the Taiwanese Feng Tai group. The plant manager is Taiwanese along with several other key executives and the logistics of shipping in materials and equipment and exporting finished shoes all over the world are handled by Feng Tai. The shoes are designed by Nike in Beaverton, Oregon, but are first produced and tested on the Feng Tai pilot line in Taiwan. So even though rising labor costs have cost Taiwan its role as the world's shoe workshop, Feng Tai and other Taiwanese footwear companies have managed to maintain an important and profitable role in the industry by managing the global supply chains of footwear production even as the factories themselves have been outsourced to countries with cheap labor. This is a prime example of using management know-how and technology to enhance and prolong the life of traditional industries.

Of course, Taiwan's proximity to China and its strong linguistic and cultural links with the mainland have given the island a comparative advantage in managing outsourcing to the mainland and operating factories and facilities there. Just as revaluation of the NT dollar forced a shift in the island's industrial structure, so too did it contribute to the government's decision to liberalize investment rules. Today, Taiwan businesses are by far the biggest "foreign" investors in China with over US$100 billion invested.

As it entered the 21st century in the year 2000, Taiwan launched the next Stage with its Plan for National Development in the New Century. It noted the challenges the economy will face from ever faster technological innovation, the magnetic attraction of mainland China, much more intense global competition from India and other new players, outsourcing and a service industry revolution, and global climate change that demands a green production chain and sustainable development. The report also noted internal challenges arising from the aging of the population and inefficient government. To respond, the plan begins with a vision of a "green silicon island" that will build a new "Taiwan Dream" based on "openness, innovation, compassion, inclusiveness, and harmony with nature." The Taiwan that will emerge will have "a creative mind, a just heart, a bold maritime spirit, a vigorous circulatory system, and a sustainable lifestyle."



Concretely, this means that Taiwan is emphasizing innovation as the prime mover of economic growth and is focusing on moving from "contract manufacturing" to becoming a "fount of creativity." In particular it aims to raise the technical progress contribution to GDP growth from the current 33.4% to 52% by 2015. It also means reducing income, digital, and knowledge gaps among the population; making Taiwan the foremost e-economy in Asia by extending broadband internet connections to six million households; making no central city more than two hours away from any other central city and assuring an airport within one hour of most of the population; and dramatically reducing air, water, and sound pollution while expanding reforestation and wildlife protection areas, and increasing water recycling and total sewage treatment.

Some of the key targets for 2015 are:

- Make Taiwan a unitary "living circle" in which no place is more than a day trip away.
- Keep increases in the CPI to no more than 2% annually.
- Raise per capita GDP to US$30,000.
- Keep unemployment below 4%
- Maintain economic growth at 5% annually

- Reduce the gap between the top and bottom quintiles of the income distribution to a ratio of below 6.

This is to be accomplished through the New Ten Projects that have as their major goals:

- To develop at least 15 products or technologies that rank among the world's best
- To double the number of foreign tourists visiting Taiwan
- To increase R&D expenditures to 3% of GDP
- To expand the number of broadband Internet users to over 6 million
- To create 700,000 jobs.

To achieve these targets, the plan envisions major investment of over $75 billion in ten major areas as follows:

- Cultivate talent for the e-generation
- Develop cultural and creative industries
- Develop an international base for R&D and innovation
- Tourism
- Digitalization of Taiwan
- Develop Taiwan as an operations headquarters
- Improve the transportation infrastructure
- Conserve Water resources and the ecology
- Construct new hometown communities

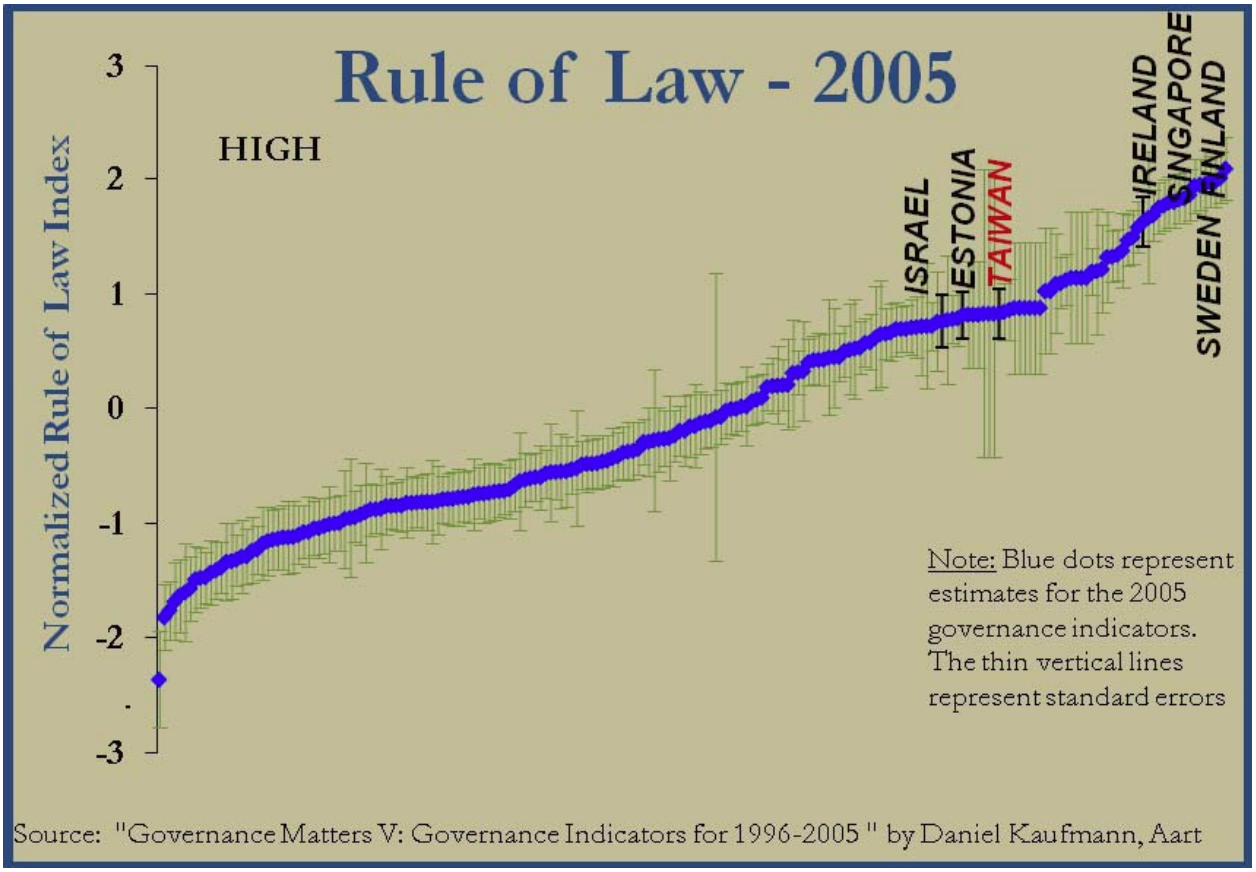
Beyond this there are also a number of other major initiatives. One is the so called Free Ports plan which would make all of Taiwan's ports (including airports) combination ports and processing – warehousing – transshipping – service centers with duty free and bonded zone status. The idea is to take advantage of Taiwan's combined expertise in air and sea transport, information technology, cross-strait division of labor (with mainland China), and global logistics management. Another key plan is that for the targeted development of service industries, including financial services, and making Taiwan a Regional Financial Services Hub, telecommunications and media services, medical and care-giving services, design services, R&D services, and engineering consulting services.

At the same time, however, manufacturing and industry is not being neglected. A big part of the overall plan is to combine the efforts of the government and the private sector to promote the "Two-Trillion and Twin Star Industries." The two trillion refers to the semiconductor and flat panel display industries each of which will soon exceed NT$ 1 trillion in production value. The plan calls for assuring their continued health and growth by increasing the number of components manufactured domestically, eliminating investment barriers, and promoting industrial R&D alliances for developing key technologies. The Twin Star Industries are digital content and biotechnology which are thought to be the emerging stars of the future. The plan is to make Taiwan the manufacturing center of digital content in the Asia-Pacific region by subsidizing development of high quality products and equipment and to bring in substantial new investment into biotech while building up clusters for biotech through new biotech parks.

