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Enhancing competitiveness through industrial restructuring:
Options for Asia-Pacific countries

by Rakesh Mohan



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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**Enhancing Competitiveness through
Industrial Restructuring: Options for Asia-Pacific Countries**

November 2000

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I. INTRODUCTION: NEW CHALLENGES CONFRONTING EAST ASIA

Following the debt crisis of the 1980s a large number of developing countries, particularly in Latin America and Africa went through 'Structural Adjustment Programmes' in the 1980s and early 1990s. The East Asian crisis of 1997 brought along similar adjustment programmes in East Asian countries. A certain degree of orthodoxy developed around these programmes which are even regarded by some as "international best practice" although clear evidence on either their success or failure is still inadequate and widely debated. Most of these programmes advocated a rapid opening of hitherto protected economies; substantial degrees of deregulation to free the private sector from government interference; restructuring of the government budget to reduce fiscal deficits, often through the cessation of subsidies to different parts of the economy; movement towards privatisation of public enterprises and, increasingly, greater involvement of the private sector in infrastructure provision. Lately, there has also been growing recognition of the importance of simultaneous action on social sectors, in particular the delivery of services such as education, health and nutrition, and directed measures for alleviating the suffering of those most affected by structural adjustment policies. Typically, although the ideal direction of policy action is known there is less advice on how such action is to be taken and what is the appropriate sequencing of actions affecting different parts of the economy. There has also been a debate on how fast or slow the pace of structural change should be.

Until the recent East Asian financial crisis most countries in the region were seen as the most successful developing countries that had navigated their way out of poverty within one generation. Between 1966 and 1996, for example, South Korean per capita income grew at about 6.8 per cent per annum, possibly the fastest growth of any country in the world in history. Similarly, China has recorded exceptional growth over the past two decades. A key indicator of China's success is that it has increased its share of world trade from less than 1 per cent in 1980 to almost 3.5 per cent now. Within the economy, the share of trade has more than doubled from about 16 per cent of GDP to about 40 per cent now. Its literacy rate is now more than 80 per cent. All of this has been achieved with increasing savings and investment (about 40 per cent of GDP) along with huge inflows of external capital. This success itself is now ushering in a new generation of problems: pressure from lower wage countries; rising real wages and aspirations; accelerating urbanization and the like. China therefore has to ascend to a higher technological and value added levels in the industrial sector. This has to be done in the presence of a large volume of excess labour which is likely to appear as state owned enterprises are reformed. This problem can be appreciated from the fact that the more than 50 designated high technology parks created in the coastal areas, which provide a significant share of Chinese exports, employ less than 2.5 million people. Thus it will not be easy to find ways of transforming the economy so that there is adequate employment creation and higher technology development in industry at the same time.

As documented in the World Bank's authoritative study **East Asian Miracle** these countries were seen to be following the so-called best practice policies. It is only after the widespread financial crisis of 1997 that questions have begun to be raised about the problems inherent in the kind of policies pursued by these countries. Another new set of issues has arisen from emergence of the so-called "New Economy". With the

onset of telecommunications revolution and explosion of information technology affecting all aspects of business new questions have arisen regarding the kind of policies that will now be required to further promote economic growth in East Asian Countries.

The knowledge revolution has created the need for faster changes in every economy to retain or achieve international competitiveness. A key issue for East Asian countries therefore is the creation of an institutional framework and incentive structure which allows firms, labour, and other stakeholders to adjust to changing opportunities and demand structures in flexible and innovative ways. This is one of the lessons learned from the recent Asian financial crisis. Sudden change in the external scenario of an appreciating dollar and downturn in world trade growth almost brought the whole East Asian region to its knees. Excessive reliance on low wage dominated exports is no longer a winning strategy. Firms have to be focussed much more on technological upgradation and innovation; the education and training systems in East Asia have to be transformed from the traditional examination and certification focus to greater importance being given to innovative thinking and problem solving; the government itself has to be more knowledge based; and a network of institutions has to be established to foster productive interaction between firms, research centres, universities and training establishments.

Are the reforms that have been undertaken by many developing countries, particularly those in East Asia, sufficient to push their economies onto accelerated or renewed growth paths? Is the removal of all the industrial, technology, foreign investment, import, capital market, foreign exchange and other controls adequate to provide the required environment and opportunity for their industrial sectors to attain the kind of growth necessary? How can the industrial structure be nudged so that the process of moving from lower to higher value added activities is accelerated? Is it enough for governments to remove themselves from the kind of intervention that they have practiced in the past? These are the kind of questions that have emerged as some of the East Asian countries like South Korea, Taiwan, Singapore and Hong Kong have achieved almost industrialised status. Others, China in particular along with Indonesia, Thailand and Malaysia have yet to diversify out of the traditional labour intensive industries to higher value added ones. They are being squeezed by developed countries at the upper end and by emerging developing countries at the other. That some of these countries are focussing actively on a strategy for the new economy is illustrated in Boxes 1 and 2.

Box 1

SINGAPORE

World Class Vision

The vision is for Singapore to become a globally competitive knowledge-based economy, competing on the basis of innovation and knowledge.

Twin Engines of Growth

Manufacturing and services must be developed as the twin engines of growth. This helps to diversify the economy reduce vulnerability and broaden the economic base. Singapore must remain an attractive

place for manufacturing investment based on total capabilities comprising skills technology and supporting services. The Economic Development Board (EDB) will attract investments in the high-growth, high value-added areas. It will help industries upgrade and develop new capabilities with focus on the electronics, chemicals, life sciences, and engineering clusters. It will encourage a balanced mix of manufacturing activities within each cluster to achieve greater resilience. It will also upgrade existing industries to stay globally competitive and develop emerging industries. Singapore will be developed into a premier services hub in Asia with a global orientation. Its existing hub status for traditional services will be strengthened. New high-growth services like education, health care, info-communications and media will be developed. Global services players will be attracted while local services companies will be helped to enhance capabilities. E-commerce will be promoted and the Trade Development Board (TDB) will expand Trade Net and establish a world-class infrastructure for international trade. The Singapore Tourism Board will make Singapore a world-class destination and Sentosa will be made more affordable and fun. Sentosa Cove will be developed as an integrated waterfront, leisure and residential resort and the Southern Islands will be developed over the next decade for recreational needs.

External Links

While local companies are encouraged to take part in the growth of the region, they must diversify their markets to other regions to tap new opportunities, and to spread risks. TDB will enhance its network abroad, and also support it in this through business missions, international exhibitions and other overseas market development programmes. An open, rule-based multilateral trading system is vital to the economic well-being of Singapore and it will take part actively in the new round of WTO trade talks. Regional and global trade and investment liberalisation will also be promoted within regional forums such as Asean, Apec and Asem. Singapore will also deepen links with economic partners by exploring bilateral WTO-consistent free trade agreements. This will complement the continued commitment to a new round of broad-based multilateral trade talks in the WTO and Apec's Bogor goals of a free trade in the Asia-Pacific.

World Class Companies

The goal is to make 100 promising local enterprises (PLEs) into world-class companies by 2005. The EDB will help them to build up core competencies in manpower, technology and market information. It will help both PLEs and MNCs to identify suitable opportunities for collaboration. It will also encourage PLEs to consolidate their strengths through mergers and acquisitions, and strengthen the equity base of growth companies through co-investment.

Strengthening SMES

The Productivity and Standards Board (PSB) will facilitate the growth of small and medium local enterprises (LEs) and help them to be globally competitive. It will help LEs raise their technological capability, efficiency and service quality. It will encourage them to pool resources, exploit IT and modernise management. A National Best Practice Centre will be established to promote widespread adoption of best practices. To sustain productivity growth, PSB will implement a Productivity Action 21 plan to prepare businesses and workers for the knowledge based economy, paying special attention to raising productivity in the construction and retail sectors.

World Class Manpower

The Ministry will support the Ministry of Manpower's efforts to develop a world class work force. It will maximise the potential of workers by supporting training and manpower development schemes such as the Skills Development Fund, Initiatives in New Technologies, and the Training Attachment Programme. It will also help to attract foreign talent to supplement the domestic workforce.

Research and Innovation

The National Science and Technology Board (NSTB) will develop the research and development capabilities of research institutions. It will also support industry collaboration and technology commercialisation. A critical mass of intellectual property-based enterprises will be built through the Technopreneurship 21 programme. The Buona Vista Science Hub will be developed as a focal point

for technopreneurial activities. NSTB will catalyse the development of a vibrant venture capital industry and financing infrastructure for high-tech start-ups. It will establish linkages with high-tech nodes abroad to help local technopreneurs gain access to foreign markets, expertise and business partnership.

Managing Resources

A SECURE reliable and affordable supply of water will be ensured. Besides seeking additional water supply from Malaysia and Indonesia, the diversification of water resources will be pursued. Our first desalination plant will start operation by 2005. Eight storm-water collection ponds will be built and the latest water treatment and reclamation technologies studies for use in Marina Bay when the Marina Barrage is built. The development of alternatives to potable water supply, such as industrial water will be encouraged. Land use will be intensified and reclamation will be speeded up so that there is enough space for industrial development. The Jurong Town Corporation will develop specialised parks for industry clusters such as pharmaceuticals, and new facilities to host emerging knowledge-based industries such as e-commerce. A secure and competitive national energy policy, with a balanced fuel mix, will be implemented and the import and use of natural gas will be facilitated. The electricity industry will be deregulated further and generation companies, divested to the private sector. The Public Utilities Board will facilitate the development of district cooling to serve the air-conditioning needs of cluster developments.

Source: "Straits Times", October 9, 2000

Are there additional measures that need to be taken to assist industries to become competitive in the world? Are there specific measures that governments should take? Is there need for specific governmental activity that would assist in the development of the technological capacity necessary for such industrial development? Or can industrial promotion activities be made more autonomous and decentralized? How can governmental or non-governmental structures, institutions, regulations, be developed so that the system is more responsive to the ever-changing economic and technological environment? Is there need for new institutional development that can aid in this process of industrial and technological upgradation? What would be appropriate industry and technology policies for a country after deregulation and opening of the economy? In brief, how can structural adjustment in the new industrial economy be made more endogenous. These are the questions that this paper is attempts to address in the context of East Asia.

These kind of issues have assumed greater importance with the advances in information and communication technology that have taken place over the last decade and a half. Furthermore, reductions in transportation and communication costs have been taking place continuously since the early part of the twentieth century. This process has also accelerated in recent years (Sanjaya Lall, 1999). Customers in all countries, both developed and developing, have better information on product quality, prices and variety than they did in earlier times. Low cost transport and communication coupled with open trade is putting ever downward pressure on product prices necessitating the attainment of higher productivity and quality levels in all manufacturing activities. Thus developing countries in general, and industrialising East Asian countries in particular, have to pay much greater attention to the attainment of technological competence in the future.

The broad debate on the administration of economic change and industrial restructuring has been between those who sing the virtues of the market and those who emphasize the role of government. Although the market camp has clearly been

on the winning side since the late 1970s, a reversal from the 1950s, the debate continues unabated with much vigour. As mentioned, explicit consideration of this issue was undertaken in the World Bank's comprehensive study of the **East Asian Miracle** (World Bank, 1993). This publication elevated the debate to a more sophisticated level since it gave grudging acknowledgement of the role of the state in most East Asian miracle countries, but added a relatively new spin: the state is successful when its actions have a built in performance regulator.

The 30 years of impressive growth in East Asia was built on an overall policy emphasising rapid industrialisation based on heavy export orientation and expansion of trade along with emphasis on high investment levels financed both by high domestic savings and utilisation of foreign capital. There was clearly a variation between the different countries of the region but these features were broadly common to most of the countries. In pursuing such a strategy it is quite noticeable that emphasis was also placed on significant investment in the development of basic human resources and in the provision of efficient physical infrastructure. Although there is considerable debate on this issue, almost all the east Asian countries practised active state intervention and direction to stimulate economic activity. "The East Asian experience can be characterised as a big industrial push tempered by prices and international market discipline to limit the egregious errors" (Ashoka Mody 1998). The impressive growth process and relevant macro economic stability experienced by East Asian Countries during the 1970s and 1980s were also helped considerably by the practice of sound fiscal and realistic exchange rate policies. It is true, however, that part of the financial crisis in 1997 was caused by excessive rigidities in exchange rate policy that had set in during the in the mid 1990s in some countries.

The 1997 crisis laid bare the fragility that underlay some of the impressive economic gains achieved in the previous 30 years. As the attention of governments was focussed on the industrial sector and trade most of the East Asian countries suffered from a very fragile financial system. The close business government relationships which were earlier admired for their efficacy in promoting industrial and economic growth, were found to result in different degrees of crony capitalism and fragile financial structure of firms. Family dominated conglomerates that led industrial growth in countries such as South Korea, Indonesia, Thailand and Malaysia were found to be extremely fragile in terms of the financial structure when faced with the kind of adversity that resulted in 1997 financial crisis. Most of these firms were overleveraged with debt emanating from a government directed financial system. The restructuring of these firms in each of these countries has been impeded by rigidities in both the capital and labour markets resulting from inadequate legal structures for restructuring and bankruptcy.

The crisis had its roots in the unsustainable world trade expansion of the early 1990s, which was accompanied by a slowing world economy. Within the affected Asian countries the problem lay as much in declining competitiveness in traditional export industries such as textiles, clothing, footwear, leather goods and the like, as with the financial sector problems. With international competition being what it is in these industries, the exchange rate appreciation of 1996 clearly hit them the hardest: the slump in these exports was much more serious than that in semiconductors and electronics though it is the latter that is generally more emphasized. Clearly, Asian countries have to move faster up the value chain both within these industries and

towards other higher value-added industries.

In most of these "traditional" export industries a good deal of value addition takes place both before and after the item is manufactured. Many of these items are manufactured on licence with foreign designs and brand names. A good deal of the product value accrues to the foreign design and brand-name holders. Whereas turning manufacturers into mass-market producers was a winning strategy in the past, the new strategy will have to be different. Asian companies must innovate and do their own designing, and build their own brand equity and loyalty on an international scale. Much of the foreign added value will then come home, leading to significant gains in competitiveness.

Broadly, this new approach requires greater attention to building a whole variety of ancillary tertiary sector knowledge based activities, which add value to core manufacturing. Perhaps this requires much greater freedom of thought and lateral thinking than Asians have been used to. Educational systems have to adapt themselves towards greater creativity while retaining their proven quality in educational basics. Asia must move beyond its core competency in repetitive manufacturing. The flying geese formation needs to admit newer patterns and destinations.

Within the manufacturing sector itself, technology and skill development are the order of the day for enhancing overall competitiveness. The absorption of foreign technology will no longer be enough: technology adaptation, innovation and creation will now be needed in good measure. Asian companies will have to devote greater resources to these areas, as will governments. Just as schools must move from rote learning to engendering creative thinking, so must colleges and universities. The creation and nurturing of centres of technology excellence would probably need international coordination within Asia. In brief, the traditional Asian veneration of learning must now be harnessed toward creative thinking and technology creation. If Asian countries understand this lesson and understand the value of knowledge embedded in the products they sell, their products will become less dependent on price competitiveness and sell more on quality, design and own brand name. Currency movements will then be less threatening.

Box 2

Republic of Korea

Three Year Action Plan for the Development of a Knowledge Based Economy

Policy Goals

Korea's new foundation for the new century will be built upon a knowledge-based economy and an information society.

The best response to the fast-changing global environment and institutions is to enhance the efficiency and resilience of our economy, based on human resource development.

Our governing philosophy- which is to bring about the 'parallel achievement of democracy and market economy' – also means expanding investment in human resource development and strengthening the middle class who will lead the market-based economic growth.

Korea must quickly shift its economic orientation toward a knowledge-based economy and an information society.

This involves upgrading and expanding our information infrastructure as well as promoting the growth of venture businesses and information technology (IT) industries.

Three Key Goals

Joining the world's top ten advanced information economies

	1998	2002(expected)
Speed of communication network	33.6 Kbps	2 Mbps
Number of internet users(million)	3	30
Number of schools, using internet network	1,613	All
Number of PC owners per 100 population	14	32
World rank of information development	22	10

Improving educational conditions to equal the level of OECD countries.

Goal of maximum number of pupils per class: until the year of 2004, in primary and middle school the maximum class size will be reduced to below 35, in high school below 40 pupils.

Average number of pupils per class

	1998	2004(expected)
Primary School (ages 6-11)	34.9	31.4
Middle School (ages 12-14)	40.8	33.9
High School	48.2	39.7

Expanding scientific and technological bases to equal the level of G7 countries.