Institutions

When he arrived in Taiwan in 1948, General Chiang Kai Shek established an authoritarian government based on one party rule and military backing. He ruled under martial law from 1949 until he passed from the scene in 1975. His son, Chiang Ching-kuo, then took over and ruled until his own death in 1988. One of his last acts was to repeal martial law in the summer of 1987. Though far from democratic, this system did provide an enormously stable and predictable policy environment that minimized business risk and provided strong incentives for investors.

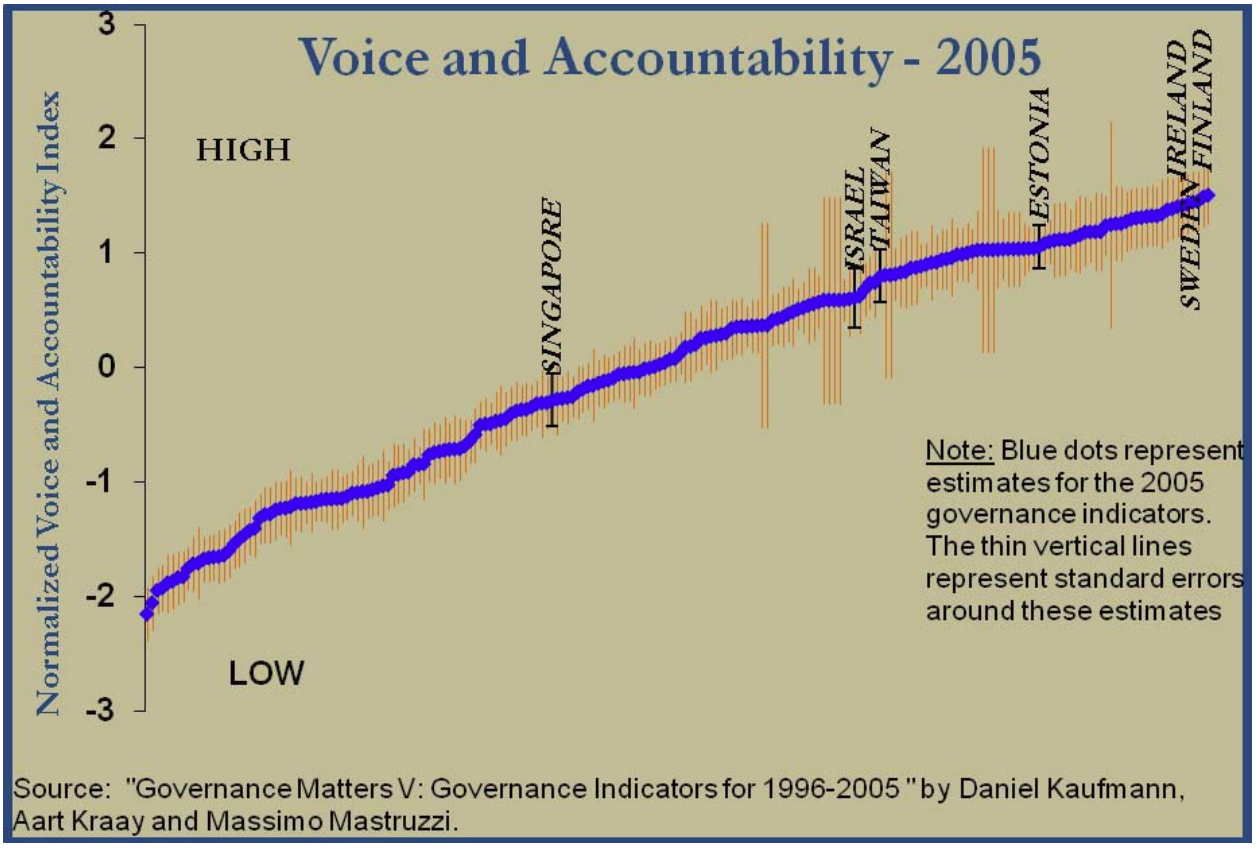
There was not a firm legal underpinning or a rule of law with a politically independent judiciary, but because the institutions were stable, predictable, and well known, procedures became quite standardized and recognized as reasonably fair and just. In addition, the civil service has been and remains of reasonably high quality. It is not the absolute top of the class as in Singapore, but government service has been and continues to be viewed as a prestigious career. Taiwanese civil servants are not paid like those in Singapore, but the compensation is acceptable and there are good benefits. For example, civil servants are guaranteed an 18 percent rate of return on their savings. In addition, many retire at a relatively early age into government owned or linked companies where they are well paid and receive additional pensions and benefits.



Given the high degree of government regulation and historically low degree of transparency, corruption has inevitably been a problem, but not a huge problem. The bureaucracy has been and continues to be relatively clean, and corruption does not impose the high cost that it exacts in many developing countries.

As noted above, the main drivers of economic strategy and policy have been the CEPD and the Industrial Development Bureau of the Ministry of Economic Affairs. Indeed, some (in a play on Adam Smith and his “invisible hand of the market”) have called CEPD the invisible hand of Taiwan. Its Chairman is a cabinet level official and its members include the Ministers of key government departments such as finance, communications, transportation, economic affairs, and so forth. In addition it has an elite staff of about 300 that is constantly analyzing the economy and looking for industries or industry niches to support. For this purpose it has a substantial budget of its own plus the power of approving major projects across the economy. For example, at this moment the focus of CEPD’s attention include Wi-Max, digital home appliances, digital auto parts, solar power and panels, bio-tech, and, of course, the whole ICT industry.

Linked with CEPD in this process are a myriad of key agencies and committees that also link to the universities, corporations, labor unions, and media. The most important of these is the Industrial Development Bureau of the Ministry of Economic Affairs which does the heavy lifting in terms of industry sector analysis and financial support of industrial and science parks and provision of incentives for targeted industries. Other key players include the National Science Council which controls the National Science Development Fund, the Industrial Technology Research Institute, the Committee for R&D on Applied Technology, and Academia Sinica (the main academic planning body). All of these bodies are tied together by interlocking membership and frequent consultation. In addition, there is close and constant consultation with industry leaders and part of the attraction of the science parks is that they are tied to university research and engineering activities so that partnership in science parks ensures access to the university work as well.



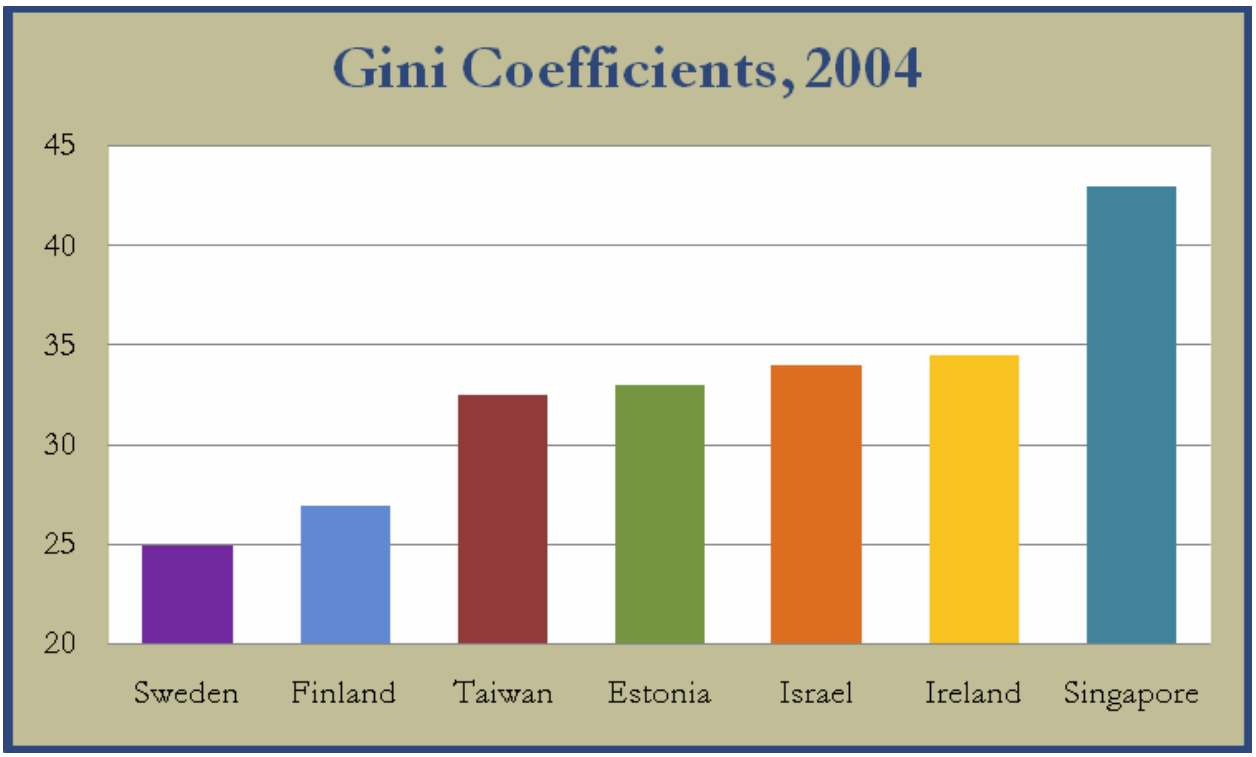
An important recent development has been the democratization of Taiwan that began in 1986-87 with the lifting of martial law and the formation of the Democratic Progressive Party (DPP) as a genuine opposition party to the ruling Kuomintang (KMT). This was followed by the holding of genuinely competitive elections for the mayors of key cities and then for members of the National Assembly. In 1996, this process culminated in the direct election of the President and in 2000 Chen Shui-bian became the first non-KMT President of Taiwan.

This move to democracy has created greater transparency and popular participation, but has also created some difficulties from the perspective of economic development. For one thing, it has brought a political spoils system like that of the United States to Taiwan. When the new party took power, it dismissed many of the top civil servants and replaced them with politically reliable but less experienced and knowledgeable appointees. For another, popular participation in government has meant that the major planning agencies and Ministries have been less able to push their programs through than in the old days.
On a positive note, democratization has led to substantial expansion of unemployment, welfare, and social security programs as well as to a strengthening of the role of labor unions that have the potential to greatly improve the quality of life for ordinary Taiwanese. Taiwan ranks quite high on the World Bank scale of Government Effectiveness, with a score of about .8. It also ranks quite well in terms of political stability, quality of regulation, and rule of law, and voice and accountability.

Society and Language

Taiwan does not have the ethnic divisions of Singapore, but there has long been a division between the people who were living on Taiwan before 1948 and the so called mainlanders who fled to Taiwan with the Chaing Kai Shek government after the communist takeover of the mainland. This division has diminished with time since the young people are all born on Taiwan. While Mandarin is the official language, many speak Taiwanese, but most are bi-lingual between the two. There has never been anything in Taiwan like the language differences of Singapore. Nevertheless, English is widely taught and spoken as the language of international business and the present emphasis of government policy is to maximize English speaking ability as a matter of high priority for national competitiveness. Another indication of the strong social cohesion of Taiwanese society is the fact that

throughout the past fifty years of rapid economic growth, the fruits of that growth have been more widely and evenly shared than in most other societies as evidenced by Taiwan's Gini scores (although recently the trend is toward higher levels of inequality).



Military service of about a year and a half is compulsory for all Taiwanese men, and this is a great integrating mechanism requiring commonality of language and common living and working conditions.

While ethnic and language divisions are relatively small and Taiwanese generally think of themselves as being on the same team, there are big political divisions between those – Blues - who favor closer relations and ties with mainland China and those – Greens - who favor declaring Taiwan an independent country. This division has become more pronounced as Taiwan has become democratic and also as mainland China has become a powerful and magnetic economic player. Indeed, one of the paradoxes of Taiwan is that even as it is the single largest source of foreign direct investment on mainland China, and Taiwanese business people flock to the mainland to run factories and make their fortunes, the country's political leadership is wary of the ever closer economic ties – fearing that Taiwan will become too closely integrated with the mainland and lose the

negotiating leverage it needs to maintain political autonomy. The result has been increased tension not only between Taiwan and the mainland but within Taiwan, and this could become much more serious in the future. On top of this, there is some question as to the identity of the Taiwanese team. Although official doctrine holds that there is “one China”, only 20 percent of people identify themselves as primarily Chinese, while 60 percent consider themselves Taiwanese and another 20 percent say they are both. “Whither Taiwan” is thus the central political and economic question facing the country, and the country’s continued success depends on finding a peaceful solution to this problem.

Military and Strategic Issues

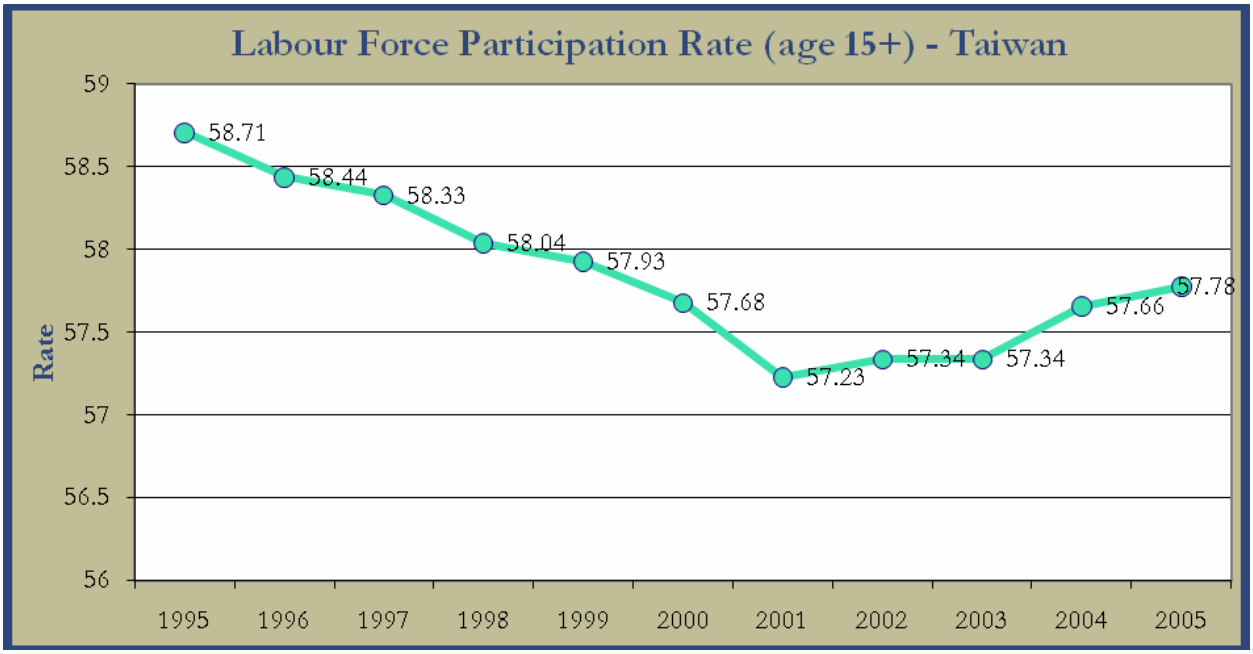
Since its administrative separation from mainland China in 1948-49, Taiwan has lived under the threat of invasion and annihilation by the regime in Beijing. Its survival as an independently governed entity has been wholly dependent on the support of the United States. As China has grown in economic power, Taiwan has found itself increasingly squeezed with many countries strengthening their relationships with Beijing while diminishing those with Taiwan. In view of this and of the universal male military requirement, one might suppose that defense spending is a heavy burden for the Taiwanese economy. Yet that is not the case. Indeed, defense spending as a percent of GDP has declined from 3.49 percent in 1995 to only about 2.54 percent today. This means that Taiwan has bet that it can rely on the U.S. defense umbrella while concentrating its own energy on economic competitiveness. Indeed, one issue of contention between Taiwan and the United States today is that Taiwan has not actually ordered a large number of fighter aircraft that the White House authorized for sale some time ago. It remains to be seen whether this has been a wise choice on the part of Taiwan.