	1997	2002 (expected)
Number of researchers per 10,000 population	30.1	40
R&D/government budget(%)	3.9	5
Number of patent registration	24,579	60,000
World rank of protection for the intellectual Property Right	41	Level of advanced economies
World rank of competitiveness in science and technology	28	10

Source: Republic of Korea: Ministry of Finance and Economy

With the changes that have taken place in the international regulatory environment with respect to open trade policies, governance of intellectual property rights, opening of capital markets and the like, the scope of old style industrial policies has become severely circumscribed as documented in the next section. The requirements of the knowledge based economy now necessitate active technology policies which are reviewed in section 3. Finally, there is now a greater need for establishing appropriate macroeconomic and "industrial framework" conditions which foster the effective functioning of markets. This requires different kinds of governmental action. The functioning of effective competitive markets requires appropriate legal and regulatory underpinnings to enforce transparency and accountability in the behaviour of firms,

and the availability of adequate information to all stakeholders. Whereas government may no longer need to directly provide social and physical infrastructure services, it clearly has to ensure that they are available in an equitable manner. Again this requires the development of regulatory and financial frameworks which facilitate such provision of these services. As these countries graduate to higher value added and technologically sophisticated industries and services, a great deal of creative destruction will have to take place to enable this transition. This requires the appropriate provision of legal and social security systems that facilitate such continuous and rapid restructuring. Singapore, for example, has recognised this explicitly and creative destruction has become a credo.

My attempt in this paper is to document the various kinds of industrial and technology policies that have been commonly put in to practice in different countries and then to provide indicators for what might be the best practice approaches to industrial policy for East Asian countries for the continuous restructuring that industry needs to go through in this ever changing world, particularly in the face of changes that are now being wrought by the advent of the "new economy"

II GOVERNING INDUSTRIAL DEVELOPMENT: AN ASSESSMENT OF TRADITIONAL POLICY INSTRUMENTS

2.1 What Constitutes Industrial Policy?

What are the policy instruments that are generally used for fostering industrial and technological performance in market economies? How are they to be distinguished from economic policies in general? The universe of these policy instruments is large and, in practice different observers, analysts and practitioners provide various definitions, each to suit their particular purposes. There is no widely accepted use of the term 'industrial policy'. Hence, it is useful to list the kinds of policies that I regard as fitting this rubric.

John Zysman and Laura Tyson, the former Chairperson of the Council of Economic Advisers to the President of the United States, provide a relatively restrictive definition:

"Industrial Policy reflects the view that competitive adjustment problems require policy measures tailored to the needs of industrial sectors and firms. Industrial policy means government policy aimed at or motivated by problems within specific sectors." (Tyson and Zysman, 1983a: 19)

They go on to say that this does not imply that appropriate solutions to sector specific problems would be sector specific. Thus some macroeconomic policies, such as interest rate reduction, could have sector specific impacts and could be designed as such. They would then be eligible for characterization as industrial policies.

Other commentators have found this kind of definition to be too narrow and favour a wider compass for the operation of industrial policy (for example, John Pinder, 1982b). Thus industrial policies could be related to the operation of product markets, ensuring adequate competition through surveillance of excessive concentration and size of firms. They could assist in the functioning of the various factor market markets: capital markets, the operation of labour markets, or of land markets. They could be regional development policies focused on industry; they could be technology policies devoted to developing capability or to the promotion of specific technologies. They could be institutional policies governing the operation of a conducive environment for industrial development as a whole. Many industrial measures are designed to encompass the whole industrial sector. Japanese industrial policy, for example, has been described by perceptive Japanese insiders as "a positive endeavour for the promotion of industrial development.... It rarely aims to develop or redress particular sectors" (see Hosomi and Okumura, 1982: 42). Another definition is focused on industrial change: "Industrial policy may be generally defined as any government measure, or set of measures to promote or prevent structural change" (V. Curzon Price, 1981: 17). This again is perhaps too, restrictive since it requires "structural change" to take place (or be wilfully prevented) as a result of policy action. Much of industrial policy could be aimed at good functioning of markets: under this definition it would not qualify as industrial policy.

A long collection of definitions of industrial policy could be made. The foregoing are given as mere illustrations to provide a flavour of what is usually regarded as falling under the general rubric of the term industrial policy. Not much would be gained by attempting to derive a focused definition of what constitutes industrial and technology policies. My interest is in helping to identify policies which would help East Asia in adapting their industries and to the challenge of the new economy. In this respect I have found Duchene and Shepherd's permissive approach to be the most useful: **"Industrial policies are best understood as all forms of activity by which the establishment in the widest sense tries to influence industrial management in directions collectively seen as desirable"** (Duchene and Shepherd, 1987a: 7).

Market economies are observed to utilise a rather large range of industrial policy instruments. It is difficult to categorise them in a very systematic manner since the same instrument can be used in rather different ways depending on the motivation for their use. An attempt is made here to list the different kinds of instruments that have been observed and to see how useful they can be for East Asian countries in the emerging scenario. The objective is to demonstrate that the range of action required for fostering continuous industrial development is large, even in the context of relatively open trade policies and after substantial deregulation of domestic markets.

2.2 Product Market Interventions

Much of the rationale for the efficient operation of market economies lies in the efficient operation of product markets. A good part of the East Asian success over the past three decades has resulted from the operation of relatively competitive product markets. Product market interventions are primarily motivated by a desire to make these markets perform better. The underlying premise is that most economic decisions are made at the microeconomic level, but made through the market mechanism. The proper allocation of resources requires that these markets operate efficiently. Industries subject to significant economies of scale typically experience problems in the operation of efficient markets, although recent developments in the theory of contestable markets shows that atomistic competition of the Adam Smith variety is not necessary for the efficient operation of markets. The task of policy is then to ensure that markets are at least contestable. This is the wide area of industrial policy covered under the rubric of product market interventions. They can conveniently be divided into external market interventions, that is trade policy, and domestic market interventions which are largely covered under competition policy. A good deal of state intervention has taken place in East Asia in product markets to promote industrial growth.

2.21 Trade Policy

This is perhaps the instrument of industry policy whose use (and abuse) has been the most pervasive in the history of industrial development. It is also the area that has received the most intellectual attention and controversy. Trade policy instruments have been used for all kinds of purposes: for protecting infant industries in the process of catching up; for protecting mature industries in the process of being caught up; as a strategic tool for promoting (protecting) capital intensive or technology intensive industries; as a sectoral tool for addressing regional concerns resulting from spatial concentration of particular industries; as a measure to smoothen or accelerate

industrial restructuring; as a tool of competition policy to correct internal product market imperfections; and as a means of fostering competitiveness in otherwise dormant industries. East Asian countries have used almost all these instruments at different times over the past three decades, in particular in their quest to promote exports.

The instruments used are also many. The traditional instruments used have largely been import and export tariffs and different kinds of quantitative restrictions (QRs) whereby imports or exports are restricted regardless of cost or price. As the use of the traditional instruments has become increasingly proscribed under various international agreements, multilateral through the WTO, regional through common market agreements such as in the European Union, and ASEAN and bilateral between many different pairs of countries, the armoury of trade policy instruments used by various countries has seen considerable innovation in the last two decades. 'Orderly Marketing Arrangements' (OMAs), 'Voluntary Export Restraints', and other forms of 'managed trade' have proliferated. Otherwise neutral regulations such as technical and safety standards, and health regulations, have also been used in a restrictive fashion as trade measures to regulate imports. Such measures have been used to regulate both high technology imports with the objective of promoting growing high technology industries, and for protecting declining industries as well. Much of the deregulation work in the European Union, after the removal of intra-community formal trade barriers, has been related to the identification, and then removal or harmonization of such standards or regulations. East Asian countries have generally practised outward orientation: exports have been promoted, and trade barriers have been relatively low, though not absent.

As trade competition increases in the coming years, and with the enforcement of WTO rules on trade barriers we can expect to see even greater "innovation" to be practised by different countries in both the developed and developing worlds. Given the importance of exports to the industrial economies of East Asia, each country will have to put in place suitable governmental capacity to monitor such tendencies in other countries so that they can be countered effectively through the available WTO mechanisms.

The basic rationale for the use of protective trade policies by countries in the process of catching up relates to the problems created by the existence of entry barriers in industries subject to economies of scale and the attainment of technological competition. For latecomers to industrial development in general or to a particular sector, protection from foreign competition provides the domestic infant breathing space for a period of time. This period can then be used by the infant to attain the relevant production and technological capability for achieving competitive production and at the appropriate scale of operation. The problems encountered in this process are manifold. Infants generally resist growing up and political and other pressures are used to prolong the period of protection, sometimes indefinitely. There are other objective problems as well. First, technological capability is often difficult to achieve without exposure to the harsh winds of international competition: trade is itself a purveyor of technical information. Second, the increasing degrees of economies of scale in many industries imply that an appropriate scale of operation cannot be achieved without looking at the world as the market rather than just the domestic market. Thus, although infant industry protection is generally recognised as a sound

basis for trade policy action, in practice there are many pitfalls, which are difficult to navigate through. Western European countries, particularly the relative latecomers, have commonly used infant industry protection as a means of breaking entry barriers: an early example being the use of tariffs by Bismarck to encourage the infant coal based steel industry in Germany in the 1880s. Even most Western European countries still continue to use this rationale for the promotion of the so-called high technology industries through different degrees of protection from the technology leaders in Japan and the United States. Whatever the temptations may be it will be increasingly difficult and undesirable to follow such policies in the future.

The fear of falling behind or being caught up gives rise to the most common objective of protective trade policy which has really been the preservation of old or mature industries in the face of increasing competition from firms in countries in the process of industrializing. The most important example of this is the Multi Fibre Agreement (MFA) and its predecessors which have regulated trade in textiles and clothing since the early 1960s. Developed countries in Western Europe and North America have slowed down their industrial restructuring through this means. High textile tariffs had prevailed in much of Western Europe against the import of cotton textiles from Japan in the 1950s (see Shepherd, 1983). The reduction in tariffs brought into force these quantitative restrictions which have been progressively expanded in scope to cover most other textile exporters and different fibres. Similar restrictions have been placed at different times on the import of a large number of 'low technology' products that threaten the older more mature industries in Western Europe, ranging from items such as shoes, to others such as steel. In other mature industries, such as shipbuilding, the protection has been exercised through competitive subsidies to producers, so as not to handicap the domestic buyers of ships produced abroad and benefiting from foreign subsidies. The common thread in the protection of all such industries is the preservation of existing employment, which tends to be large in these industries. It also often tends to be regionally concentrated. Such policy has tended to retard the process of industrial restructuring towards higher value added industries. "Overall, protection has done little to assist restructuring in industries in difficulty; yet the lessons which could be drawn from these experiences have not prevented the increasing application of protectionist measures to industries with strong growth prospects, notably those undergoing rapid technological change" (OECD, 1992a: 51). East Asia must avoid these temptations as their older industries mature and as they face the new challenges posed by the new economy.

As the East Asian countries advance further and wages continue to rise along with economic growth, some of the labour intensive industries will become uncompetitive under pressure from lower wage countries. There will be increasing pressure from both labour and capital to erect some kinds of trade barriers to protect these industries. Apart from the difficulties in practising such policies in the new multilateral arrangements under the WTO, it would be a major error to slow down the industrial restructuring which ought to take place in the face of such pressures. The correct response will be to put in place training programmes for labour along with schemes for their redeployment in the newer industries. Other measures for coping with these emerging pressures would be to encourage greater value added in the producer-related services both upstream and downstream.

Trade policy has also been used in a positive fashion for the promotion of exports by most East Asian countries. Once again, this instrument has been used both by countries attempting to catch up and to break into new markets and by countries attempting to retain their lead by providing support to industries that export typically capital intensive products. In the first case, export subsidies have been provided in various ways. Subsidies have been provided often directly in the garb of rebates against domestic taxes, or indirectly by protecting the domestic market. Export sales can then be made at even less than marginal cost if the domestic market provides excess profits through protection. In such a strategy, the rationale is once again that of infant industry promotion: the initial subsidies are essentially a means of compensating for entry barriers that exist in the form of brand loyalties, advertising, and other marketing activities of existing firms. The main export promotion activities indulged in by East Asian countries have been through the development of Export Promotion Zones, the allocation of effectively subsidised credit, and some protection of domestic markets. The existence of Export Promotion Zones effectively subsidises various infrastructure costs of firms, which would otherwise be higher. Protection of domestic markets provides some excess profits, which can then effectively compensate for lower export profits derived through competitive pricing.

The manoeuvrability that countries enjoyed with respect to trade policy over the past fifty years is no longer available. Tariff rates have fallen across the board and there is little scope to now use these instruments. In South Korea, for example, effective tariff rates had already decline to an average of 6.8 per cent by 1988, 4.5 per cent by 1996 and 2.8 per cent by 1999. (World Bank, 2000a). Much of the practice of trade policy was in the context of rigid exchange rates and autarkic economic policies. With the transparency now required by the WTO and the existence of flexible exchange rates, the days of protective trade policies are effectively over. Active trade policy will now increasingly lie in the realm of technology policy and promotion of human resources.

2.22 Domestic Competition

The second area of product market intervention is motivated by the desire to promote domestic competition in domestic markets. The first and most important area is competition policy in the advanced European economies, which has now extended to most East Asian countries. The second area of domestic market intervention is that of market entry regulations. These could be both competition enhancing or restricting depending on the policy motivation. In either case they are usually motivated by the desire to promote domestic industries in the process of industrial development. This is practised by those catching up, when it is felt that entry barriers exist in international product markets. The entry of new firms then requires policy intervention in order to correct for the distortions encountered. Countries attempting to stay ahead intervene in the promotion of new products on the grounds that evaluated risk is too high for the private sector to act alone. A third category of product market intervention is policy related to foreign direct investment. Policies encouraging foreign investment are generally competition enhancing. But restrictive policies are also practised to protect or promote domestic capability development.

In East Asia, most countries such as China, Taiwan, Singapore Thailand and Indonesia have actively encouraged foreign investment in the manufacturing sector. However, South Korea actively discouraged FDI in the past. After the 1991 crisis all

countries are even more open to FDI than in the past, including South Korea. The new issue in these countries is the opening of service sectors such as banking, telecommunications and the like to FDI.

Competition Policy

Competition policy is one area of policy, which most countries are now implementing more aggressively. The United States has traditionally given great emphasis to the operation of 'Anti-Trust' policies. The existence of a large continental economy there, and one that was overwhelmingly dominant until recently, meant that the competition provided by foreign trade was relatively unimportant. Furthermore, the growth of large dominant corporations also required effective monitoring against excessive market power. Interestingly, the threat of anti-trust action has been enough in most cases to deter monopolistic activity. The encouragement of family dominated conglomerates in East Asia militated against the active pursuit of competition policy. With the active industrial restructuring now taking place the judicious enforcement of competition policy will also assume importance. The practice of promoting competition is difficult to make non-discretionary. With the greater opening of trade barriers, and almost full opening of markets within different trade blocs, a key issue in the administration of competition policy is the definition of appropriate market size. In industries subject to large economies of scale the relevant market may be global: each market player is of very large size and each country may not have more than one or two players, as for example, in petrochemicals and cars. In these industries the appropriate competition policy is open trade policy. In other areas, national markets or trade bloc wide markets may be the markets where contestability must be examined. Competition policy also encompasses policy on mergers and take-overs: once again the administration of this requires the use of considerable discretion. Hence competition policy is a crucial but difficult area of industrial policy. As non-tradable areas such as telecommunication become open to private and foreign entry, the role of competition policy in these sectors will become very important.

As mentioned earlier, industrial policy is often primarily seen as government policy aimed at or motivated by problems within specific sectors. Sectoral problems essentially arise because of problems encountered in product markets. Whereas the first category of product market intervention is devoted to making internal markets more competitive, the second category of domestic product market interventions is usually competition distorting, though the use of open market entry regulations could also be competition enhancing. Countries attempting to catch up through the nurturing of infant industries often complement their restrictive trade policies by specific sectoral promotional measures designed to encourage domestic entry in those products. The rationale for such intervention could be the operation of oligopolistic markets at the global level. The desire is to achieve continuing upgradation of the industrial structure through the development of domestic competitive capability. This is attempted through various policy instruments, such as the encouragement of mergers; the promotion of 'national champions' through subsidies of various kinds; by restriction of competition in domestic markets; and through promotion of public sector enterprises to the exclusion of others. The encouragement of domestic market entry could be competition enhancing in the long run if it results in expansion of the number of producers in the world. If, however, the restrictive policies are pursued too long such product market interventions often end up distorting competition

indefinitely. These interventions then end up nurturing uncompetitive industries. Internal product market interventions could either be substitutes for trade policy action, for example through the grant of subsidies to domestic industries rather than the levy of tariffs; or be complementary to them, for example through the encouragement of mergers in the presence of open trade. Another type of product market intervention of the same genre, but as an aid to orderly decline, is the organization of recession cartels, as has been widely practised in Japan in the phasing out of declining industries. Where it is clear that an industry is losing its comparative advantage and firms are increasingly uncompetitive in world markets, capacity can be phased out in an organized fashion to minimize social losses.

The last decade has seen a significant opening to foreign investment by developing countries led by East Asia. This has happened alongside moves towards trade liberalisation, but often-substantial FDI opening takes place before trade liberalisation. This does give rise to FDI of the tariff jumping variety: the lesson is that FDI policy should be in tune with trade policy. Premature opening of FDI in sectors which are not open to trade can give rise to setting up of uneconomic capacities which can later lead to anti competitive practices. The simultaneous opening of FDI and trade naturally gives rise to new competition which then has to be matched with appropriate industrial restructuring. Flexibility in the operation of factor markets is then a necessity.