Labor

While in power on mainland China, the KMT regime of Chiang Kai Shek had banned labor unions out of the belief that they were nothing more than communist fronts. While unions were not banned after the KMT fled to Taiwan, they were strictly controlled under the umbrella of the KMT controlled Chinese Federation of Labor. Strikes were essentially banned and no labor hours were lost to labor disputes. Unions were enterprise unions and had little power to bargain for higher wages and benefits. There was no unemployment insurance or welfare

with the consequence that, as in Singapore, costs of hiring and firing were quite low and wages were flexible. On the other hand, from 1953 until the early 1990s unemployment rates remained at around 2 percent and real wages grew at close to 10 percent annually.

After the end of martial law in 1987, organized labor outside the state controlled system began to develop, aided by the DPP and other opposition political parties. But these tended to be single-issue unions that dissolved once their demands had been met. Indeed, the popularity of independent unions actually declined in the 1990s until the government's privatization program galvanized workers in the state owned enterprises about to be privatized to organize and take control of the state managed unions in their workplaces. But the problem was that just as the unions were beginning to learn how to operate outside the state system, their base began to evaporate as Taiwan's manufacturers started to move to mainland China and the island's industry structure began to shift dramatically toward service industries that typically are not unionized.

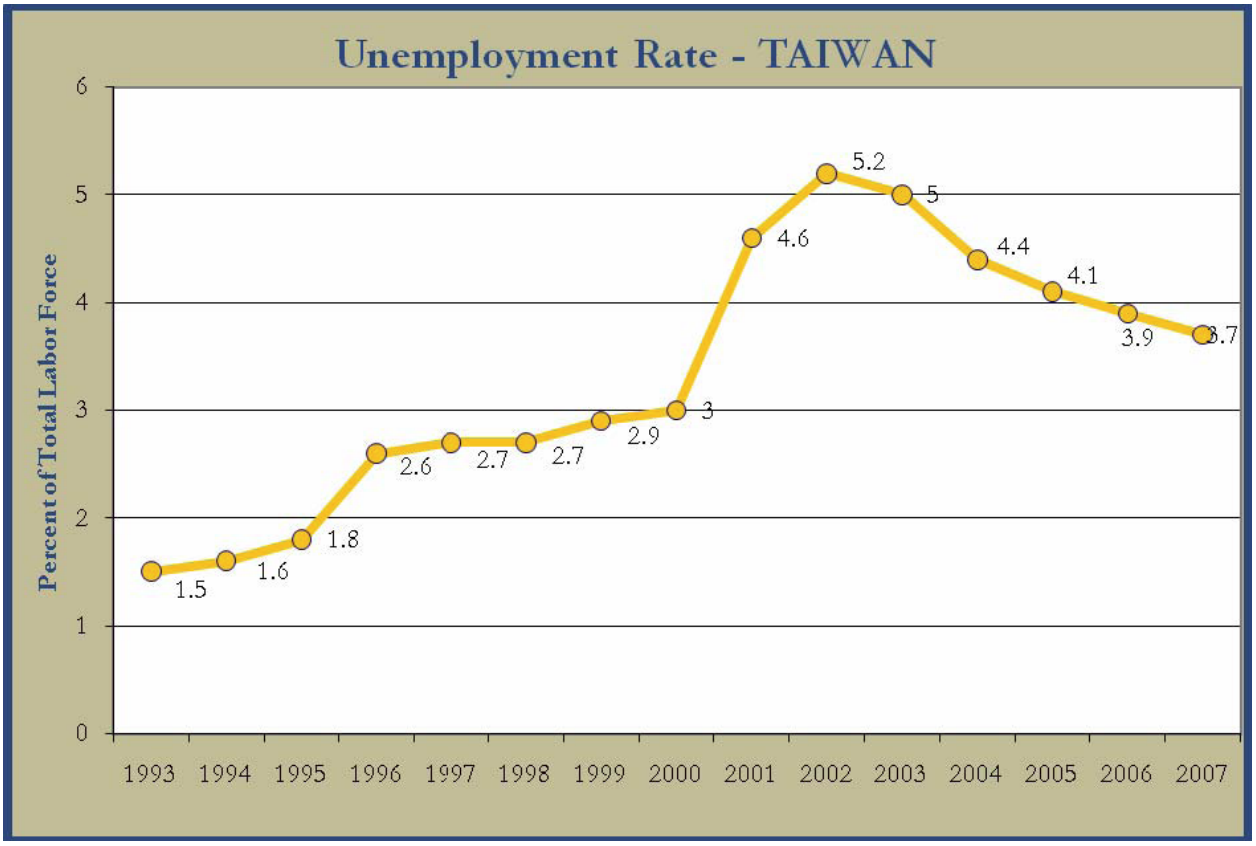


On top of this, the labor law prohibits unions in companies with fewer than 30 employees (many service companies), allows only company unions and often only factory specific unions, prohibits unions for certain kinds of workers such as teachers, and restricts strikes and demonstrations by government employees.

Even when allowed, strikes are difficult to call. They cannot be held while mediation is on-going, and no strike can be called without a two thirds majority of the vote of the union membership. As a result, there have been only 36 strikes called since 1987, and two thirds of them involved bus companies. Not surprisingly perhaps, only 6 percent of Taiwan's workers are members of unions.

Nevertheless, in alliance with the DPP the unions and workers in general have made substantial gains. Thus unemployment insurance was instituted in 1999 and this was supplemented by the Employment Insurance Act of 2003 that provides not only unemployment insurance, but also counseling, retraining, and early reemployment bonuses. In addition, a program to expand employment in public service was launched in 2003 to help reduce the jobless rate that was then just over 5 percent while other initiatives to upgrade job skills and promote sustainable employment were also introduced. Further, an NT$5,000 per person per month subsidy scheme was added to encourage companies to hire the unemployed.

Having said that, unemployment is now down to about 4 percent while labor force participation remains high at its historical level of about 60 percent with the male rate having declined slightly from 72 percent to 68 percent while the female rate has climbed a bit from 45 percent to about 48 percent. Productivity remains high with over a third of the labor force being university graduates and over two thirds having at least high school or vocational school training.



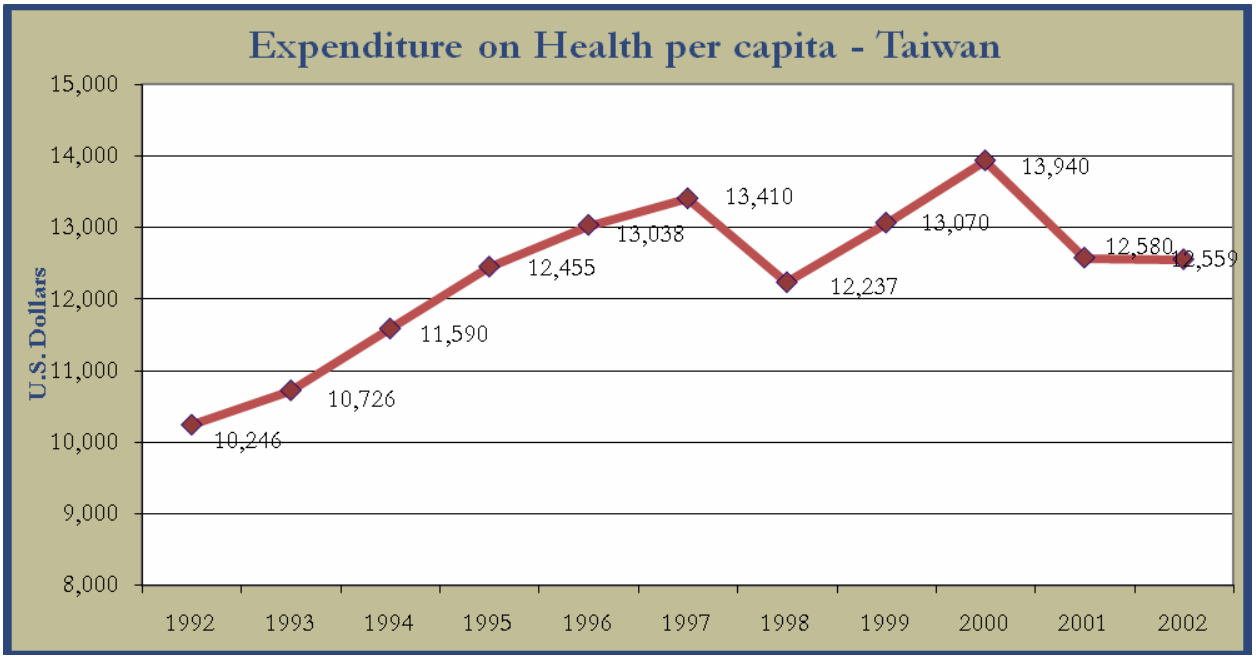
Health and Welfare

Until 1995 there were a variety of industry sector and government employee health care insurance schemes but no generally available public health care and very little welfare. In that year, however, a national health care system was introduced that covered the entire population and that was later made portable so that workers do not lose health care coverage if they change employers or even if they leave the work force.