2.3 Factor Market Interventions

2.31 Capital Markets

As in trade policy interventions, the rationale for capital market interventions includes correction of (capital) market imperfections, infant industry promotion, and the protection or elimination of declining industries. The first category of capital market intervention is the enabling of efficient functioning of the institutions that work as intermediaries between savers and investors: this is a core market promotion function, the failure of which leads to the capital market imperfections which give rise to other interventions. The standard response that developing countries have used, as have most East Asian countries, is the setting up of "Development Finance Institutions" (DFIS) to promote industry. To the extent that such institutions receive some form of subsidy from the government they can even improve the development of well functioning capital markets.

The provision of direct capital subsidies to industrial enterprise is the second category of capital market intervention, which has also been used extensively in East Asia. In countries attempting to catch up, as have most East Asian countries, the very lack of well functioning capital markets, and, perhaps, the lack of availability of adequate savings was sought to be corrected by the state by providing capital assistance for setting up infant industries, as particularly exemplified by the heavy chemical industries, (HCI) initiative of South Korea in the late 1970s. The advanced industrial countries have to make continuous investment in new industries to stay ahead. Thus capital assistance is provided in sectors where it is judged that the risk perception is too high and the pay out period too long for the private sector to invest adequately within the prevailing conditions in the capital market. Further, various interventions can be made for assisting investment in small and medium enterprises (SMEs) on the

rationale that the capital market suffers from severe imperfections in this area. The third category of intervention is the indirect provision of capital subsidies for much the same purposes as the direct subsidies but with the government one step removed from the industrial enterprises. The fourth category is the governing of institutional processes, which enable capital mobility, particularly from declining industries, in the interest of industrial restructuring and efficient reallocation of resources. Finally, the fear of being caught up also gives rise to various types of capital assistance to established and mature industries. Old established industries tend to suffer from technological lock in effects and hence, it is argued, need capital assistance in order to compete. Such industries could also receive capital assistance on regional development grounds when they happen to be concentrated in specific regions.

The first category of capital market intervention is of the market promotion variety. Rather than providing subsidies, indirect or indirect, the State intervenes in the capital market by correcting for the market imperfections directly. "Financial markets in Britain and the United States are, by any conceivable measure, among the most highly developed institutions of market capitalism. Their capacity for innovation; their experience of revolutionary structural change; their increasingly global organization; the extent to which they apply rational calculation and high technology: all these show them to be the social vanguard of the market order." (Michael Moran, 1989:51). Ensuring the efficient operation of these markets is of the utmost importance if adequate volumes of funds are to be raised through these mechanisms for regular and growing investment for industrial growth and development. The importance of making capital markets work and of ensuring adequate transparency in financial transactions has been highlighted by the East Asian financial crisis.

Thus various schemes are devised for improving market information on investment opportunities and savings sources. The first necessity is the establishment of credibility of the intermediary institutions, be they stock markets, banking institutions, mutual funds, or other financial institutions. This does not happen overnight and complex regulatory processes and institutions have to be developed over time. This is a key area of activity for each of the East Asian countries, particularly if they are to encourage new capacity in the new economy industries.

Financial and Capital Markets

A great deal of attention has been given to this issue in East Asia in the recent years in the wake of the financial crisis, the quest is to ensure greater transparency and disclosure, strengthen corporate governance and accounting rules, and enforce prudential supervision of banks and financial institutions. A particular need is to improve the functioning of equity and venture capital markets in order to make it easier for risk capital to flow to the new economy activities. Market development and regulation is not easy: it takes time and has to be nurtured, government's own capacity has to be built up to bring in such change along with the establishment of credible and expert regulators.

Changes in technology also require a constant watch on the functioning of these institutions: the introduction of computerized systems of electronic funds transfer has, for example accelerated the speed of funds transfer tremendously adding to the volatility of capital markets. Investor protection requires constant vigilance as

evidenced by new legislation that had to be enacted for this purpose in both the United Kingdom and the United States as recently as in the 1980s. This had to be done despite the long history of stock markets in these countries.

Indeed, the Securities Acts governing the functioning of stock markets in the United States were passed in the 1930s only after the disastrous experience of the Great Crash of 1929. The whole governance of security markets is designed to improve information flows and for the protection of small investors. Capital market intermediation is enhanced if appropriate protection is available to the suppliers of funds. The promotion of these institutional arrangements requires considerable governmental intervention through legislation and the setting up of institutions. The development of credible financial markets requires continuous care and tending for which the government has to initiate adequate institutional capability.

Box 3

**Important Issues in Developing Venture Capital in China
Improving Access to private Equity and Venture Capital:**

These are at an early stage of development in China. Offshore venture capital appears to be more important as a source of capital for start-up companies than domestic venture capital. Recognising the importance of private equity markets for the development of the high technology sector, the government has increased efforts at stimulating the development of these markets. A RMB 1 billion venture fund has been established by the Bank of China recently, and work has started on venture capital and investment fund legislation. A comprehensive legal framework defining the legal-organizational structures, which can be used to establish private equity funds, known in China as "industrial investment funds", is required. Other related issues are the legal organization of fund (that is, a joint stock company or contractual), the need for trustees to protect investors against adverse actions of the fund manager, the use of fund manager and tax treatment to avoid double taxation. Appropriate amendments would also be required in company law, contract law, trust law, and taxation policy. Also the state presently plays the role of sponsor, investor, and fund manager. The investment industry in general would benefit considerably from the state's changing its role from patron of companies in which it invests to protector of efficient competitive markets.

Improving Access to Public Equity: The company law discriminates against the listing of private firms by requiring both a three year record of profitability and an RMB 50 million market capitalization as conditions for listing. The plan to open, by the end of 2000, secondary boards on the Shanghai and Shenzhen stock markets to give high technology companies greater access to the equity market is a step in the right direction. However, this policy change does not address the need for equity funding for start-up companies in traditional industries and services. Broadening and strengthening the range of exit mechanisms available to investors. With the opening of the secondary boards and official pronouncements of transparency in the listing approval process, non-state companies can expect more equal access to listing, countering the favoritism traditionally shown to SOEs on the main boards in Shanghai and Shenzhen. Under existing conditions, the lack of viable exit is the greatest risk to investors who continue to eye the possibility of listing firms in Hong Kong or elsewhere offshore. The current quota system for entering the stock market has given priority to state enterprises. This has resulted in inefficient use of financial capital and less chance for more efficient private firms to get investment funds through stock markets. It is recommended that state and non-state enterprises have equal access to finance on stock markets on terms that vary only with market-related characteristics of their investment according to central or provincial government criteria.

Source: World Bank (2000b)

The provision of credit rating systems, which improves the availability of information tremendously by providing market valuation of different categories of risk, is another

example of the kind of information services which need to be developed for efficient functioning of capital markets. East Asian countries have been slow to develop these systems that are now essential for their functioning. If information services of this kind do not develop adequately in the private sector, the government has to induce their introduction into the market. Capital market imperfections affecting start ups in SMEs are reduced through the provision of 'Over The Counter' (OTC) markets and through tax and other provisions making the operation of venture capital funds easier, another essential development in East Asian countries. Incidentally, capital market interventions that promote new entry also improve the operation of product markets by stimulating competition in product markets. The more successful the correction of these capital market imperfections, the less need there is for subsidies, direct or indirect.

The supervision of banking and other non-banking financial institutions is another vast area of governmental or quasi-governmental (through central banks) regulation. The complexity of this area being vast, and the financial sector itself being a whole sub sector of the economy, this area of policy action is not really subsumed within the broad concerns of industrial policy, except as they impinge on industrial functioning. The adequate and timely available of short, medium, and long term debt at reasonable cost through banking institutions is of direct concern to the efficient functioning of industry. The inefficient functioning of banks raises interest costs to industries, which could be instrumental in making them uncompetitive in international markets. The lack of competition in and of adequate supervision of the banking system could lead to higher banking costs and indifferent quality of service. The regulations governing relations between financial intermediaries and their industrial clients also influence industrial strategies and styles of management. It is argued by many that one of the differences in the functioning of industrial management's in Germany and Japan on the one hand, and Anglo Saxon countries like the U.K. and the U.S. on the other, lies in the greater and more active roles of banking institutions in the financing of industry in the former two countries. This feature has been said to give their firms a longer time horizon relative to British and American firms which have to pander to the fickle short term expectations of stock market investors. Governing the appropriate role of banks in industrial financing is therefore of considerable importance for industrial growth and development.

In East Asia, the close relationship between government and business on the one hand, and government influenced financial institutions and business on the other, have come under specially strong criticism in the wake of the recent financial crisis. In the past, the availability of large volumes of bank debt to conglomerate firms enabled rapid large corporate investments in highly efficient factories, new product development and penetration of international markets. As long as export volumes grew and these conglomerates could maintain healthy profit lines they were able to sustain high debt levels. But the absence of adequate impersonal capital markets contributed to the lack of early warning signals when the crisis came.

Direct Capital Subsidies

The second category of capital market intervention is the provision of capital subsidies. Intervention may be direct through state investment in public enterprises, or indirect through state subsidies to private sector enterprises. Whereas developed

countries may use this rationale for providing government capital subsidies in high technology and capital intensive industries such as aerospace, electronics and atomic energy, much the same rationale prevails for industrial latecomer governments to make direct investments or indirect ones through subsidies in industries that are regarded as too risky or capital intensive for the private sector to invest in. The Korean Pohang Steel Complex is perhaps the most celebrated example of a project where both domestic and foreign private investors were unwilling to invest and where the state invested directly and successfully to set up a competitive and highly profitable plant. Direct public sector investments in capital and technology intensive industries have been made widely in Western European countries since the Second World War but particularly by Italy and France. Direct ownership of declining industries, through nationalization, has been practised commonly, mainly as a means of slowing down structural change and thereby preserving employment, at least temporarily.

East Asian countries must avoid such temptation in the light of current adversity. Capital subsidies have been common in almost all-Western European countries for propping up declining industries such as shipbuilding and steel. The rationale is usually couched in support of modernization and technology upgradation as a means of accelerating restructuring but significant success through this instrument has been elusive. More often than not such capital support ends up slowing down the industrial restructuring that is desired, and merely protects the declining industry or enterprise from being caught up. It also damages the efficient firms in the same industry, either in other countries or at home. State subsidies to high technology sectors has been used in all the countries, the best known example being the Airbus Consortium which cuts across different countries. The state also often owns partial equity in private enterprises as a promotional measure. This practice can be understood as the state trying to act like a venture capitalist.

Indirect Capital Subsidies

The third category of capital market intervention, the provision of indirect capital subsidies is routinely made in most countries through fiscal instruments such as investment allowances, investment tax credits, special depreciation allowances, and special treatment of capital gains, usually for the promotion of more capital intensive industries, or of small and medium enterprises. These measures are sometimes economy wide and are therefore not specific to particular industries but more commonly; they are differentiated by sector thereby favouring some sectors over others. The rationale is essentially to aid investment in capital or technology intensive sectors in order to correct for capital market imperfections that otherwise reduce the perceived risk weighted return to private investors. Indirect subsidies are also provided through the banking system by means of subsidised interest rates and other banking instruments. Historically, state supported Banks have commonly been used to provide directed or concessional credits for the promotion of industrial investment in areas which are otherwise dominated by countries which have industrialized earlier as has been done widely in East Asia. Germany's process of rapid industrialization in the late nineteenth century was aided by state supported banks in response to general British dominance in industry (Pinder, 1982b). After the Second World War, Marshall Plan funds were largely channelled through banking intermediaries as indirect subsidies for new private investment. Indirect subsidies are also aimed at promoting

the start up of small enterprises where it is argued that the information imperfections in the capital market militate against the optimal availability of capital for SME start-up. Most of these interventions are indirect and made through banking intermediaries. It should be understood, though, that almost all indirect capital subsidy measures have an impact on the budget since the tax allowances or credits affect revenue generation and any support through banking intermediaries has to be supported through some budgetary subvention, direct or indirect. To the extent that such measures are fiscally sustainable, such interventions for providing for SME start ups can be practised usefully in East Asia.

Promoting Capital Mobility

The fourth category of capital market interventions that have been practised by many countries can be categorized as those promoting capital mobility. These measures could involve subsidies, direct or indirect, or other market promotion measures, which enhance the mobility of capital. Fixed capital is, by nature, immobile. Hence, in the interest of efficient allocation of resources and continuing industrial restructuring, it is necessary to intervene in the market and make this fixed capital mobile. In addition, to the extent that fixed capital embodies technology, the absence of mobility gives rise to technology lock in effects, which then impair the competitiveness of the enterprise.

The industries most likely to need restructuring at any given time are, almost by definition, those, which have been in existence for some time and have fallen behind in technology. What is required in these cases is a rapid restructuring of both labour and capital: labour needs to be redeployed as does capital.

The most important capital market intervention in this area is the creation of an institutional environment, which enables smooth and transparent bankruptcy procedures. Such procedures allow the smooth transformation of capital resources otherwise locked-in in declining industries. A market for depreciated capital stock arises in the process. Bankruptcy does not destroy physical assets, but it devalues them and gives new managers or owners an opportunity to better utilise them. Alternatively, when a failed enterprise shuts down completely, overall efficiency is increased since only the more efficient enterprises remain (V. Curzon Price, 1981). The capital owner can utilise the proceeds from the bankruptcy procedure in a more efficient manner, and the remaining devalued assets are also rendered more usable after appropriate valuation. In this process, capital is effectively made mobile. Different countries are found to have rather different bankruptcy procedures, some emphasizing the rights of equity holders, others the rights of debt holders, and others those of management and labour. What is of importance in the interest of capital mobility and industrial restructuring is the speed of these procedures. Impersonal or legally oriented procedures for industrial restructuring and bankruptcy are more important in countries such as the United Kingdom and the United States where most of the industrial capital is raised in impersonal capital markets through widely held equity and debt. In other countries such as Japan and Germany, where universal banks are more important as sources of industrial finance, capital restructuring processes are often internalised and made less impersonal (to the firm). These banks, acting both as important shareholders and debt holders in firms, themselves act to reorganise the locked in capital in declining firms. It is often argued that these procedures are less prone to the shortsightedness of stock markets and are therefore less likely to suffer

from such capital market imperfections. Capital restructuring is then done in a more timely fashion and waste of assets reduced. Others argue that there is much greater chance of conflict of interest arising in these bank based systems, where the transactions are not at arm's length. Banks in these cases could tend to prolong declining industries in order to delay loss of assets involved in complete bankruptcy.

The adjustment processes put in place in the countries most affected by the 1997 crisis have emphasized the development of these procedures in these countries, most notably South Korea, Thailand and Indonesia. This is a most important area of policy, which is absolutely necessary to implement in East Asian countries if they are to restructure successfully and also to reap the advantages of the new economy. Successful implementation requires appropriate legislation, the institution of speedy judicial procedures, the development of consultants and intermediaries who aid the restructuring process, financial regulation which allows for writing off a dead financial assets, and labour legislation which allows for corresponding labour flexibility. In East Asian countries, where the entities undergoing restructuring include large influential conglomerates, the problem of such restructuring cannot be minimised. Government will inevitably have a significant role to play in allowing for and encouraging such restructuring. It would be useful to establish specialised temporary financial institutions, which house the non-performing assets while they are restructured or disposed off. This is already being done in some countries. As the current problems are solved, such procedures have permanent basis.

The fifth category of capital market intervention that is widely practised is that in the aid of regional development. Most of this intervention is in the form of capital subsidies of one kind or another and could be subsumed under the first and second categories. I list it separately because of its prominence as an industrial policy instrument. Differing speeds of industrial development have not only been characteristic of different countries but also for regions within large countries. Most countries have had prominent programmes for the redressal of such inter-regional inequity. The key instrument used has been that of capital subsidy in different forms. Direct subsidies, interest rate subsidies, preferential availability of capital from publicly owned institutions, direct investment by public sector enterprises are among the instruments commonly used. As in other capital market interventions, the rationale is that the private capital market is not capable of providing the right amount of capital investment in these areas because of risk perceptions. It is only when agglomeration economies are achieved after some investment that the capital market begins to realise the potential returns from investment in backward regions.

2.32 Labour Market Interventions

Labour market interventions derive their rationale both from efficiency and equity objectives. Continuing industrial development and structural change requires ever-higher skills in the labour force. Unless there is adequate supply of technical training facilities there would be failure in the supply of appropriate skills in the labour force. Thus the first category of labour market intervention is action for the enhancement of labour skills, analogous to the role of capital subsidies. Education may be the crucial variable in catching up (Soete and Verspagen, 1993). The availability of appropriate and continuously improving levels of technical capability in the labour force is critical for the achievement of rapid technological development. Second, considerable state

intervention is needed to assist in the efficient and equitable operation of the labour market. Wage flexibility is very important for industrial efficiency, as is flexibility in the deployment of labour. Here, however, management of such flexibility is rendered difficult by overriding equity considerations. It is difficult for workers to sustain sudden wage losses, or to move spatially. Hence, labour market intervention in this area essentially consists of smoothening these transitions. Specific effort is needed for the correction of information imperfections. Third, labour market intervention is needed in different ways for the promotion of industrial restructuring of declining industries. The most intractable problem in industrial growth and restructuring lies in appropriate labour mobility because issues of equity are pervasive. Whereas capital can be scrapped, labour must be retrained and redeployed or retired. To the extent that the labour itself is not responsible for the changes in industrial structure that occur and which are beyond their control, there is strong rationale for government intervention for retraining and redeployment of displaced labour, along with arrangements for appropriate compensation for the temporary losses incurred. Finally, the problems of industrial development in backward regions are strongly related to the inadequate availability of trained labour. Specific labour market interventions are required to correct for this deficiency.