Pension benefits had been even more varied and minimal than health insurance. Although all employers were supposed to have pension plans and to contribute between 2-15 percent of wages and salaries to their company funds, the law did not require full funding of pension funds. As a result only about ten percent of Taiwan companies actually had a reasonable funded pension plan until 2005. Moreover, an employee did not vest until having worked at a company for 25 years, and he or she lost the pension entirely by a change of employer. In July of that year, a national pension plan was finally adopted. A defined benefit plan, it

will be mandatory for all employers and will also be portable for employees. It will require a 6 percent of wages and salaries contribution by employers. Employees will be able to contribute up to another 6 percent on a voluntary basis. Driving this was the rapid population aging Taiwan is facing like many other countries. Today 9 percent of Taiwanese are 65 or older. That will rise to 10 percent by 2011 and to 30 percent by 2051. The question, however, is how industry will be able to fund the plan since it will mean an additional bill estimated at about US$80 billion and could become a significant competitiveness issue.

However, health and welfare costs remain quite low for Taiwan compared to many other countries. For example, Taiwan spends only 6 percent of GDP on health care overall and the government costs are only 3.5 percent. This, of course, is above Singapore but far below the other industrial countries. At the same time, life expectancy is 77. 43 years on average with men at 74.67 and women at 80.47 years. So this is a very low cost for a very good result. As in the case of Singapore, there is extensive preventive care and use of digitalization to control record keeping and other costs. Taiwan's total government expenditures on social costs come to only about 4.5 percent of GDP.

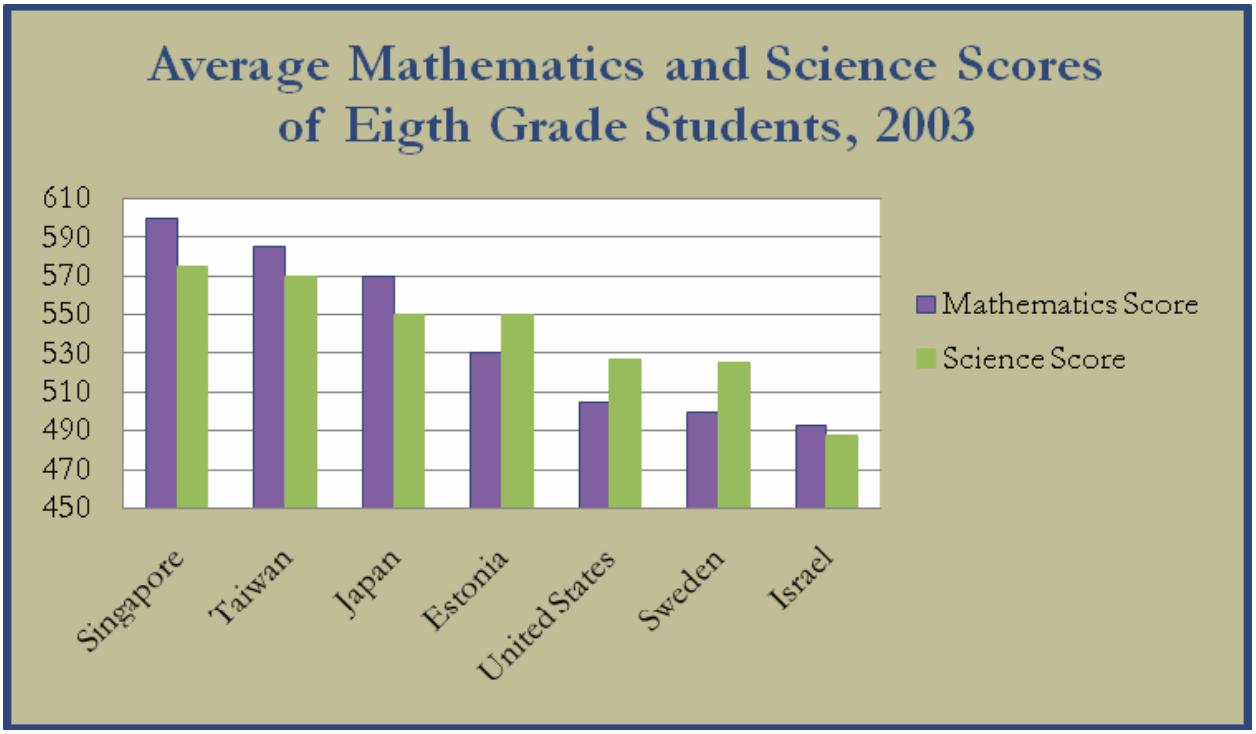


Education

Education has long been a high priority for Taiwan which spends about 6 percent of GDP on its educational system and whose students consistently rank near the top of the various international comparative exams, especially in science and math. Until recently the system was rigidly centralized under the management of the Ministry of Education. This control has been loosened a bit since 1988 and particularly since the advent of DPP government. Nevertheless, it is still a very unified system with a standard nationwide curriculum, common standards for teachers, little variance in school budgets and quality, and a standard examination program with, as in the case of Singapore, a tendency to test frequently and to put great emphasis on test results. There is a long tradition of rote learning, and efforts are being made to encourage creativity and individuality in response to criticism that the system is not oriented toward innovation.

The system begins with two years of pre-school and then six years of elementary followed by three years of junior high school. At this point the class divides. Some go on to vocational school for two years. Others go by examination to three years of high school and still others go to a five year vocational school program. At the end of high school, some go on to university and others then also go to junior colleges. There are also vocational/junior college options and those who did the senior vocational school can also try for entrance to university. So, although the examination process is rigorous, there are some options and second chances for late bloomers.

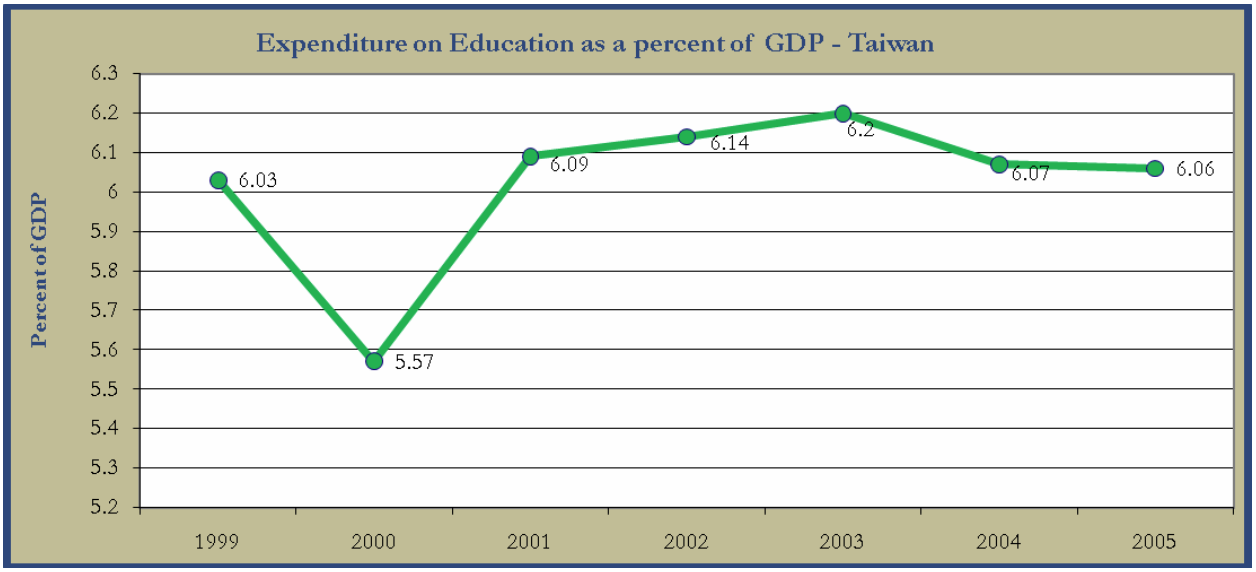
Since 1976, Taiwan has dramatically raised the percent of its population with secondary and tertiary education to 49 percent and 32 percent respectively. Recent laws to raise the priority of education have stipulated substantial increases in government spending on education. Thus, in 2005, the Taiwan government spent over 18 percent of its revenue on education, a sum that amounted to over 6 percent of GDP. Today, fully 70 percent of students plan to pursue higher education and 27 percent anticipate doing a graduate degree. Moreover, surveys show that 90 percent of parents have set an educational goal for their children.