Technical Education and Training

Given the externalities and spillovers involved in technical education and training, there is always great need for appropriate government interventions. This seems to have been recognised by most East Asian countries, most notably South Korea, Singapore, Malaysia and China. A great deal of new investment is taking place in universities in these countries. New initiatives include the setting up of specialised research institutions within the overall university framework. A new feature of such activities is the interest being taken by prominent knowledge intensive multinationals in investing in research activities in these countries. Singapore is actively seeking out American and European universities to establish campuses in Singapore. Attempts are also being made to associate technical universities with new Science Parks. These are all efforts in the right direction and need to be intensified further.

In South Korea, total spending on education now exceeds 13 per cent of GDP: 4.4 per cent by the government, 2.3 per cent by parents on tuition and other expenses, another 3.2 per cent on private tutoring, and a further 3.4 per cent on additional expenses on materials, books and the like (World Bank, 2000a). This constitutes an impressive devotion to education: perhaps unmatched by any country in the world. There may, however, be some lurking problems in the education system being too examination and certification oriented. What is needed now is the development of lateral thinking, innovative abilities and problem solving approaches.

Box 4

Chinese Elite Universities as Key Actors in the Knowledge Economy

The top Chinese universities are becoming major actors in China's transformation into the knowledge based economy. They are not only training the future brains and leaders of China, but they are also very directly involved in the generation and application of knowledge.

The Beijing University considered as the Chinese Harvard, celebrated its Centennial last year by organising a meeting of the presidents of 157 'sister universities' which consisted of the most prestigious of the world. It is the site of 10 of China's 150 Key State laboratories. Some, such as the one on rare earth materials, are world leaders in their disciplines. The university has undertaken a deep reorganization of research institutes to facilitate cross fertilization. For instance, it has regrouped biotech, cell and molecular laboratories in a life science college; and has created a nano-technology centre integrating biology, physics and micro-electronics labs. It benefits from major collaborations with large multinationals. For example it received a \$ 10 million grant from IBM for equipment (the largest ever made in China), and has developed one of the world largest pioneering genetically modified organisms (GMO) test field with Monsanto. It has also spun off many new high technology companies, numbering about 60, one of which is a major one on the Chinese stock exchange. It also gets a significant portion of its revenues through profits from spin-offs in which it has capital shares and royalties and income it gets from companies that license its technologies, or contract its research.

Located close to Beijing University, Tsinghua, the Chinese MIT distinguishes itself by a multi-faceted entrepreneurial activity. More than 60 companies have spun-off from the institution in the recent years, three of them being listed on the stock markets for a total value of 26 billion yuan (in July 2000). The spun-off companies contributed last year a total of about 600 million yuan of revenues. It has also been very actively developing a science park in the Zhongguancun high tech zone (China's largest) surrounding both Beijing and Tsinghua. The science park includes an incubator which in a year has hosted more than 20 companies, half of them being expected to be listed on the stock market in the next two years or so. It also has a specialised patent office receiving an average of 150 deposits a year and 600 licenses a year. It hosts 15 key State laboratories and is investing enormous sums in new ones, e.g. in a post geomics institute built in two years with 20 million yuan and a core of Overseas Chinese attracted back from world class research teams based in Oxford, Rochester, and other places.

The Shanghai Jiao Tong University is acting on similar lines. It has doubled the outflows of graduates in the last five years (from 2265 in 1995 to 5170 in 2000). The volume of the research undertaken by the university has tripled in the last five years reaching almost 300 million yuan in 2000. A science park, part of a broader municipal, inter-college high tech complex, has hosted more than 200 companies, of which 30% have been created by university researchers and graduate students. Close cooperative agreements are in operation with 80 world class foreign universities. Research institutes have made major contributions to numerous Chinese top achievements in satellite, marine, nuclear and other advanced technologies.

To further spur these elite universities, the Central Government has created a special fund of 6 billion yuan for the 1999-2001 period years; 3.6 billion has been allocated to Beijing and Tsinghua universities to improve their facilities, raise professors' salaries, and invest more in research.

Source: Reproduced from World Bank (2000b)

Unless technical education and training is guided adequately by the market, there is likely to be a mismatch between what is demanded by industry and what is being supplied. Although the adequate supply of trained labour is determined by the educational system as a whole, it would be straying too far astray if general considerations of educational policy were included in this discussion of instruments of industrial policy. The areas of importance for industrial development are the systems for the technical education of engineers and technologists and for the vocational training of technicians. This is an area where great differences are found between countries. The crucial issue is finding the appropriate balance between government determined supply of this category of education and its responsiveness to the demand for skills as expressed by industry. Continuous upgradation in the quality of the training system is essential both for countries in the process of catching up and for those trying to stay ahead. In fact, countries falling behind are often characterised by specific failures in the upgradation of labour and scientific skills. The instruments

used are direct provision of vocational and engineering training schools by the state; appropriate certification procedures; the provision of educational and training subsidies, both for trainees and for institutions; and programmes for curricula upgradation, including import of training procedures where necessary. The availability of well-accepted certification procedures is also very useful for labour mobility. Where the vocational skills of workers are not well certified, mobility between firms becomes problematical and the development of internal labour markets between firms becomes more important. Differences in the quality and style of technical education and vocational training between countries are usually cited among the important factors explaining differences in relative industrial and technological performance of these countries.

Social Safety Nets

The second category of labour market intervention is to do with assistance in the efficient and equitable operation of the labour market. A good deal of labour market legislation is designed to protect workers from the threat of unwarranted dismissal and changes in working conditions. Similarly, wage levels are effectively protected through established systems of wage bargaining, which limit the flexibility of employers in the setting of wages. Thus elaborate institutions, conventions and practices related to worker protection have developed in all advanced market economies. Relations between employers and employees are governed by complex laws, regulations and conventions which limit the autonomy of employers in their relations with employees in almost all respects. The extent of this limitation on employer flexibility has to be traded off with the requirements of production efficiency which needs greater flexibility in the deployment and cost of labour. Where this conflict between principles leads to excessive rigidities and actual social conflict between employers and employees, production efficiency and capacity of enterprises to upgrade technologically is impaired significantly. The objective of policy intervention in this area is therefore to mediate effectively between the conflicting demands of equity and efficiency.

A great many instruments are used in this direction. Every developed country has an elaborate system of insurance against unemployment to provide temporary support when workers get unemployed. The level of support provided by these systems differs considerably across countries and each country attempts to calibrate it carefully so that the incentive to work is not significantly impaired, while the worker is protected adequately against the risk of dismissal. Most of these systems are run by governments though, in principle, private insurance could provide similar services. This is mainly because an element of compulsion is implied by universal coverage: for all workers to be protected everyone must contribute. Voluntary participation would be prone to considerable moral hazard and free rider problems. The availability of unemployment insurance promotes labour mobility since it reduces the pressure on employers to avoid redundancies during times of difficulty or when restructuring is required. In most European countries employers are usually required to provide further compensation for dismissed employees, by law, by convention or by collective agreements. The permissible causes for dismissal are similarly prescribed. It is in this area that there is considerable current debate. The persistently high levels of European unemployment in the last two decades are attributed by many to the growing rigidities in the labour market caused mainly by social labour legislation and practices. Others

disagree and point to low unemployment in earlier periods under similar circumstances and general social harmony in Europe in favour of the labour market arrangements that exist (see Robert Lawrence and Charles Schultze, 1987, for a full discussion on this issue). The government also provides extensive employment services for assistance in finding jobs, in retraining activities and in job creation. In summary, the effective, efficient and equitable operation of labour markets involves a great amount of government intervention which is largely unavoidable and the style and quality of which has substantial effects on the pace of industrial and technological development.

East Asian countries have a great deal to learn on this issue. China is beset with serious problems regarding the excess labour employed in the State Owned Enterprises (SOEs). The restructuring or shutting down of many of these enterprises will require careful handling of the labour to be redeployed. Similarly, in South Korea labour rigidities have inhibited the rapid restructuring of some of the large conglomerate industries. The widespread bankruptcy being faced by many industrial firms in Thailand and Indonesia also requires appropriate institutional frameworks for dealing with labour being rendered surplus from these industries. The continuous rapid restructuring that the industrial sector will go through in the future will require the implementation of appropriate policy, and development of institutional frameworks that promote labour flexibility while taking care of labour welfare issues. Much can be learned from the experience of European countries, which seem to have erred on the side of excessive rigidity and high fiscal costs. The development of funded unemployment social security mechanisms is essential for the medium and long term.

Employer-Employee Relations

Relations between employers and employees within the running firm are equally important for the efficient operation of labour markets and for industrial and technological development. Harmonious relations between employers and employees promote job flexibility within the firm: this has become more important in the context of new techniques of production management connected with total quality management, flexible production systems and the like. A particular characteristic of the continental European countries, in contrast to Anglo Saxon tradition in the United Kingdom and the United States is the State promotion of more equitable relationships between employers and management on the one side and employees on the other. Legislative actions promoting worker participation in management have been characteristic of continental European countries in increasing fashion in the Post World War period. This has promoted the existence of healthy industrial relations, which are essential for continual industrial development. It is argued, however, that excessive labour participation can slow down decision making and lead to rigidity in industrial structures. Once again, an appropriate balance has to be struck in laying down the framework, which is itself, a need for extensive processes of consultation between employers, employees, and the government.

East Asian labour practices have tended to be less participatory than is the case in European countries. As the labour forces in these countries ascend the education and skill ladders they will increasingly demand a greater role in the running of enterprises. As the influence of the new economy pervades all sectors of the old economy, skilled

and knowledge workers will form the majority of workers. Moreover, as the Japanese factory management practices have demonstrated even shop floor workers add considerably to productivity improvements when asked for their suggestions. This will be even more important in knowledge dominated industries in the future. East Asian countries will have to give special attention to this issue since their societies are typically more hierarchical traditionally than their Europe counterparts. But participation in the new economy will necessitate giving greater voice to workers.

The third category of labour market intervention is concerned with labour problems connected with industrial restructuring. These problems could be subsumed within the general issue of labour mobility. A distinction is being made here between the problems of marginal adjustments in normal day to day circumstances of market flexibility and discontinuous adjustments when whole plants or firms are restructured or closed down and when whole industries begin to decline. In these circumstances the government usually has to take more specific action for promoting labour mobility out of these industries. The instruments used are similar but are more directed to the specific problems of such labour. A much greater effort has to be made for retraining; for the search for new employment; for specific mobility assistance when spatial movement is necessary; for the creation of new productive jobs and the like. These measures usually have to be combined with regional development activities when the industrial restructuring in question is concentrated in specific regions. As in the case of capital adjustment bankruptcy procedures have an important bearing on the quality and speed of labour adjustment in declining industries. The fairness, or otherwise, of these procedures towards labour have a bearing on their attitude toward industrial restructuring. If the compensation procedures and redeployment assistance are not seen as fair there is likely to be much more labour rigidity in industrial restructuring. Government intervention in setting the framework for dealing with labour issues and in direct action for the aid of labour is essential for providing the means for rapid industrial restructuring as the need arises in competitive markets.

The fourth category of labour market interventions is in the development of backward regions. Industrial development in any region is a cumulative process. Industry begets industry. Industrial investment is often not made in backward regions because of the inadequate availability of labour, even if adequate infrastructure has been developed and capital subsidies are available for investment in these areas. Specific action for developing skills and technological capability is needed. This implies the location of new technical education and vocational training institutions in these areas. It is easier to attract higher qualified employees for industry if there are others of similar ilk available in these locations. Labour market interventions for the provision of trained labour therefore involves other associated actions, which are complementary.

The nurturing, management and development of the labour market is among the most sensitive tasks that governments face in the governance of industrial and technological

Development. It is also complex because the government can only set down the framework whereas it is employers, individually and as associations, and employees, individually, as plant level unions and as national unions, who in their separate and joint activities who actually make any policies work. A special feature of the social market democracies of continental Europe has been the creation of harmonious environments through legislation, jawboning and convention. The result has been a

scenario of industrial relations, which has been relatively free of discord. There may also have been some cost: industrial restructuring may have been a bit slower than necessary and inadequate for the demands placed by an increasingly competitive and global economy.

2.4 Regional Development Policy

Regional problems of relative underdevelopment are often sought to be corrected by specific actions designed to accelerate industrial development in these areas. Within country regional inequality seems to be more difficult to accept than international inequality. Whereas, typically, greater resources are available in advanced market economies for tackling regional development issues than those available for redressing international inequalities there are, perhaps fewer policy instruments that can be used. Regions that are backward within countries that are otherwise more prosperous do not have the independence to pursue autonomous macroeconomic, trade, exchange rate or other sovereign policies that may be in their interest. In principle, differences in wage levels could compensate for 'sharing' the same exchange rate as other more prosperous regions in the same economy. In practice there are severe limits to the differences that can be sustained between regions in the same country on the grounds of differences in relative productivity. Similarly, with freer migration between regions in the same country, it is difficult for backward regions to hold their better-qualified manpower. The result is that initial backwardness itself becomes a cumulative cause for backwardness. In principle, the availability of lower cost labour should induce manufacturing firms to move to the less developed regions, but the existence of agglomeration economies in the more advanced regions, compounded by the relative lack of infrastructure in the backward regions, leads to market failure that governments seek to correct. Policy action is typically taken by all the different levels of government, federal, provincial, and local in most countries. Similar action is taken at the supra national level of the European union. The actual instruments used have already been discussed under their appropriate categories above, but the high level of attention given to regional development concerns suggests that this area of policy concern be listed separately. Moreover, regional inequality problems in developing countries are, if anything, more severe than they are in developed countries. These issues are gaining increasingly importance in China, Thailand and Indonesia and require sustained attention.

The basic categories of policy action arise quite naturally from the identification of market failure in appropriate resource allocation between regions. First, the imbalance in existing infrastructure is sought to be corrected by governments. Second, the higher effective costs of capital investment are sought to be compensated by the use of capital subsidies for industrial investment. Third, problems in the labour market are tackled by special efforts at improving the quality of the labour force, and by the use of employment subsidies which are designed to compensate for lower productivity. Fourth, the lack of agglomeration economies are also sought to be corrected through specific actions and investments designed to increase the attractiveness of these regions. The policy instruments related to the capital and labour markets have already been introduced.

Infrastructure endowments of countries have developed over a very long period of time. The spatial distribution of economic activities, the historical proximity of some

regions and not others to, natural infrastructure such as the sea and rivers, and the related and consequent distribution of population and settlements has determined the distribution of infrastructure. Compensating for these historical legacies is expensive and difficult. Unless the initial infrastructure investment made by or induced by the state in these regions succeeds, the investment is rendered infructuous and contributes to eventual budgetary difficulties. Most European countries, for example, have had long experience with attempts to improve infrastructure in their backward regions through cross subsidies and special subventions but have seldom succeeded without other complementary activities. The largest effort has been for the Mezzogiorno region of Italy, which has met with some success but at tremendous cost. Direct investment in infrastructure elements such as roads, telecommunication, ports and airports have been made in backward regions, but they have to cope with the problem of moving targets since the more advanced regions also continuously improve their infrastructure levels with higher activity, income and technology levels. In summary, success in compensating for regional inequality is hard to come by through infrastructure investment without accompanying complementary market developments. China consciously developed its coastal region first. Similarly, South Korea developed the Seoul and Pusan regions, and Thailand the Bangkok region. There is now great pressure to develop other regions.

The problem of agglomeration economies has received more specific and innovative attention in backward regions in European countries in recent years. Some of these regions are the 'newly backward' regions: those regions such as the Northern parts of England and the Ruhr District of Germany which have suffered tremendous industrial decline and have therefore become backward regions in need of industrial renewal. It has been understood in some of these regions that regional attractiveness is a cumulative issue and therefore its redressal needs sustained attention. The restoration of or attraction of new industrial investment requires not only direct infrastructure investment, availability of capital and/or labour subsidies, but also other complementary educational institutions, business services, and leisure and cultural attractions in these regions. Many of these kinds of policy instruments have been introduced by government/private sector partnerships involving different levels of governments as well as different levels of private involvements. Their success has depended on the innovativeness of the local or regional authorities. Other agglomeration inducing activities include the initiation of localised industrial infrastructure such as industrial parks, science and technology parks, innovation centres and the like. Once again, these activities also usually fall in the domain of local and regional authorities, in association with industry associations and technical institutions. The introduction of localised technology diffusion institutions has also been attempted in some regions.