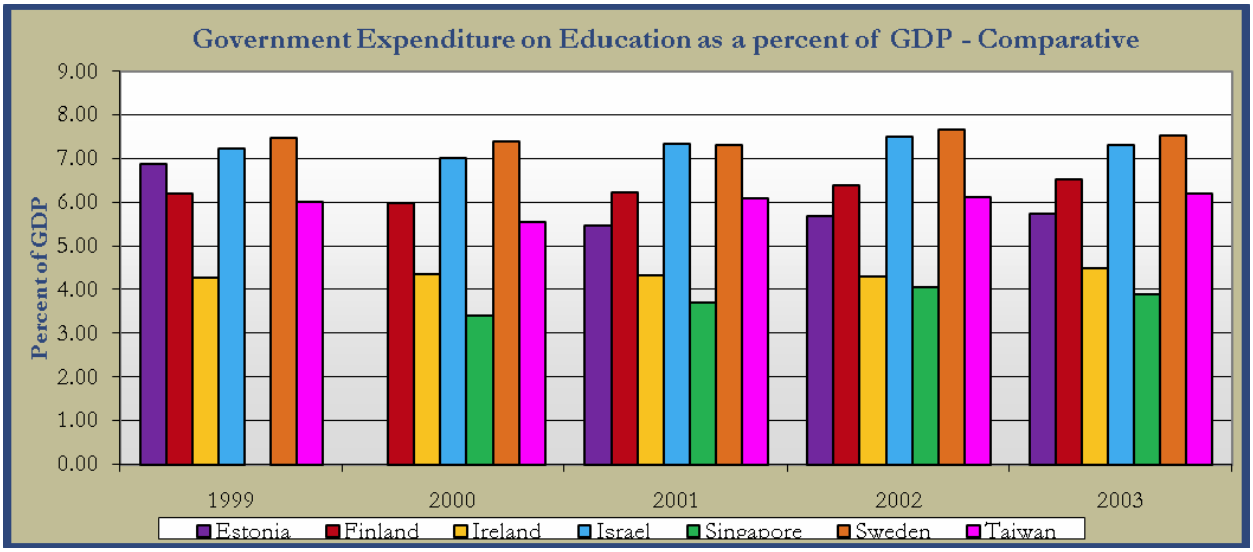
Particularly noteworthy is the emphasis Taiwan places on science and engineering education. Nearly half of all bachelor degrees are in these fields and Taiwan ranks second in the world (just behind Finland) in the percentage of 24 year olds with first university degrees in science or engineering. Indeed, this emphasis is so strong that Taiwan's Outlook for 2015 calls for a better balance between culture and technology and also for more creativity and study abroad.

Two areas of emphasis for the future are creating world class universities and expanding continuing education. There is a serious drive to have a Taiwanese university ranked among the world's top 100 and to have at least ten academic departments ranked among the top in Asia by 2008. To this end the government has appropriated $1.5 billion additional funds annually to beef up the universities and has taken a number of other dramatic steps. For example, laws have been changed to allow a foreigner to become President of a Taiwanese university. At the same time course requirements and schedule time tables have been relaxed to encourage flexibility and creativity. Perhaps most importantly, universities have been required to rate their faculty members.

The link between universities and the corporate world has been mediocre in the past. On the one hand, there was much emphasis on training engineers for Taiwan's manufacturing sector and attention was given to matching the demand and supply of technically trained workers through coordination with the technical institutes and universities. On the other hand, academic research tended to be insulated and isolated from the real world. The new plans are for much more joint innovation between industry and academia. The science parks have always been a mechanism for joining the universities and the corporations. More emphasis will be placed on this as well as on encouraging joint research in the technical institutes.

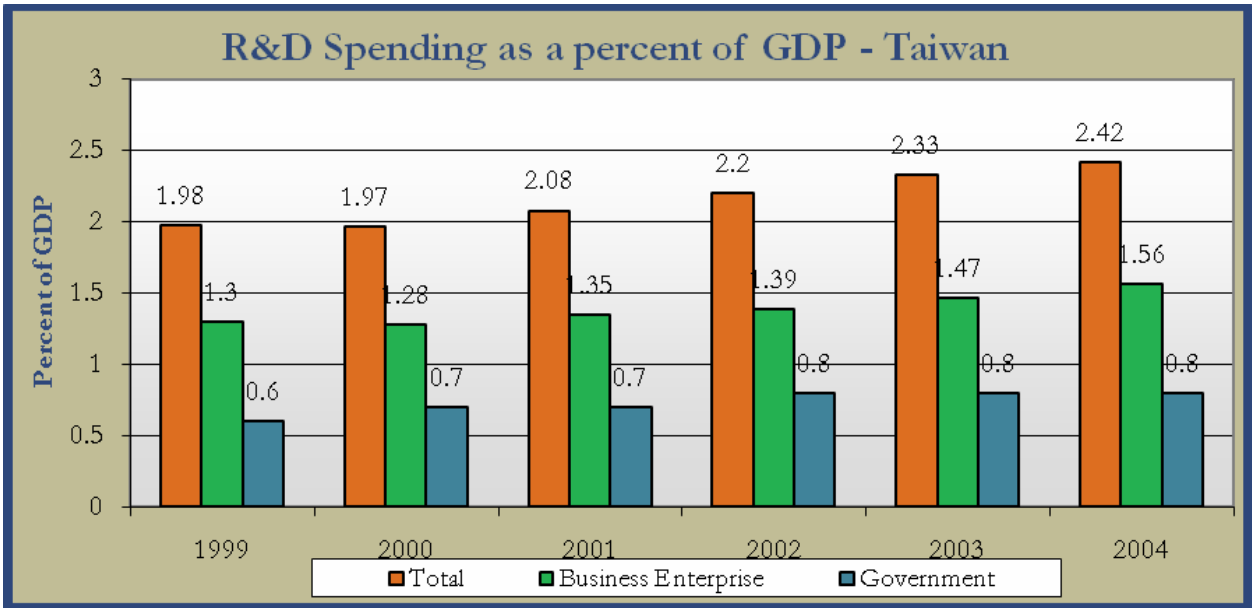


Finally, new emphasis will be placed on lifelong learning. It is estimated that as much as 60 percent of the population is now going to school in one way or another. The target is to have 80,000 people enrolled in life-long learning programs by 2008.



Technology and R&D

Taiwan has understood for some time that its future both economically and politically is highly dependent on being competitive in technology. This is obvious from the entire thrust of its economic strategy and industrial policy over the past twenty five years. It is also obvious from the all the data we have on the structure of Taiwanese industry and the content of its exports. Until now, however, this effort has grown largely out of and been an extension of Taiwan's role as an engineering and manufacturing based economy. It has therefore focused on developing into a producer of the leading edge technology products, particularly in the ICT field. However, now that much of the actual manufacturing is moving to mainland China, there is a new emphasis on Research (instead of mainly the D done in the past) and on broadening the areas of technology development beyond ICT.



The main body guiding future strategy is the National Science Council (NSC) whose latest plan is the National Science and Technology Plan for 2005-2008. This envisions raising Taiwan's technology capability to that of the advanced countries by 2010. Along the way, this will mean raising R&D spending to 3 percent of GDP by 2007, and increasing the number of research (not development or engineering) personnel to 4 per 1000 of population also by 2007. There is also a target of 6 million broadband internet users by the end of this year.