Box 5

Shanghai's Knowledge Economy Strategy

No.	Strategy Elements	Explanations and Details
1	Focus on Biotechnology industries	As Beijing has a strong information technology industry and Shenzhen a strong manufacturing base and Shanghai focuses on further exploiting an advanced biotechnology base and building the pudong Bio ST Park by providing incentives.
2.	Help enterprises to invest in R&D	Preferential tax regime and financial assistance are provided to help high technology start ups investing in R&D
3.	Put more public	Public resources are invested to establish new basic research

	resources in R&D	institutions focused on Shanghai's strengths and interests, to encourage cooperation between universities and corporations, to re-organise old research institutes, etc.
4.	Catch up information industries through competition	To develop bio-tech as a mainstream industry, IT industry is used as a major driving force. To catch up and reduce technology gaps, it is necessary to establish companies through intensifying market competition.
5.	Encourage use of Internet	Telecommunication and Internet access costs are lowered by government institutions given to monopoly state owned companies.
6.	Provide reliable information	Information released by Chinese governments or corporations used to be questioned on its credibility, and that raised transaction costs and affected information exchanges. Information reliability is being re-established by adopting international standards and regulating markets with more transparent rules.
7.	Stimulate information diffusion through networking	Discussion and information exchange networks are created among various institutions, including government, university, researchers and businessmen.
8.	Stimulate Knowledge Service Industries	Specific areas include education, software, consulting, design, advertisement, culture and health. Strategies focus on attracting outside professional employees and cultivating students' skills.
9.	Attract high-quality professionals to Shanghai	Restrictions on wages and immigration are gradually eliminated. A market-oriented reward system is designed to attract high-quality people.
10.	Establish a venture investment system	Laws and regulations aim at normalizing venture capital operations and management. Favourable policies, such as tax deductions, preferential loans and risk compensations, encourage venture financing. A venture investment system is formed with a venture capital market, a venture capital fund, venture investment management corporations, and numerous high technology firms.
11.	Establish a venture capital market	The major role of enterprises and individuals in venture capital market is acknowledged. Security secondary boards and intellectual property rights exchange markets are organized. Strengthening the "macro market", coordinating capacities of the government are developed.
12.	Mobilize Shanghai education sector	A highly-educated labor force is developed by increasing student intakes in universities and allowing private investment in education (which reduces the fiscal burden). Educators' market sense and management ability are strengthened in order to leverage education resources.
13.	Form innovative education system	An innovative and open education system is established by reforming the traditional exam approach, and course settings by adopting optional courses, and emphasizing creativity. Science and skill educations are strengthened.
14.	Turn bureaucracies into learning organizations	Government departments are instructed to act as models of learning organizations by focusing on cooperation and knowledge sharing through good social networks.
15.	Improve knowledge management in enterprises	Enterprises must acknowledge the value of knowledge capital, and set up incentive regimes including stock options, estimating intellectual property as stock etc. The market value of intangibles such as brand, trademark and patents etc. must be emphasized. Strengthening firm-based training is to be encouraged as well as labour mobility.
16.	Establish sound income re-distribution system	In order to ensure balanced development and social fairness, government aims at building up an appropriate tax system on personal income and inheritance. Also, it emphasizes Internet access and education for low income families.
17.	Establish social security system and efficient employment retraining	Unemployed people must be retrained to meet demand of the new economy. For establishing a stable social security system, government provides incentives to enterprises which create new

		jobs and the employment system is gradually changed from a government-led to a market-led one. Employment opportunities are increased by the development of SMEs.
18.	Build communities capacities	Communities are encouraged to become the basic units of education, retraining, public health and social welfare services. At the same time, improved information networks and connections are built to strengthen them.
19.	Design an information city	Information technology is used for public transportation system and other infrastructure to improve urban management
20.	Adapt city architecture	Balance city land usage: residence vs. leisure, work vs. study and information vs. transportation. Combine physical and virtual spaces of the city.

Original Source: Research on the Formation of Shanghai Knowledge Economy Strategies, Dec. 1999, Shanghai Science and Technology Committee (translation by World Bank Staff)
Source: Reproduced from World Bank 2000b

Often negative industrial policies are designed in the garb of regional policies. It is usually the case that a declining industry is concentrated in a specific region. All the interest groups then coalesce in pressuring the government to take action in slowing down the necessary industrial restructuring through restrictive entry policies, trade policies or labour policies. The health of a region would almost always be better served by the acceleration of the restructuring of the declining industry toward newer more competitive industries. Such positive actions may lie in the range of technology and training policies of the kind practised by some European countries in recent years.

III. THE WAY AHEAD: INDUSTRIAL POLICIES FOR THE NEW ECONOMY

3.1 Technology Policy

3.11 Overview

"Technical Change is a fundamental force in shaping the patterns of transformation of the economy."
(Christopher Freeman, 1988:2).

Continuing productivity increase is the key source of per capita income growth. And it is technological development that is the root of productivity enhancement. Inducement of technology development is one area where there is universal agreement that government has a very significant role, both directly in support of specific technical activities and indirectly in fostering an environment that is conducive to technological development. The source of this general agreement is that market failure is characteristic of this area and without adequate government intervention there would be underinvestment in R & D through normal market allocation (Arrow, 1962). However, the process by which technical change takes place and why some firms and why some countries do better than others is a source of continuing debate and research effort (see David Landes, 1969; Nathan Rosenberg, 1976; and Henry Ergas, 1984, 1987 a, b; among others). There is little agreement on what constitutes good technology policy and what is the appropriate extent of government involvement in technological activities. Except for the earliest industrializers in their early stages of industrialization, particularly Great Britain in the late eighteenth and early nineteenth centuries, the state has been active in attempting to forge technological development in all industrialized countries. This area is the focus of attention in most East Asian countries. China, South Korea, Malaysia and Singapore are each giving very specific attention to overall technological advancement.

China, for example, has so far concentrated on developing a manufacturing sector with strong export orientation. Much of this has been in the development of mass traditional industries such as textiles and garments, toys, shoes and the like. They have benefited greatly from foreign direct investment and have attained high degrees of manufacturing competitiveness. Their technology policy has attempted to make their scientific and technological research institutions to more industry oriented. This has been done by forcing them to be more reliant on contractual research. Correspondingly, having concentrated on primary education in the past they have now shifted attention to expanding secondary and higher education. The issue is whether this orientation is adequate for the need of the future, as China shifts from factor based growth to knowledge based growth. This problem is illustrated by the fact that less than 15 per cent of Chinese exports can be characterised as high technology exports. Sanjaya Lall (1999) has ably documented that the highest growth rate in exports is now in the category of high tech exports. Thus, if China and other countries in East Asia, are to retain their export competitiveness, they will have to increase the share of high tech exports. This requires the attainment of technological competence all round. The current Chinese expenditure in R&D is less than 1 per cent of GDP: this will not be adequate in the future and needs to at least double over the next decade.

Technological activities exhibit most of the symptoms of market failure. There are large positive externalities; much of R & D output is publicly available information and is therefore in the nature of a public good; even returns from private R & D investment in technology are not fully appropriable with information diffusion and mobility of scientists being the norm; there are significant economies of scale in R & D activities in many areas; and risk and insufficient information is intrinsic to research and innovation activity. At the same time, innovative products, new technologies, new processes, and new designs, all provide large first mover competitive advantages to innovative firms. Indeed, the new theories and empirical examinations of the patterns of international trade emphasise the importance of technology differences between firms and countries as explanatory of comparative trade performance (see, for example, Ray Vernon, 1970; Gary Hufbauer, 1986; Dosi and Soete, 1988). Hence, the interest of East Asian countries in upgrading technologically. The conduct of technology policy is seen as being an increasingly important component of overall national strategies for economic and industrial growth in the advanced market economies by some of the key policy makers and advisers in these countries (see Zysman and Tyson, 1983; Tyson, 1992; NAS/NAE/IOM, 1992; Robert Reich, 1992; Michael Dertouzos and others, 1989; Soete and Arundel, 1993). Equally, the achievement and retention of technological advantage is seen as essential by multinational enterprises. Thus there are large incentives for nations as well as firms for investment in developing ever-higher technological capability.

There is also a growing literature on first, the importance of building technological capability as a key means of catching up; second, the advantages of being technological followers for achieving rapid growth; but also the complexities of so doing (see for example Sanjaya Lall, 1987, 1990; John Enos, 1991; Soete and Verspagen, 1993; Larry Westphal and others, 1978; Carl Dahlman and others, 1987). Technology development being a cumulative process, technological leapfrogging is not possible and catching up involves making considerable and sustained investments in technological infrastructure (Robert Evenson, 1993). Yet, until recently, most discussion on strategies for the development of the less developed countries not give critical importance to the processes involved in achieving technological capability. Far greater importance is given to other policies such as overall macroeconomic and trade policies (see, for example, World Bank, 1991, 1993). It was only in 1998, almost twenty years after the first World Development Report that the World Bank made knowledge development the focus of its attention. There is a great need for much wider discussion on what goes into the building of technological capability; what is possible and what is not; what historical processes are instructive; and what are the institutional forms that are of relevance to those attempting to catch up with the technological leaders. The complex relationships that have developed between governments at different levels, manufacturing firms, educational institutions, research laboratories, and other technology diffusion institutions in the more technologically advanced countries are worthy of study for informing policy makers in developing countries. These issues are of crucial importance to East Asian countries at the different current stages of their development and to their new quest for acquiring technological capability. What may be appropriate for South Korea may not be so for China or Thailand.

The current thinking in Europe regarding the complexity of technological change and of designing policies for supporting such change, and which is equally applicable to East Asia, can be illustrated by the introductory statement in a report on the role of government intervention in technical change submitted recently to the Commission of the European Communities by a group of leading European scholars:

Technical Change is a complex dynamic process that involves many social and economic factors and a wide range of individuals, institutions and firms. It is dependent on the ability of firms, institutions and public agencies to develop and apply new knowledge through a cumulative process of learning. This process of learning at the level of an individual agent or organisation is linked to the aggregate economy by the diffusion of innovation and knowledge, which form the raw material for further learning at the microeconomic level. Therefore, the capacity of an economy to derive competitive advantages from technical change is dependent on the dynamic efficiency with which firms and institutions can diffuse, adapt, and apply information and knowledge. (Luc Soete and Anthony Arundel, 1993:11).

Accordingly, they have focused on "policies that affect diffusion within the general framework of innovation and technology policy". This kind of thinking emphasising the role of systems and of diffusion in technical change processes is distinguished from earlier views which tended to look at these processes in a more linear fashion. The earlier assumption was of a linear progression of technological activity from pure research to applied research, to advanced development, to technology diffusion, and then manufacturing and marketing. This thinking also led to strategies of 'Big Push' where specific industries were assumed to be amenable to development through large government investments in R & D and extensive support of specific firms and research institutions thought to be potential winners and national champions. The issue of encouraging technical change in an economy is now seen more as a problem of devising a 'National system of innovation' conducive to such change rather than of devising 'technology policies' (World Bank, 2000a). Christopher Freeman(1987:1) has defined the concept of the national system of innovation as that "network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" (see also Dosi and others, 1988; Bengt Ake Lundvall, 1992; and Richard Nelson 1993; for authoritative discussions on this view). The effectiveness of government is then dependent on a cumulative and long term process in which government is only one, although possibly the most influential participant. It is argued now that technical change is not a unidirectional process but is, instead, "complex cumulative process which contains both self reinforcing feedback loops and multidirectional linkages" (Soete and Arundel, 1993:12). It is a series of concurrent interactive processes each of which rely significantly on science and scientific engineering at every stage. Consequently, quick fixes are hard to find and the design of technology policy itself is more like a process than a linear activity. East Asian governments will therefore have to understand that, despite their best

efforts at ushering in technological change through government efforts, success of such efforts will only come if such complex networks actually develop.

Box 6

Preconditions for Efficient Technology Diffusion Programs

Based on the experience accumulated both in industrial and developing countries, the following general principles appear to be important:

- The status of disseminators should be clearly recognised wherever they operate (in specialised centres, universities, and so forth). They should be adequately remunerated for the services they provide and not penalized in their careers (for example, academics involved in technology extensions). In the Chinese context, soft technology activities of intermediaries were traditionally disregarded compared with those dealing with pure science or hard-technology production. In addition, the private sector's involvement in technology consulting services should be encouraged. Currently, most technology diffusion agents are converted from former government-affiliated institutions and are still largely controlled by line ministries, which do not allow private sector involvement.
- The appropriate status of a dissemination entity is generally that of a nonprofit organisation. This is the status adopted by the efficient organizations we have visited in China (for instance, head offices of science parks). However, it seems that such a legal status is not yet well established, and in particular the tax advantages normally associated with nonprofit organisations seem to be nonexistent.
- A minimal amount of guaranteed core funding is necessary for these organisations to operate efficiently in the long term. The amount of core funding will vary with the specific public good and the level of privatization in the specific institutions. In most cases, core funding should start with a minimum of 50 per cent of the total budget and can be higher when the organizations have to operate in depleted or developing areas, or when they are involved in research activities such as the engineering research centres. As demand takes shape, the proportion of core funding the sponsoring government institutions provide can be reduced gradually. These conditions are generally not those that most of the diffusion operate under in China today.
- Operations of a significant size, notably the large-scale programs that we will propose later, generally should be financed jointly by both the central government and the local or provincial authorities. This follows a principle of matching funds where the funding of the former is conditional on the capability of the latter to respond with a similar amount. Sometimes, alternatively on in addition, private business resources should join the programs to fund infrastructure elements such as buildings, equipment, and personnel.

The efficiency of the dissemination organisations is considerably increased when they are involved in well coordinated networks in which intensified exchanges of experience and information take place. Furthermore, regular meetings of responsible officers in charge of the dissemination organisations are necessary for ensuring good management, especially when they operate in areas or regions remote from each other.

Source: Reproduced from World Bank (2000b)

In what has become a very influential statement on the issue of technology policy in Europe Henry Ergas (1987a) reviewed how technology policies differ between various advanced market economies. He characterised the policies of the United States, United Kingdom and France as being "mission oriented", focused on radical innovations needed to achieve clearly set out goals of national importance, and primarily related to objectives of national sovereignty. In contrast, he saw technology policy in Germany, Switzerland and Sweden as "diffusion oriented". Closely bound up with the provision of public goods, the principal purpose of these policies is to diffuse technological capabilities throughout the industrial structure, thus facilitating the ongoing and mainly incremental adaptation to change" (Henry Ergas, 1987a: 192). As might be expected, he placed Japan in a class of its own as being both mission

oriented and diffusion oriented. He also viewed technology policies as facilitating factors rather than as explanatory factors in shaping patterns of technological evolution. The effectiveness of a country's technological infrastructure (or national system of innovation) depends on the way the "country's factor and product markets respond to innovation opportunities"(Ergas, 1987a: 193). Thus in outlining the technology policy instruments commonly followed, it must be noted that their efficacy depends crucially on the other aspects of industrial policies already discussed. **The overall incentive structure for industrial activity, as expressed through features of the economic environment such as the degree of competition in the economy, the trade policy regime, the responsiveness of the capital market to new opportunities, the technological capability of the labour force, and the quality of technical entrepreneurship, determine the effectiveness of technology policy.** This is particularly true today when many of the traditional levers of industrial policy are no longer available to the policy maker.

Much of the mission activity in countries was directed at selected industries. In the United States, for example, the aerospace industry has been the most important mission activity, with the main support coming from the defence department and the National Aeronautics and Space Administration (NASA). Similar has been the case for the United Kingdom and France as evidenced by the support given to building the supersonic transport aircraft and the Airbus through the grant of massive subsidies. Similar examples are available in East Asia. The development of the car and aircraft industries in Indonesia, and the car industry in Malaysia come to mind. Many other examples of industry support can be given for this practice of technology oriented missions. Whereas there is now little intellectual support for this instrument, what has replaced it in Europe and in Asia is the idea of 'generic technologies'. It is felt that whereas the state should not intervene in choosing specific industries for support because the market can do that better, it is defensible to provide public funding and programmes for generic technologies, on the usual argument of market failure in technology development. Generic technologies, it is argued, are those technologies, which are all-pervasive and affect the technical change across various industrial sectors. Public support for their development is essential since they are not internal to any one industrial sector. To some extent, this change reflects the importance of the new information technology, developments in telecommunications, and in biotechnology, to the development of other sectors right across the economy.

Given the systems character of technical change and the reality of the complex webs that form national systems of innovation it is difficult to list the various policy instruments in a systematic fashion. For this purpose, it is worthwhile to return to the basic rationale for government intervention by looking at the degrees of market failure in different areas and stages of technology endeavour. Although it is not always easy to distinguish basic or primary research from applied research, it is clear in principle that the private sector is least likely to invest in basic or primary research. It is here that economic returns are the least easy to appropriate: the uncertainty of achieving results is high; making public research results for peer review is important; and the results of basic research are essentially in the nature of public goods.