The plan outlines six major strategies with 185 separate measures to be implemented to make Taiwan into an international "Innovation and R&D Base" that will increase the value added and the digital ration of the economy. This effort has already led to the creation of 87 R&D centers and to the attraction of 27 MNC R&D operations. In addition, the plan calls for $1 billion to be invested in developing six strategic industries – soft electronics, nanotechnology, RFID, Smart Robots, Smart Vehicles, and Living Spaces. Finally, three new industrial parks are being planned which will focus on biomedical technology and communications and knowledge based service industries. Of significance is the fact that these parks include not only R&D and industrial facilities, but also ties to the network of research institutes and universities as well as incubators and links with the SME and venture capital networks.

That Taiwan is moving toward Research and Innovation does not mean it is ignoring technology extension and enhancement of its core competence. One current objective is to become the IPO capital of the world. In this case, IPO does not mean Initial Public Offering. Rather it means International Procurement Office. Already such companies as Apple, Cisco, Dell, IBM, Samsung, Toshiba, Siemens, and Philips maintain IPO's in Taiwan. Last year they procured over $70 billion worth of items from around the world from the Taiwan base. This business is growing at the rate of 12 percent annually.

Another current objective is to develop the next generation of Wireless Broadband and related services. (e.g. WiMax +3.5/4G). This is intended to lead to development of the digital home (e.g. Intelligent Housing, medical devices, and home multi-media edutainment systems.). Healthcare is also seen as an extension in terms of portable medical equipment and devices. Another focus is the so called Green Industry with emphasis on solar devices and energy saving technology. The objective is to generate production value of about $400 billion by 2015 in these areas.

More broadly, the objective is to use China as the factory and to leverage Taiwan's logistic, technology, educational, and partnership advantages to make Taiwan the IT hub of the Asia- Pacific Region. Taiwan believes it can "manage mainland China better than anyone else" and plans to turn that into its prime competitive advantage. Whether it will work or not only time will tell. But Taiwan will not fail for lack of forethought, planning, and effort.

SMEs and Venture Capital

Small and medium sized businesses have always been an unusually large part of Taiwan's industrial landscape. Although they constitute an unusually large proportion of the Taiwanese economy and have been in many ways key to much of Taiwan's success, SMEs have generally been left alone by the government's economic ministries and agencies – for both good and ill. The fact that SMEs have been allowed to flourish is evidence that the government never overly centralized economic power in the hands of the major state owned companies or government industries. Taiwan does not have any domestic version of the big chaebols and keiretsus that dominate the economies of South Korea and Japan, for example. Taiwanese entrepreneurs took advantage of this freedom to become

the backbone of the island's economy, particularly in light manufacturing industries like shoes, apparel and electronics. They have also often led the way in international trade and investment.

Pao-Cheng Shoes, for example, is a firm that has grown from a small operation based in the living room of its founder to become the world's biggest shoe maker. Pao-Cheng continually expanded its operations in Taiwan until rising wage pressures forced it to move its operations offshore – thus becoming one of the first wave of Taiwanese overseas investors. By the mid 1990s, the firm had 17 production lines up and running on mainland China, a further 11 in Indonesia, and 8 more in Vietnam.

Taiwanese firms have traditionally funded their growth the old fashioned way – through cash flow and close relationships with local commercial banks. The Taiwanese government initiated the domestic venture capital sector in 1984 when it created a venture capital fund to assist with the creation and development SMEs. This policy was a belated acknowledgement by the government of the power and significance of SMEs to the Taiwanese economy – and the need to provide them with new sources of capital as the economy moved up the ladder to ever more sophisticated and technologically advanced businesses. In 1998 measures were introduced to enable SMEs to take advantage of the incubators in the science parks, and the current Development Vision calls for stronger credit guarantees to the SME sector into which there are now over 100,000 new entrants each year. To encourage those entrants and foster their development into more than mom and pop operations, Taiwan has developed some 190 Venture Capital funds, many of which have close ties to Silicon Valley.

Infrastructure

A major part of Taiwan's strategy is to upgrade its already good infrastructure to the world leadership level. Already near the top in terms of broadband users, Taiwan intends to have broadband in virtually every household by 2010. This effort actually goes back to the 1996 National Information Infrastructure act. Current plans include M-Taiwan which will be the largest Wimax testbed in the world. It aims to have 17 Key Stone companies providing wireless internet access at high speeds to 8 million subscribers nationwide without surfing barriers. Ports will also receive much attention. The plan to make Taiwan an IT hub for the region

revolves significantly around having world class port operations. The Free Port program and the Kaohsiung Harbor Intercontinental Container Center will assure that (increasing container capacity by 50 percent). Other key projects include mass rapid transit, island-wide high speed rail (Living Circle – any place in one day), extensive installation of desalination plants and wastewater treatment facilities, and creation of international arts and music centers. A total of $15 billion has been budgeted for these over five years.

Fiscal and Monetary Policies

In common with all successful economies, Taiwan has maintained very prudent fiscal and monetary policies. From 1960 to about 1990, Taiwan sustained average annual growth of 9.4 percent while unemployment remained below 2 percent and inflation ran at 4.3 percent during the 1970s (including the oil crises) and at only 3 percent in the 1980s. In the 1990s, average growth was 6.5 percent, inflation ran at 2.9 percent and unemployment was 2 percent. From 2000-2005 the numbers were 3.6 percent, 0.8 percent, and 4.4 percent respectively. For most of this time the income ratio between the top quintile in income and the bottom quintile was 4.l7. This hit 6.39 in 2001 due to the affects of globalization and the dot.com bust, but has since come down to 6.03. That is a remarkable record by any measure.

Until the late 1980s, much of this growth was driven by high savings and investment rates that mobilized capital and labor. According to Lawrence Lau of Stanford University, increased utilization rates of capital and labor were responsible for almost all of the GDP growth in Taiwan from 1953 through 1985. Throughout this period, savings rates were very high - rising from about 17 percent of GDP in 1951 to roughly 40 percent in the 1970s and 80s. Interestingly, since the mid 1980s, the role of total factor productivity, a commonly used proxy for increases in technical progress and human capital, have accounted for roughly half of the growth in the economy. This reflects the shift to a more knowledge intensive and technologically oriented economy in Taiwan in recent years – as has the fall in savings rates from their peaks to about 25% today.

Throughout the postwar era, monetary policy kept inflation controlled and avoided overvalued exchange rates, while fiscal discipline kept budgets in surplus since the early 1960s. Since the advent of the 1990s, the budget has gone into

deficits of around 2 percent of GDP in every year except 1998. Nevertheless, public debt is still only about 38 percent of GDP. Given Taiwan's high rate of saving and huge current account surplus (its dollar reserves are close to $300 billion), this level of debt is not a problem. Moreover, government revenue is only about 16-17 percent of GDP while spending is about 18-19 percent, so the government financial footprint is relatively small.

Taxes have also been a favorable factor. Although the top personal rate is a high 40 percent of income, the loopholes make the effective tax rate for most people only 12-14 percent. Moreover, the corporate rate is only 25 percent and that, again, is effectively lowered by all the incentives of the science and industrial parks and other industry promotion efforts.

Service Sectors

One of the most dramatic pictures to spring from the statistics is the shift of the Taiwanese economy from industry and manufacturing to services. Clearly this represents a repetition in Taiwan of the experience of other developed and developing countries as they grow more sophisticated. Much of the development in services industries represents not so much a shift away from manufacturing as the separation by outsourcing of activities that were once all part of the manufacturing operation. Taiwan has shed much of the manufacturing business that depends on low or semi-skilled labor to cheaper locations on the mainland or in South East Asia. But Taiwanese companies still own and manage many of these offshore manufacturing operations, and retain much of the higher value added work domestically in Taiwan. Management, research and development work, design, marketing and supply chain management are all still based in Taiwan and many of these jobs are now classified as service sector. Indeed, Taiwan has developed into perhaps the preeminent world leader in managing global supply chains. This will likely prove to be the key comparative advantage of Taiwan in the years to come.

Taiwan has also been striving to develop pure services industries like tourism and finance. One of the major efforts of industrial policy of recent years has been the attempt to develop Taiwan as a Regional Financial Services Center, partly at least out of envy of Hong Kong and Singapore and anticipated rivalry with Shanghai. Liberalization actually began in the late 1970s and has continued steadily as the

economy developed and became more sophisticated. But with the advent of the 1990s and the turn toward a more services oriented economy, the notion of financial services as a new growth industry took hold and the planners began rapidly introducing programs to make Taiwan a rival to Hong Kong. Upon entering into the year 2000, targets were set to reduce the number of government owned banks from 12 to 6 and to halve the number of financial holding companies, and to have at least one domestic financial institution run by a foreign owned entity or be listed on an overseas stock exchange by the end of 2006.