Box 7

Innovation Programs and Selected OECD Countries' Experiences

Innovation Policy Measures	Countries with Best Practices
Incubators, innovation centres, technology parks	Finland: Over the last decade or so, several dozens of innovation sites (including incubators, innovation centres etc.) have been successfully developed in Finnish cities jointly funded by local governments, central authorities and business communities. A remarkable feature of these initiatives is their self generating growth capabilities, despite the limited size of surrounding cities (50 to 200, 000 inhabitants)
Engineering Research Centres	Germany has a dense and diversified network of technical research and assistance centres serving the needs of industry (Fraunhofer institutes). Benefiting from a significant core support by the central government, the provincial authorities (lander) and also the business communities (grouped on a regional or sectoral basis), the centres provide their services on a contract basis. A number of them are established in universities.
Agriculture extension/rural development	Denmark built a century ago a remarkable network of cooperatives for developing its agriculture and related industries. In recent decades, it has supported efficiently the development of small enterprises in rural areas in building a dense network of low cost, (about 60 offices for one of the smallest European countries).
Civilian use of military technology	Several countries can offer examples of interest for China. The United States have gone through some valuable conversion experiences in certain regions with important defence industries. In France several large enterprises strongly defence oriented enterprises have successfully diversified their activities. The United Kingdom has efficiently reoriented defence-related government research centres towards civilian (contract based work)
Basic research support	The United Kingdom has developed a very rigorous system for evaluating, supporting and expanding its science base. Founded principally on an extended peer review process, with very selective procedures, the system is administered by a set of Research Councils for project funding, and for core support by the Department of Education as regards universities, and sectoral departments for government institutes.
Excellent centres	Canada has put in place in the last decade a network of about 40 excellence research centres throughout its large territory, each centre been constituted with complementary teams based in different places and connected by ICT means. Funding is provided for a three to five year period and renewed only after thorough evaluations.
Government R&D institutes	Japan's government R&D institutes (notably those established under the Agency for Industrial Science and Technology) have contributed decisively to development of the Japanese technology. Very solidly staffed and funded, and well plugged in international ST communities, they have played a key role in leading large R&D programs jointly undertaken with industry. Korea's experience for attracting overseas talent in the starting stage of its government research institutes should also be considered.
Public Interest-related research	The Netherlands has paid particular attention to the development of such research. For instance, world class, government institutes deal with key issues for the country such as sea works and water roads as well as agriculture and food

	industries. Important schemes support research in environment and sustainable development, involving all the different stakeholders, including local governments..
Tax incentives for R&D	Australia , among the advanced nations, used to have the strongest tax incentives for R&D and these incentives have been efficient to lift up the R&D efforts in industry which had remained very low. These incentives have been suppressed a few years ago after being the subject of extensive evaluation. Other countries with important experiences with such incentives include Canada and Spain.
Support to innovation in small and medium sized enterprises	France : Established in the late seventies, the Innovation Agency (ANVAR) has played a critical role in improving the innovation climate in French regions. Offices located in each of the 24 regions, provide packages of support addressing the diverse financial needs of smaller firms (including those in creation): seed money, loans reimbursable in case of success, subsidies to contracts with RD institutes, employment of researchers, links to venture capital, etc. Large delegations of authority on project funding are given by the central management to local offices.
Large Scale R&D Programs	The United States have the most extensive and successful experience in the development of large scale R&D programs, based on procurement policies in national interest areas such as defense, space, and energy. Some more recent, and more modest, schemes, such as the Advanced Technology Program, provide useful experience on the support of civilian industrial R&D in the most advanced technological nation of the world.
Evaluation of research structures and programs	Sweden has very efficient, low cost, procedures for evaluating its R&D structures and related government support, based on a systematic involvement of foreign expertise. Research activities (team, projects etc.) benefiting from the support of the Natural Sciences Funding Agency (NFR) are periodically reviewed, discipline by discipline, by teams of three international recognised experts, of which the reports are then made public. R&D programs of technological nature are also regularly evaluated, with some foreign expertise.

More details on these programs and other experiences can be found in relevant OECD publications (Directorate for Science, Technology and Industry).
Source: Reproduced from World Bank (2000b)

3.12 Basic Research

The first area of technology policy that governments have to engage in is in deciding the volume and composition of basic research to support. In the mission oriented countries, decisions are more based on the desire to invest in a few areas of 'national importance', whereas in the diffusion oriented countries these decisions would be more participative and the areas of research more likely to be organically linked to the rest of the national innovation system. In either case, a large proportion of funds have to originate from the government. Mission oriented research being typically linked to defence considerations there is a greater likelihood of research funds emanating from defence sources, with the associated tendencies towards secrecy in decision making and lesser diffusion. A good amount of basic research is also carried out in the diffusion oriented countries but it is less likely to be concentrated in a few areas. In developing countries or in newly industrialised countries much greater importance is rightly given to applied research. Although choices do have to be made in favour of applied research a certain amount of basic research has to be conducted even in these

countries to build a scientific and technological base. This may have become a problem in China in recent years where excessive attention may have been given to the promotion of applied research. In countries at the frontier there are additional problems of size of basic research. In the cutting edge areas of scientific and technological endeavour, aerospace and atomic energy in particular, there are significant economies of scale and the minimum volumes of research resources are high. Allocation decisions in these areas are difficult because there are additional problems of accountability and monitoring because almost all the experts in these areas are likely to be interested parties. Mission oriented countries tend to give greater importance to such areas and inevitably suffer from these allocation problems.

The implementation of basic and primary research is done in various ways in different countries. Institutional systems have to be designed for finding the appropriate levels and composition of funds to be allocated to such activities. These responsibilities are seldom centralised in one Ministry: it is more typical to find different ministries funding the basic or primary research in their respective areas. Ministries such as Defence, Industry and Trade, Finance and Economic Affairs, and Science and Technology (if one exists) are the major ministries involved in these activities. Ministries for non-industry related areas such as health and agriculture are also usually among the significant research investors. Pure science research responsibilities are usually split between the education and science ministries. Big-ticket items such as atomic energy and aerospace are often funded through defence ministries. Because of this dispersed nature of R & D activity there is often a high level scientific advisory body which usually reports directly to the Head of Government; it attempts to set national scientific and technological priorities, and mediates between the various competing interests. Government funds are disbursed to a variety of institutions and through varied processes. The basic problem is of accountability and evaluation. Bureaucracies are seldom knowledgeable enough to evaluate the competing claims of different disciplines and interests. It is then typical to delegate this task to intermediary organisations or committees with significant scientific membership. At the same time, there is usually a reasonably large system of research laboratories funded and run directly by government departments.

A number of different kinds of implementing research organisations can be identified: research is carried out in government owned and government run laboratories; in autonomous but fully government funded laboratories; in universities, almost all being exclusively owned by the state in most countries, whereas many are autonomous and private in the United States; by large research contractors in the private sector, again more common in the United States than in Europe; and in corporate laboratories. Each of these different kinds of research institutions receives substantial government funding through different channels. Private sector funding for basic research is relatively small but can be significant in some sectors. This activity is in infancy in East Asian countries. South Korea and China are making large investments. They will need to observe the different experiences available in Europe and North America and develop systems most suited to their conditions. A touchstone of policy making in this area will have to be the introduction of accountability at every level.

3.13 Applied Technological Research

It is in the second area of technology policy, applied technological research that more policy problems are encountered. The nearer is the R & D activity to production of goods the less rationale there is for government involvement. Furthermore, it is also desirable that this kind of research be done within industrial enterprises involving close interaction between the researchers and production personnel. Firms are quite happy to receive government support for such activities but the question always is whether this support complements the firm's own fund allocations or if it substitutes for them. The more 'pre-competitive' the activity is the higher the risk and greater the problems of appropriability. Consequently, greater are the chances of private under-investment in this kind of research activity. Thus, in general, there is justification for government support of 'pre-competitive' applied research where returns are still both uncertain and leaky. But there is less rationale for similar support of 'competitive' applied research, where results are largely proprietary and returns appropriable.

In practice, these distinctions are hard to apply and there are a great variety of practices that is encountered. Such R & D activity is also spread widely in a large variety and number of institutions: government laboratories; autonomous laboratories fully dependent on the government; autonomous laboratories dependent on both government and enterprise support; institutions supported by associations of firms; corporate laboratories; and private consultants. Apart from funding of R & D institutions, direct government R & D subsidies to firms are encountered in all advanced market economies; as are a complex set of tax arrangements amounting to significant indirect subsidies. Private funding of these R & D activities is substantial in all advanced industrial market economies. Indeed, the presence of substantial research activity within firms is a good indicator of their ability to respond to external market pressures. Where such activity is not adequate, that would constitute an additional reason for public programs to foster a more intensive R & D culture in manufacturing firms. In addition there is a complex web of arrangements in all the advanced industrialised countries between all the kinds of institutions mentioned, with varying degrees of accountability, peer review and monitoring built in. How effective such systems are depends on how well the different segments of the technological system communicate with each other, and how the technology suppliers interact with the sources of technology demand. It is in the design of relationships between different segments of the innovation system that economic criteria need to be built in order to achieve a balance between technology supply from the R & D system and technology demand from the firms and institutions nearer the market. Where these links are not strong and the technology suppliers are isolated, problems are likely to be encountered in the relevance of R & D being conducted.

The large conglomerates in South Korea such as Hyundai, Samsung and Daewoo had indeed began to invest heavily in technology and R&D, exhibiting some of the highest proportions of sales revenues devoted to R&D. With the financial problems encountered by them since the Korean financial crisis, and their subsequent restructuring it is not clear yet what the long term impact will be on these activities. Firms in China, Singapore, Malaysia and Thailand will have to build up similar technology cultures.. In these countries governments may have to design policies and procedures to induce such activity in the manner described above.

The importance of government support to technology development even within firms is recognised by the WTO and OECD alike. With the strict supervision that is now being done on trade and competition policies, R&D related subsidies are among the very few that are still permissible.

Much of the applied technological research activity relevant for industry is carried out in corporate laboratories. The competitiveness of firms, particularly at the technological frontier depends on their constant ability to innovate in terms of new or improved products, new or improved production processes, and in new or improved production organisation and management methods. Until recently, that is until the innovation in production practices introduced by the Japanese in the engineering industries, inadequate attention had been given to the potential productivity gains that could be derived from investments in such innovative activity (see Ashoka Mody and others, 1991a,b, c, d; 1992). This kind of research activity is an illustration of applied technological research, which could be classified as both pre-competitive or competitive. Such research is not particularly related to specific production lines or to specific products, and hence pre-competitive; but it also provides very substantial competitive advantages to the firms, which invest in it, and is hence competitive. Governments trying to foster pre-competitive research activity have essentially to devise instruments for encouraging this research within industrial enterprises. Finding a balance between substitution of their own efforts and complementing them is difficult and, inevitably, much governmental effort is devoted to so doing. With rising real wages and wage and price competition emerging from other countries, East Asian countries will increasingly have to compete on the basis of product quality and innovation, or on service delivery. This will require much more within firm R&D activity than has been necessary in the past.

3.14 Competitive Research

The third area of technology policy is related to the great amount of technological activity carried on further downstream: competitive research, product design and development, testing, production engineering, marketing and servicing, encompassing the whole area of technology diffusion. These are areas that are typically carried out almost entirely by firms but are also influenced by the general technological environment. As argued by a recent report of the National Academies of the United States, not only is there market failure in the support of basic research, but there is also market failure in the adoption of new technology (NAS/NAE/IOM). Indeed, the demand articulation for technology creation upstream depends crucially on the quality of these activities within firms in both the manufacturing and services sectors. The success of technology diffusion activities by both public agencies and firms is dependent on the ability of the receivers to absorb what is being disseminated. The realisation of the importance of diffusion has come relatively late but there are now active government programs of many descriptions attempting to promote technology diffusion in particularly small firms. As part of the overall effort to bring cohesion in the European Union, many programmes have been designed to promote collaboration between even the largest firms, with special emphasis being given to cross border diffusion. Many of the diffusion instruments are designed at the local and regional levels, with active partnership between the local and regional governments on the one hand and technical institutions, industry associations, and firms on the other. In many of these cases the role of public policy is essentially seen as a catalyst. Ironically, as

the European countries have got nearer the technological frontier, the more emphasis there is on technology diffusion, particularly to small and medium enterprises. There is a myriad of new programmes in all countries devoted to this purpose. They range from straightforward subsidies for employment of R & D personnel in small and medium firms, as in Germany, to subsidised provisions for technical consultants, as in the United Kingdom, and the setting up of public diffusion mechanisms such as the Innovation Centres in the Netherlands. The basic rationale for public policy is correction of information imperfections, which would otherwise not take place. Different countries have also made use of publicly funded technology information banks; in others, these have appeared in the private sector.

East Asian countries will also have to give specific attention to this issue. Japan has had its own "Keiretsu" tradition which has forged organic links between large companies and groups of small and medium enterprises that act as their ancillary suppliers. In the process a great degree of technology diffusion takes place. Special efforts will have to be made in other East Asian countries to develop similar networks and to promote better organic contact and hence diffusion between large and small and medium firms. Given the small size of countries apart from China, there is also need to promote cross-border diffusion. Regional programmes such as ASEAN could be used to promote such programmes.

3.15 Technical Education and Vocational Training

The design of effective technology dissemination systems does not just depend on the volume of government funding and on the functioning of the actual disseminating institutions. Dissemination is of no use unless there is effective demand and absorption of what is disseminated. Demand for technology is unlikely to be generated unless firms feel the need for continuous technology upgradation. Competitive market pressure generates such need. Without competitive pressure there is little incentive for firms to expend the resources required for continuous technology acquisition and improvement, and for investment in R & D. However, this is not always sufficient for the generation of adequate response. Competitive pressures could as well lead to competitive loss when the technical response does not emerge, or cannot emerge. In such a situation the release of competitive forces through opening of markets could well result in deindustrialization. The basic requirement for technical responses to be generated is the adequate availability of technical competence in firms. Technical competence is necessary at all levels for firms to be technologically dynamic: management must be technology friendly; adequate R & D capability must exist for the purposes of the firm; technical personnel must be open to innovative activities; and the workers and technicians must be technically capable of absorbing technology upgradation. The changes in production technology, increasing electrification of processes, and the spread of new forms of work management are all contributing to greater demands for technical sophistication of all workers from the shop floor to the board room. Conscious building of dense technology networks between all the many public, private, and co-operative institutions mentioned is the task of technology policy.

Whereas the building of such a technology culture is determined by a whole set of historical and societal conditions far beyond the scope of this paper and my own competence, an essential ingredient of the fourth category of technology policy is

making available appropriate technical education and training systems. This issue has also been addressed earlier in the discussion on labour markets. The building of a technology culture requires not only the availability of an adequate quantity of technical education and vocational training but also the appropriate style and quality. East Asian countries exhibit a large variety of institutional systems devoted to technical education and training. Close interaction between industry and institutions of technical education and training is generally found to be an important characteristic of successful systems from the industrial technology point of view. Institutions are needed at many different levels and also with a good geographical spread. Only then are the varied levels and kinds of technology requirements and concerns of different sectors of industry adequately addressed. Interaction cannot be legislated but rather developed through dynamic need articulation and responsive supply. Technology demand articulation is aided if industry personnel are themselves technically competent and are also receptive to and aware of the technological potential for problem solving. It is under these conditions that there is adequate communication between those requiring technology and those supplying it. Since the organisation of and pattern of financing of technical education and vocational training is largely a government responsibility this is an important policy instrument for fostering technology development in industry. Most of the attention in technology policy is typically devoted to the organisation of technology supply institutions, both those that are technology generators and others that are diffusion agents. It is the lack of adequate attention to technology demand articulation that often leads to failure of the technology suppliers and thus of technology development as a whole.

3.16 Technology Framework Conditions

(i) Technology Standards:

A fifth area of technology policy activity is the creation, maintenance and constant renewal of what might be called technology framework conditions. Japan, for example, consciously created strong institutions for the creation of standards as a means of diffusing technological knowledge and simultaneously upgrading quality standards throughout Japanese industry. Standards have to be devised and then constantly updated with changing technology and quality requirements. The standards that are needed are not only technical standards but also marketing standards related to standardised description of goods and services, and others related to mundane things like weights and measures. Environmental and safety standards are other sets of standards that are gaining increasingly in importance. The diffusion of new environmental technologies and of improved safety standards constitutes a relatively new opportunity for widespread technology diffusion. Greater the transparency of these standards the more useful they are. The diffusion that takes place is not just after the standards are set. The process of setting them can itself be used as an effective diffusion mechanism if it involves widespread consultation. Great differences exist between countries on this account. Emphasis on the maintenance of standards through public policy sends a strong message throughout industry also giving rise to a whole host of private engineering and design services which help smaller firms. Standardization is particularly important in the engineering industry where the standardisation of components reduces transaction costs thereby improving industrial productivity. It also makes make entry of new firms easier, which provide the competitive threat, necessary for existing firms to be on their toes constantly.

(ii) Intellectual Property Rights:

The system for governing intellectual property rights is an important component of the technology framework. This area has received new attention due to its coverage in the Uruguay Round of the GATT. The efficiency with which intellectual property rights are protected may have some bearing on inventive activity. What is perhaps more important is the technology diffusion and information dissemination function of the patent system. Its existence provides an incentive to innovators to make public their innovations, and the availability of the technical information in the patents is a useful technology diffusion device. For industrial latecomers, traditional patent systems may have limited relevance for encouraging indigenous innovative activity. In these economies, much of this activity essentially consists of adaptation of foreign technologies. There is little original innovative activity, which is patentable. At this stage, the value of having a patent system is mainly to reassure foreign technology suppliers that their technologies receive adequate protection in these importing countries. For encouraging their own adaptation oriented innovative activities they need to introduce systems of half patents or 'utility models' (see Robert Evenson, 1990). Thus the design of an appropriate regime of intellectual property rights should be done in a manner consistent with a country's innovative capacities. Excessive protection through the patent system can also dampen technology diffusion.

(iii) Public Procurement Processes: Another aspect of the technology framework in a country is the use made of public procurement practices for technology upgradation and diffusion. The public sector is a large player in the market in all advanced industrialized countries in many important areas of technologies. In areas such as construction of roads, bridges, public buildings, utilities, telecommunications, railways, information dissemination, public agencies are the main buyers. This buying power can be used constructively in the diffusion of technology standards and of quality in a very effective fashion. It is common to see the opposite happening as well. Inadequate attention to public procurement procedures can lead to the building of stagnant supply monopolies who exploit their market power to thwart the introduction of new technologies in their areas. This has been particularly noticeable in the operations of most of the telecommunications monopolies and their equipment suppliers in European countries. A significant portion of telecommunications is now in the process of being privatized in many countries but the core areas have traditionally been under the control of publicly owned monopolies in most countries. Advances in electronics and information technology depend to a large extent on the technology and market openness of the telecommunication giants (see Alan Cawson and others, 1990, on the behaviour of European telecommunication monopolies). Thus this large area of new technologies is significantly dependent on the procurement practices of public agencies. Such examples can be multiplied in many other areas: suffice it say that procurement policy can be used in favour of technology development in a very constructive fashion if it is so organised.

(iv) Export and Import of Technology: The regulations concerning the export and import of technology form part of the technology framework in any country. In most industrially advanced market economies the import and export of technology is quite free. The restrictions that exist are mostly in the garb of security needs to restrict the international diffusion of 'dual use' technologies. The main areas of civilian

interest that have been affected are in aerospace, electronics and nuclear energy, with the restrictions led by the United States. Such restrictions have indeed posed problems for technology followers but they are usually only effective in delaying the diffusion because of information leakage's that are endemic to technology development. They also provide greater incentives for the follower countries to invest in the development of these technologies. What has been of much greater importance in the past for developing countries is their attitude to the import of technology. Indeed the policy on technology import has often been seen as the most important instrument of technology policy. Those practising restrictive policies on technology imports have done so in order to provide strong incentives for local technology development. Others have encouraged technology imports with the motivation of speeding up the catching up of the technology leaders. The increasing importance of multinational corporations has meant that a large amount of technology transfer takes place within the corporation between headquarters and subsidiaries, or between subsidiaries. In European countries concern exists about inadequate technology transfer within foreign multinationals. Where multinational corporations merely locate final assembly operations in the host country, the fear is that there is very little technology transfer and hence little technology capability building in the receiving country. Local content regulations have then be used to force such technology transfer. It has also been observed that multinational corporations usually conduct most of their R & D activities in their home bases (see, for example, John Hagedoorn and Jos Schakenrad, 1990). The only effective policy instrument to persuade them to do otherwise is the existence of an effective 'national innovation system' which would induce such multinationals to conduct significant R & D in their subsidiaries. Thus the design of effective technology import policies is no longer an issue of regulating overt technology transfer agreements between firms: account has to be taken of technology transfer within the large multinationals and how they can be encouraged to make such transfers on a regular basis.

(v) **Technology Parks:** A relatively new activity in establishing favourable technology framework conditions to encourage technology oriented enterprises is the establishment of technology parks, science parks, innovation centres and the like in all East Asian countries. This reflects specific acknowledgement of the importance of agglomeration economies in technological endeavours and that technology development is not a linear process. The location of industrial enterprises, both large and small, in close proximity to scientific and technology generating institutions recognises the symbiotic relationships that exist between the generators of technology and the productive enterprises. Not only do the manufacturing enterprises benefit from the proximity to research and other institutions, but so do the research establishments. High technology industries which have a close relationship with the laboratory are obviously more prone to benefit from such arrangements. It also makes it possible to transfer results faster from the laboratories to their eventual applications. The transfer of embodied technical expertise in the form of scientists and engineers moving from research or development activities to entrepreneurial and manufacturing activities is another source of faster technology development possibilities in these science parks. A specific function of these parks is the encouragement of new technology start-ups, which typically provide challenges to existing enterprises. Public agencies at regional and local levels in particular are using such science and technology parks as important instruments for fostering industrial and technological development of their regions in all European countries.

Box 8

Suzhou Science Park

Suzhou New and High technology Innovation Service Centre-Suzhou International Business Incubator-China Suzhou Pioneering Park for Overseas Chinese Scholars (the three functions are basically carried out by the same staff; hereafter they will be referred as "Park") is a non profit technological service institution. In 1994, the first incubation site was put into use in 1994. In 1996, the United Nations Development Programme and the Ministry of Science and Technology approved it as one of the first four international business incubators in China. In 1998 the Ministry of Science and Technology, the Ministry of Education, and others jointly set up China Suzhou Pioneering Park for Overseas Chinese Scholars.

So far 300 enterprises are located in the park, out of which 90 were set up by overseas Chinese and 10 were set up by R&D institutes and universities. Forty-six enterprises are high technology enterprises, accounting for 20 per cent of all enterprises in the park. About 450 projects have been conducted in the park, and 60 of them are national-level key projects. By now, the park has yielded an output of 6 billion yuan.

By the middle of 2000 the park employed about 3,000 people, out of which around 400 are employed by overseas Chinese firms, 100 have Ph.D.s, and about 200 are overseas Chinese. The park has attracted many high-quality overseas Chinese with active information. Campaigns (visits abroad, we communications, etc.), and use of central ministries programs. Key factors for the success of the park include is due to the following:

Investment: The Suzhou government set up a venture capital of 100 million yuan to provide seed money; meanwhile, the park attracted overseas venture capital to invest in the park. In addition, banks and financial organizations, such as the China Trust and Investment company, the Chinese Commercial and Industrial Bank, and the Transportation Bank, also provided loans to small private firms with more dynamism and flexibility.

Infrastructure Building: The park built an incubation site of 38,000 square meters with Internet connections every 10 square meters, conference rooms, a multimedia room, a technical trading room, information centers, product testing centers, public labs, and so on. In addition, the park also provides resources such as an accounting office, law firm, business planning space, and other services for all the enterprises, reducing the burdens on start-ups.

Import-Export Service: The park provides free import-export services, including customs declaration, bonded warehouse, and so on.

Human Resources Support: The park has a labour market, which holds three big recruiting events each month and has a human resource database. In addition, some recruiting firms also help to identify qualified people.

Management Consulting Services: University professors and successful entrepreneurs give management and business training including seminars and case studies.

Market Development: To promote products, the park set up networks to help relevant enterprises introduce their products, organizes public media visit. Hosts exhibitions. Most importantly, enterprises gain membership in the Shanghai Technology Stock Exchange, thus obtaining investment, projects, new products, and market-related information.

Source: Reproduced from World Bank (2000b)

(vi) **Engineering Design Capacity:** Engineering design capability is an important component of overall technological capability. The ability of firms to respond to technical and market changes is dependent on their ability to re-engineer their production processes consistent with new conditions. In the absence of design capability there is inevitable dependence on external engineering capabilities which

may well be inappropriate for the prevailing factor market conditions in that country. The response speed to changes is also impaired if there lack of such availability of skills in the local market. The encouragement of engineering consultancy organisations is another feature of the technology framework of a region or a country. Diffusion of production methods and capital goods design is embodied in these organisations. If they do not appear in response to market needs, the government can sponsor their development much like an infant industry enterprise. The diffusion of technological advance to small and medium enterprises is crucially dependent on the existence of such design capability in consultancy or other technology intermediaries.

China has already given considerable attention to the improvement of basic manufacturing activities. Since 1991, 84 Engineering Technology Research Centres have been established. Another batch of 79 National Engineering Research Centres have been established with partial World Bank funding. Some attention has also been given to establishment of standards, quality certification and metrology. It is not clear how effective these institutions have been. They need to be funded adequately and staff compensated appropriately so that they can achieve appropriate quality levels. Efforts also have to be made to provide them with external orientation so that they can absorb foreign technology rapidly.

3.2 Industrial Framework Conditions

I have reviewed the many policy instruments that can be used for influencing the course of industrial and technology development. The methods and procedures used in industrial planning have not been discussed because they are no longer used widely in either developed countries or in developing countries. As has become obvious in this review even advanced market economies continue to use a myriad of ways, some direct and some indirect, to influence the course of industrial development, some effective and some even counter productive. These policies and processes are now becoming more and more relevant for East Asian countries as they approach the industrialised status. In this concluding section of what constitutes the realm of industrial policy making in the new economy I attempt to examine the institutional context in which industry functions in market economies. This is of great consequence to East Asian developing countries in the process of deregulating and opening their markets in the new economy context.

3.21 Physical Infrastructure Development

Availability of physical infrastructure is the first physical requirement for the efficient functioning of industry. The efficient functioning of infrastructure services such as transport, telecommunications, energy, water and ports provides the physical framework for industrial activity. Comparative advantage in different activities is sought to be built by different countries through state investment in such infrastructure. Whereas many of these services are privately provided, though regulated, in the United States, in most other countries it is the state or public agencies that have been traditionally responsible for them (see Carsten Dreher, 1991; Dany Jacobs, 1991; on the structure of public ownership in energy and telecommunications in Germany and the Netherlands, for example). They have largely been regarded as natural monopolies requiring public ownership. Technology changes have made

possible the division and measurement of usage by individual consumers or groups of consumers in many cases thus making possible the levy of appropriate user charges and the commercialisation of activities hitherto not regarded as commercial. In Europe, the United Kingdom has led the way on privatisation which then spread to the rest of the European Union. However, the process of regulating these privatised infrastructure suppliers has not been problem free and is being progressively developed with experience (see Tony Prosser, 1989; C.D.Foster, 1992; for detailed treatment of privatisation and regulation of natural monopolies).

All the advanced industrial countries have used the specific provision of infrastructure as industrial framework conditions. The development of the large concentration of industries in the whole region of Tokyo to Osaka, for example, was greatly influenced by expensive and directed infrastructure developments such as the Shinkansen fast 'bullet' train facilitating fast, efficient and convenient ground transportation. The agglomeration economies promoted by the concentrated development of the whole Tokkaido region also made possible the development of the Japanese production management system using Just in Time (JIT) techniques for efficient outsourcing and cost cutting practices of substantial subcontracting. A more specific example of creating comparative advantage is the co-ordinated infrastructure investment in ports with the design of bulk iron ore carriers, along with the construction of new steel plants which made possible the development of the highly competitive steel industry in Japan (Michael Borrus, 1983). Another example of the development of comparative advantage through infrastructure investment is the development of expertise in trading by the Netherlands in Europe and Singapore in Asia made possible by directed investments in state of the art port and airport facilities. These small countries developed comparative advantage in petroleum based industries as a result of the port investments. The efficient airport facilities also facilitated Dutch expertise in such specialised niches as flower trading and transport.

Box 9

MALAYSIA

Creating the Multimedia Super Corridor

As a first step, Malaysia has created the Multimedia Super Corridor-a world-first, world-class act- to help companies of the world test the limits of technology and prepare themselves for the future. The MSC will also accelerate Malaysia's entry into the Information Age, and through it, help actualise Vision 2020.

The MSC will bring together, for the first time ever, an integrated environment with all the unique elements and attributes necessary to create the perfect global multimedia climate.

It is a length of greenfield "corridor" 15 Kilometres wide and 50 kilometres long, that starts from the Kuala Lumpur city Centre (KLCC), itself an intelligent precinct, which houses the world's tallest buildings- down south to the site of the region's largest international airport, the Kuala Lumpur International Airport (KLIA) which was launched on the 27th June , 1998.

Two of the world's first small cities are being developed in the Cooridor: Putrajaya, the new seat of government and administrative capital of Malaysia where the concept of electronic government will be introduced; and Cyberjaya, an intelligent city with multimedia industries. R&D centres, a Multimedia University and operational headquarters for multinationals wishing to direct their worldwide manufacturing and trading activities using multimedia technology.

Set to deliver a number of sophisticated investment, business, R&D and lifestyle options, the MSC will be:

- A vehicle for attracting world-class technology-led companies to Malaysia, and developing local industries
- A Multimedia Utopia offering a productive, intelligent environment within which a multimedia value chain of goods and services will be produced and delivered across the globe
- An island of excellence with multimedia-specific capabilities, technologies infrastructure, legislation, policies, and systems for competitive advantage
- A test bed for invention, research, and other ground-breaking multimedia developments spearheaded by seven multimedia applications
- A global community living on the leading-edge of the Information Society
- A world of Smart Homes, Smart Cities, Smart Schools, Smart Cards and Smart Partnerships

The Multimedia Development Corporation envisions a 20 year time-frame for the full implementation and execution of the MSC, when Malaysia will have achieved leadership in the Information Age.

There will be three phases of activity:

Phase I:

Under this phase, the MDC will successfully create the Multimedia Super Corridor, attract a core group of world-class companies, launch seven Flagship Applications, put in place a world-leading framework of cyberlaws, and establish Cyberjaya and Putrajaya as world-first intelligent cities.

Phase II

The MDC envisages that during this period, it will link the MSC to other cybercities in Malaysia and the world. It will create a web of corridors and establish a second cluster of world-class companies. It will also set global standards in flagship applications, champion cyberlaws within the global society, and establish a number of intelligent globally-linked cities.

Phase III

During this final phase, it is expected that Malaysia will be transformed into a knowledge-based society- being a true global test bed for new multimedia and IT applications and a cradle for a record number of multimedia companies. It will have a cluster of intelligent cities linked to the global information super highway, and become the platform for the International cybercourt of Justice.

The development of the Special Economic Zones in the coastal regions of China is another example. The most dramatic attempt to leapfrog up the technological ladder through infrastructure investment is the development of the "Multimedia Super Corridor" along with the world class Kuala Lumpur international airport by Malaysia. This investment is designed to usher in the information age by bringing together "an integrated environment with all the unique elements and attributes necessary to create the perfect global multimedia climate". Even with the onset of privatisation activities, European countries are actively considering substantial investments in trans European networks in energy, telecommunications, information highways and railway transportation, both at the individual country level and at the European Community level. These infrastructure initiatives are essentially seen as weapons in the building of comparative advantage in the economic race relative to their key competitors, the United States and Japan. Even if some of these investments are primarily made by privately owned entities, state co-ordination and planning will be dominant.

Industrial Parks: Infrastructure investment at the regional level has already been remarked upon in the last section on technology development. The most widely used

weapon by local and regional authorities in attracting industrial investments is in the development of regional infrastructure in the shape of industrial estates and industrial parks. China, Malaysia, Singapore and Thailand have all used specialised industrial park or zone development to promote industrial development. Earlier, it was the traditional components of industrial infrastructure like land, energy and water, and the like that were readily supplied in industrial parks as inducements. Now the infrastructure supply includes intangibles such as easy access to information banks, science and technology consulting facilities, and close proximity to R & D establishments of different kinds. Competition between regions in the provision of such facilities is intense. In summary, infrastructure investment made by the state directly or co-ordinated by it and at different levels of government remains an important component in the industrial policy armoury of different countries and regions.

3.22 Regulatory Systems

Successful operation of modern industrial markets requires the operation of a regulatory system that mediates between the freedom of corporations and enterprises to pursue their ends, largely for profit making and expansion, and the requirements and interests of the general citizenry. To the extent that much of the industrial sector is dominated by multinational enterprises, national regulatory regimes assume added significance in mediating between the objectives of nations and multinational corporations, which may not always coincide. Even corporations that are not multinationals can be quite large in their own countries thus wielding considerable power, at the local or regional level if not at the national level. It is the recognition of this power and its use by large private corporations that is behind much of the requirement for regulation. These issues are mostly to do with externalities that emerge from the operation of industrial enterprises.

The functioning of the enterprises and corporations themselves requires regulation in different ways. Many of them have already been covered in the discussion concerned with the operation of the various factor markets. The functioning of an industrial market is built upon a myriad of relationships between individuals as labour, individuals as consumers, individuals as sources of financial savings, and individuals as sources of creative ideas, on the one hand, and the functions of various organisations as employers, corporations as users of capital, corporations as producers, corporations as trade facilitators, and so on, on the other. The government has to function as the intermediary or referee of these relationships and the efficient and productive functioning of the market depends on how the intermediating institutions are organised.