The most recent three year Spring Plan is even more ambitious, calling for Taiwan to become a leader in the Asian securitization, wealth-management, and futures industries while also inducing top-notch local and foreign companies to make Taiwan their first-choice securities market. The plan goes into great detail, listing several hundred specific measures and reforms to be undertaken towards these goals. Unfortunately, we believe that this is an example of an unwise industrial policy - while becoming a major financial services hub is no doubt appealing to the government bureaucrats behind the plan, Taiwan will never be as attractive a location for financial services as Hong Kong, Singapore or Shanghai and thus the time, effort and money spent on developing the financial sector is unlikely to meet its objectives. While a more competitive financial sector will be a net benefit to the domestic Taiwanese economy, and hence some reforms should no doubt go forward, Taiwan should not waste resources trying to compete with the real financial centers of Asia because there is a problem – China.

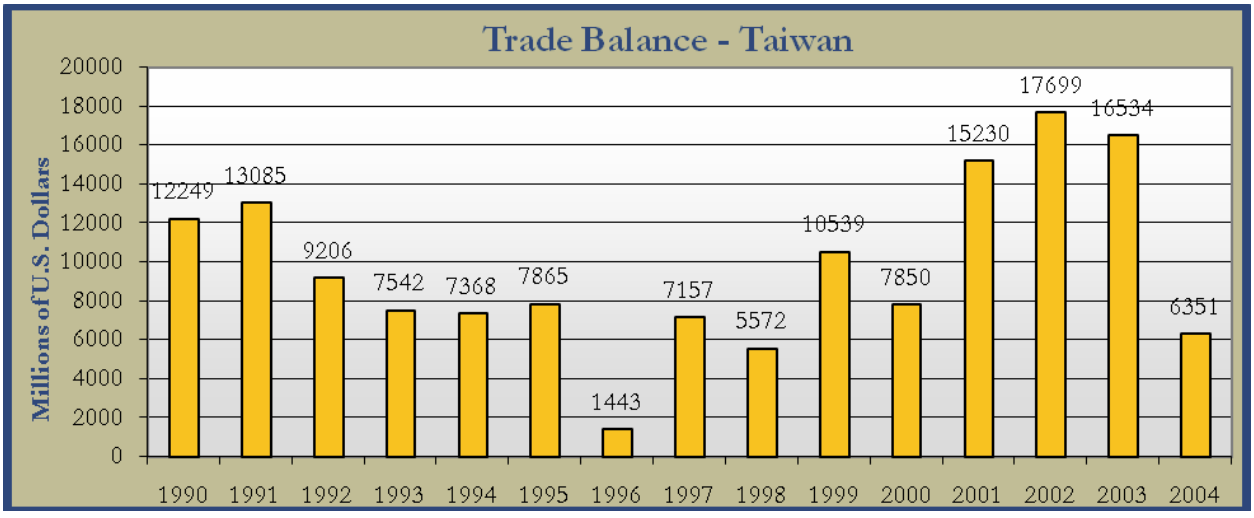
Hong Kong has long served as the gateway to investment in China and Taiwan can never hope to replace it, not least as long as the various restrictions on investment and transportation links the government has enacted remain on the books. But even if cross-Strait relations were somehow normalized, Hong Kong has built up a competitive advantage in financial services, with a strong base of human capital and powerful banking institutions with close ties to the mainland. The most significant competition facing Hong Kong comes from Shanghai, the historic financial center of China before the communist revolution and a city with the pretensions – and perhaps the political connections in Beijing – to try to regain that role.

Likewise, Singapore is well placed to continue to exploit its strengths as a center for wealth management and merchant financing. It is a major hub of South East Asia, has built up much in the way of human capital and institutional capacity, and is becoming an ever more popular source for capital flows from the Middle East and other oil exporting nations as well as mainland China.

International Trade

Export led growth has been at the core of Taiwan's development strategy from the early 1960s and it has made Taiwan, with a population of only 22 million people, the world's 16th largest trading nation. Total trade is now over $400 billion and exceeds the economy's GDP. Spurred by the development of China, it has been growing at the rate of nearly 20 percent annually which is faster than the growth of global trade. Taiwan has thus increased its share of the global trade market.

Although the structure of the economy has swung strongly to "services", exports remain a matter mainly of goods. Here the swing has been from mechanical devices and commodity manufactures to electronic equipment and components. Although plastics, steel, and such products still account for a large part of trade, it is the high end of these lines that is being exported. Not surprisingly, imports mirror the export composition with the exception of oil.



The really big development, of course, is the shift of trading partners. In 1995, Taiwan exported virtually nothing to mainland China (although 23 percent of exports went to Hong Kong) while nearly 24 percent of its exports went to the United States. In 2005, nearly 22 percent of exports went to mainland China with another 16 percent going to Hong Kong. Only 15 percent went to the United States. This again highlights the importance of the mainland to Taiwan and reemphasizes the Taiwan dilemma.

In fact, mainland China is not just a problem for the financial services industry. It is THE problem for Taiwan. The crux of the issue is that Taiwan cannot go where it wants to go economically without integrating more with China. But it cannot stay where it wants to stay politically if it goes ahead with such integration. The more it integrates the more leverage it gives to Beijing to bring political pressures to bear. For example, in order to maintain technological leadership, Taiwan currently prohibits the export of certain technologies to the mainland. But as U.S., Japanese, and other global companies set up shop on the mainland and demand cutting edge components from their suppliers the Taiwanese tend to be shutting themselves out. Or, take the plan to be a financial hub. It is going to be very difficult to be a financial hub in Asia without having fast communication and travel to China. But Taiwan presently has no direct air links with China. If you are in Taipei and want to fly to Shanghai, a direct flight of only an hour and a half, you have to go first to Hong Kong or Tokyo and then to China, flights of six to eight hours. Thus, until Taiwan figures out an acceptable political settlement with the mainland, not only the idea of being a financial services hub, but of being any kind of a hub will be difficult to realize.

Lessons for Mexico

Taiwan has developed a very competitive business environment centered on its international orientation and its strengths in engineering and manufacturing. It is moving aggressively to enhance these strengths and to branch out into services and high-level research and development in high-technology sectors. Three important lessons from Taiwan’s history of economic development stand out for Mexico.

First, Taiwan has shown that industrial policies can be used to enhance and promote entrepreneurial activity and technological innovation. While the ultimate success of Taiwan Semiconductor Manufacturing Corporation, for instance, must be due to a combination of strategic public policies, entrepreneurial energy, excellence in engineering, and to no small degree luck, the fact that a Taiwanese firm could essentially come out of nowhere to become a dominant player in the semiconductor industry speaks to the ability of Taiwanese business and political leaders to overcome obstacles to growth and promote investment in high technology industries. Economic development is ultimately about structural change, and as Taiwan has moved from a predominantly agricultural economy to one based on manufacturing to today's technologically driven businesses, the state has proved adept at fostering these developments and providing the extra push that enables private industry to enter new markets and fields.

Second, Taiwan's openness to international trade, investment and technology have allowed it to shed low-skilled manufacturing jobs and move up the value added ladder to more sophisticated knowledge intensive fields. Taiwanese business people's mastery of supply chain management have allowed the country's businesses to retain an important role in traditional industries like footwear and electronics manufacturing even as the factories themselves have left Taiwan and moved to locations with cheaper labor. Taiwan has not abandoned the management expertise and technical know-how gained in its previous stages of economic development (as so often happens when economies shed manufacturing jobs), nor has it fought to protect uncompetitive industries. Instead, it has constantly adapted its human capital to changing realities, building on previous lessons learned and expertise gained.

Third, although state agencies and ministries have played an important role in overcoming obstacles to growth and promoting investment in new industries, the country has not allowed economic power and decision making to become too concentrated in the hands of bureaucrats. The country's stable of small to medium sized enterprises have proved to be not just an engine of economic growth, but have also managed to ensure the most equitable distribution of income of all the Asian Tiger economies.