In most advanced industrial market economies "the conventional divisions between public and private spheres of power lose most meaning in regulatory arenas. 'Public bodies' like departments of state routinely represent 'private' interests in the debates surrounding regulation. Formally private bodies like trade associations routinely carry out nominally public roles, such as the implementation of particular regulations" (Leigh Hancher and Michael Moran, 1989:5). "Economic regulation of markets under advanced capitalism can thus be portrayed as an activity shaped by the interdependence of powerful organisations who share major public characteristics" (Hancher and Moran, 1989: 275). It is large bureaucratic organisations, ministries

themselves or specialised government or semi government bodies that regulate other large, often bureaucratic, bodies like corporations or trade unions or associations of firms and individuals also possessing various degrees of public characteristics. Many instances of regulatory capture result in this interaction of bureaucratic organisations, and constant surveillance of these tendencies has to be resorted to. The functioning of the various institutions involved in regulating the advanced industrial market economies is of particular interest to developing countries because of the widespread observation of government failure in these countries in the past. As they deregulate and open to the rest of the world to reduce the possibilities of government failure in directed industrial development they should neither be subject to the vagaries of market failure in increasingly marketed economies nor open up new areas of government failure in the regulatory institutions and conventions that have to be fostered in the process of industrial and market development. Many regulatory activities are critically shaped by the particular social and industrial histories of different economies. Institutions cannot be transplanted. But much learning can take place from the experiences of countries, which have had a long period of evolution in these areas. As was seen in the context of capital markets regulatory regimes are constantly evolving: what may have been appropriate yesterday may not be appropriate today. Moreover, competitive advantage of a nation may itself result from its own peculiar brand of regulation of the industrial market environment. Copying another's framework may not then be the best course to follow.

Box 10

Measures to Improve the General Policy Environment for Business in Korea

Area	Actions Taken
Transparency	The chaebol are required to prepare consolidated financial statements beginning in 1999, and quarterly reporting in 2000, that must include line-of-business reports as well as disclosure on intra-group transactions.
Shareholder rights	The reform of the Commercial Code in December 1998 has enhanced the rights of minority shareholders by lowering ownership thresholds for initiating various types of adverse actions. The removal of "shadow-voting" in September 1998 permits investors to vote freely on such matters as mergers, business transfers and the election of directors and auditors.
Company directors	Listed companies are required to fill one-quarter of their boards of directors with outsiders beginning in 1999. The responsibilities and obligations of directors have been clarified, while the definition of directors has been expanded to include any person who exercises a direct decision making function in a corporation. Cumulative voting (which enhances minority shareholders' rights) for directors is now possible (but not required)
Intra-group relations	New debt guarantees between chaebol subsidiaries were prohibited in 1998; existing guarantees are to be eliminated by March 2000. The 25% ceiling on equity investments by chaebol subsidiaries in third companies (which had been intended to limit chaebol expansion) were lifted, with a view to facilitating restructuring. Holding companies are allowed, subject to restrictive conditions on debt and the structure of such companies.
Insolvency Procedures	Re-organization procedures (applicable to large enterprises that are deemed viable) have been strengthened through the introduction of economic criteria in evaluating applications and through the establishment of time limits.
Investment	The ceiling on foreign shareholding in individual companies was abolished in 1998. All forms of mergers and acquisitions, including hostile take-overs by foreigners are permitted. The number of business lines where foreign direct investment is restricted was reduced from 53 to 24.

Other	<p>The ceiling on bank's equity investments in individual companies was temporarily boosted from 10% to 15%.</p> <p>As from 2000, the corporate tax system will not allow deductions for interest payments on any debt exceeding five times equity capital.</p> <p>A Corporate Restructuring Fund of KRW 16 trillion was created in October 1998 to assist SMEs.</p>
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Source: OECD 1999c

Reproduced from World Bank, 2000a

3.23 Legal Systems

The most important component of the framework conditions governing industrial market economies is the character of the legal systems that mediate in the case of conflicts. A large number of legal conventions and explicit laws determine the character of functioning of the industrial market system. At the core of this system is corporate law governing the creation, functioning, and death of corporate organisations. Since corporations are owned by many entities: other corporations, funds, individuals and other organisations, corporate laws have to be explicit about the relative property rights of different types of owners according to the extent of their relative holdings. Rules and regulations are essential for the control of corporations, with ownership being effectively divorced from management. Large variations are found between the various advanced industrial countries and between European countries themselves. For example, in some countries, particularly Germany, laws on corporate governance give explicit roles to labour in the management and control of corporation, thereby limiting the concept of capital ownership itself. Such variations have significant effects on the functioning of corporations and provide useful comparative information for the latecomers to industrialisation. Allusion has already been made in previous sections regarding the laws and procedures concerning bankruptcy. Their smooth operation or otherwise determines the responsiveness of the industrial system to the requirements of industrial restructuring. In this complex activity, it is both the formal laws and the style of administration of these laws that is of importance. As in the case of developing technology capability the smooth operation of industrial restructuring activity is a cumulative process of gathering experience: there is nothing automatic about it. Governments and other institutions, particularly financial institutions, have developed a body of practice over time through successive experimentation involving both successes and failures. The lack of adequate corporate governance systems came to light in a focussed manner in most Asian countries as a result of the financial crisis. The functioning of family dominated companies is no longer adequate and more impersonal systems have to be devised.

3.24 Tax Systems

The operation of the tax systems governing industrial activity influence the pace of industrial and technology development. It is the one instrument over which government has large discretionary power which is used to its fullest by most governments. This discretionary power is of course tempered by parliaments or equivalents in democratic countries; it is also the area where the most lobbying activity takes place from all interest groups. Consequently, tax systems are strongly influenced by those who are affected by their provisions: government autonomy is considerably tempered in this sense. As has been mentioned earlier in the context of

capital markets, investment activity, both overall and for particular industries, is sought to be influenced by most governments through active policies concerning the treatment of depreciation, the provision of investment allowances and investment credits and the like. Elaborate procedures also have to be devised for the treatment of multinationals whose owners reside in other countries: again it is over time that experience has grown and conventions have developed on the treatment of tax liability at source of earnings in the host countries and those of owners residing elsewhere. There is nothing obvious about these systems and conflicts between multinationals and individual tax authorities and between countries continue to arise. International organisations such as the OECD have had to mediate between its member countries in order to establish acceptable rules of practice (see Sol Picciotto, 1989 for some of the typical difficulties encountered in this area). In these areas also East Asian countries have to observe, analyse and gain from experiences already gone through. Just as countries in the European Union, and more widely in the OECD, have actively tried to harmonise their corporate tax systems, East Asian countries will also have to attempt such harmonisation through ASEAN or APEC mechanisms.

Tax instruments are also widely used to influence innovative activity. Investment in technology upgradation is often encouraged even more than physical investment activity. Differences in indirect taxation of different products has been greatly reduced through the introduction of the value-added tax in all European countries. The complexity in indirect tax structure that is found in East Asian countries obscures the real relative profitability of different industries thereby distorting the incentive structure and possibly resulting in an inappropriate industry composition. Incentives granted for attracting foreign direct investment have contributed to this complexity. Similar is the operation of import tariffs in many countries with a highly variegated structure although this has reduced over the past decade in East Asia. The influence of these incentive systems on the structure and development of industry can be much more powerful than any other direct industrial policies. Thus tax framework conditions have to be nursed very carefully: the self restraint which now characterises many developed countries in not imposing highly differentiated indirect taxes on different products and industries needs careful study by the late industrialises. The less differentiated the tax and regulatory treatment is of different industries, the less government lobbying activity there is on behalf of industry, the lower the chances are of regulatory capture of government, and the less chance there is of government failure. These benefits are in addition to the classical economic benefits gained from a non-distorted incentive structure for industry.

Other framework conditions such as intellectual property protection, environmental regulations, setting of standards, policies related to quality, labour market regulations, competition laws and regulation have already been addressed. These are all areas of government intervention providing the framework for industrial activity. As direct government activity through industrial planning or other kind of discretionary regulation is reduced, this kind of rule based and more transparent regulatory activity becomes more important. Most of these regulatory activities involve the acquisition of specific knowledge, expertise and development of information systems. The development of environmental regulations, for example, is essentially a technical activity involving the interaction of several traditional scientific disciplines in the development of environmental standards. Their implementation requires the application of administrative and economic principles for devising methods for their

enforcement through a mixture fiscal levies and direct control. The considerable expertise required for all these activities is not often available within government agencies themselves in the advanced countries as well and complex consultation mechanisms between government and the relevant interest groups have to be devised. These processes provide interesting examples of the complexity of regulatory processes and the considerable amount of governmental work required in their development and administration. Similar is the case for the development of standards, including those for safety. These areas which were relatively neglected earlier, or essentially seen as passive minimum requirements, are increasingly being seen as active areas for industrial and technology policy, particularly in the area of technology upgradation.

3.25 Role of Government

This brings me to the final component of the industrial framework: the character of government itself and its style of functioning in relation to the industrial sector. What is obvious from the foregoing is that government has a very substantial role in the fostering of industrial and technological development in all the modern advanced industrial economies. **This role is substantially different from that of governments in planned industrial systems and from the kind of role practised in many East Asian countries.** There is much less discretionary activity in the direct implementation of rules, regulations and procedures: much of activity is conducted at arm length. This has not made governments smaller, but they are less intrusive in the day to day functioning of enterprises. Governments do have a great responsibility of monitoring industrial activity and its growth and development, particularly in relation to its competitiveness. The modern role as has been sketched in this paper requires a considerable amount of expertise within government. Just as technological development has become increasingly science based at every step, and gone are the days of the backyard tinkerer as inventor, so has government activity become more specialised. Just as the process of technology development is seen increasingly as a web of complex activities and inter-relationships so is the process of governing the industrial sector. The globalisation of industry, the globalisation of financial markets, the revolution in telecommunication and information technologies, and the increasing importance of multinational corporations means that national governments have to consider not only direct consequences of their actions within domestic markets and on specific industries, but also many indirect consequences in the international markets and other linked industries. As also argued by Tyson and Zysman (1983b), government increasingly requires independent analytical ability to examine industrial dynamics and to diagnose industrial difficulties on a continuous basis. Although external expertise can be utilised to supplement government efforts, even the utilisation of such external expertise requires considerable internal absorption capability, just as technology import cannot be efficiently absorbed by firms without substantial internal technology capability. Indeed, just as much of market failure can be attributed to information imperfections, a good amount of government failure in developing countries can be attributed to capability failure in government bureaucracies and associated public agencies. This is an issue that has not received adequate attention in the discussion of the role of government in industrial development. There has been excessive emphasis on 'rent-seeking' in the analysis of government failure, which has led to neglect of essential government functions in the pursuit of industrial development in a market economy environment.

For late industrialises in particular, an essential government role as catchers up is the expression of industrial and technology vision. In the competitive international world of industry, it is not only firms that have to chart out strategies for gaining or improving competitiveness, but also governments in order to provide some sense of where a country's industry is headed and what are achievable goals and targets. This activity is not a one side affair: it involves a lot of consultation and 'jawboning', which itself can be done systematically, as is being attempted in many 'technology foresight studies' in many advanced industrial economies. In summary, the functioning of government in fostering rapid industrial and technological development in an industrial latecomer requires not only much more specialised capability for the governance of complex systems but also a guiding vision which lifts the aspirations of its industrial entrepreneurs and corporations. One such vision is available in Box 11: a bold statement from the Deputy Prime minister of Singapore, Mr. Tony Tan.

Box 11

Creative Destruction Needed in New Economy by Tony Tan, Deputy Prime Minister, Singapore

The world is in the midst of a third industrial revolution brought about by the convergence of breakthrough discoveries in six key technologies:

- Microelectronics;
- Computers;
- Telecommunications
- Material Science
- Robotics; and
- Biotechnology

The third industrial revolution has created a New Economy which is drastically revolutionising the way business is conducted, wealth is created and economic growth, generated.

The third industrial revolution includes out is not limited to the explosive growth of the info-communications business, particularly those areas related to the Internet, which is making its influence felt in all sectors of business today.

Prof. Thurow believes that they key source of wealth creation for individuals and countries in the New Economy is the possession and control of knowledge, and that the acquisition of skills is the single most important requirement for individuals to thrive in a knowledge-based world.

Discarding Old Practices

For countries to prosper in the New Economy, three requirements are essential:

- Good infrastructure
- Heavy investment in education and research and development; and
- Acceptance of the concept of creative destruction, to replace old business models and practices with new models and new practices which are more relevant to a fast changing, technology-intensive world economy

If we look around the world today, there are many countries in Europe and some countries in Asia which would be able to satisfy the first two requirements specified by Prof. Thurow for countries to prosper in the New Economy.

What separates countries which can transit successfully from the Old Economy of the industrialised world, where wealth is generated by exploitation of natural resources and mobilisation of people, to the New Economy where wealth is generated through creating, possessing and controlling knowledge is the willingness of a country's society and economy to accept that economic and business practices which they have got used to and which have been successful have now to be discarded in favour of new economic and business practices which are unsettling, uncomfortable and often disruptive to large sections of society.

The same point was made by Senior Minister Lee Kuan Yew when he emphasised, at the Singapore Tech Venture 2000 Conference in San Francisco on March 9, that to enjoy the kind of productivity gain that the US has achieved in the New Economy, governments and their peoples will have to be bold enough to not cling on the past successes but instead let "creative destruction" take place to chart new paths. The Senior Minister believes that Singapore can succeed in transiting to the New Economy because "we do not have that same irreversible attachment to what we have done. That which did us good in the phase that was will not do us good in the next 20, 30 years. We start changing our mindsets now".

Why is it so difficult for government and society to abandon economic and business models and practices which have been successful? To answer the question, it is useful to use an analogy; since Singapore started to industrialise in the 1970s, we have lived in a world where change has come gradually and incrementally.

To prosper in this world, we constructed an economic engine based on political stability, good infrastructure, a disciplined and educated workforce and openness to multi national corporations, which has given us above average economic growth over the last 30 years and created wealth for the country and for Singaporeans. Our present economic model can be likened to a car which we have fine-tuned to trundle along the Old Economy road at a good speed, with the car's passengers that is, Singaporeans, sitting comfortably and enjoying the progress that is being made mile by mile.

Admittedly, there are bumps along the Old Economy road for example in 1985 and 1998 but we know that with some modifications in our driving habits the bumps are not disastrous and we can pick up speed after we have crossed the bumps.

Leaving a Comfort Zone

Just as we are speeding comfortably along the old Economy road, we suddenly see, to our consternation, that there is a new superhighway called the New Economy, where cars are flashing by us at speeds which are much higher than what we can achieve on the Old Economy road.

Our dilemma is whether and how we can safely turn off from the Old Economy road which we are comfortable with, to the New Economy superhighway which is unfamiliar and where we do not know what medications we need to make to our present car and driving habits to enable us to speed along the super highway and not be left behind by other faster moving vehicles.

It will be a mistake to identify the New Economy with the dot.com companies which have risen so spectacularly in the stock exchanges of the world. Dot.com companies are the most visible symbol of the New Economy, but they are only a part of it. It is useful to think of the New Economy as having three major characteristics.

First, the New Economy is built on technology, particularly fast advancing technologies like infocommunicaitons and the life sciences. The infocom technology, centred on the Internet, has enabled radically new business models to emerge. Insurgent start-ups are posing severe threats to established incumbents, not just in one particular industry but across a whole range of industries.

Many incumbent companies, fearing cannibalisation of their existing businesses, have been slow to change their operations. However, if they do not cannibalise themselves, newcomers will and will be a worse fate eventually. Recognising this danger Jack Welch, the CEO of General Electric set up in house company called "destroy-your-own-business.dot.com" to galvanise his staff to embrace change.

The life sciences have not yet had the same impact as infocoms but with the completion of the Human Genome Project, life sciences will generate the next big wave of technological innovation and, possibly rival the Internet as a major area of business enterprise. Already, pharmaceutical companies are preparing themselves to tap new discoveries in genomes to achieve breakthroughs in producing new drugs.

Second, the new Economy is characterised by a risk-taking business culture which seeks to create wealth rather than merely preserved wealth. Companies are focused on creating value for shareholders and will not shrink from major restructuring including selling or closing down profitable divisions, if they are not appropriate to the company's business model. Executives are paid very well but they are also subjected to high demands. Any shortcoming in performance by the company or its executives is mercilessly punished.

An announcement by Procter and Gamble that its profits will be less than analysts projections is immediately followed by a one third decline in the market capitalisation of the company. Two quarters of poor results by a company and the CEO is shown the door by the company's board of directors. The net result is a relentless focus on increasing a company's profitability to enhance shareholder value and justify a high price for the company's share.

Beyond Bricks and Mortar

Third, the New Economy has fostered a capital market environment which values concepts, ideas and knowledge just as much as and, in some cases, more than physical assets and financial resources. New start-ups attract venture capital and if they are successful and go IPO attract even more funds in the stock market. The most extreme example of this characteristic is the dot.com companies many of which are making losses but which have huge market valuations because investors believe that the company's concepts will eventually lead to huge profits. Take for example price Line.com from the United States, Porice-Line.Com sells airline tickets through the Internet. Its revenues are miniscule fraction of the revenues of the major American airlines but Price-Line's market valuation is larger than the total combined valuation of all the US airlines.

While the market valuations of many of the dot.com companies are undoubtedly excessive and will suffer severe correction in due course the valuations are not simply froth. They give the do.com companies the financial clout to buy up substantial Old Economy companies. For example, AOL's takeover of Time Warner and, nearer home Pacific Century Cyberworks' acquisition of Cable & Wire less HKT.

This has created a huge flow of resources towards innovative ventures, enabling New Economy start-ups to combine their ideas with the assets of Old Economy companies.

Source: Straits Times, March 2000

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