

**“Industrial Restructuring in South Africa”
Trade and Industrial Policy Secretariat Annual September Forum
South Africa,
September 20-22, 1998**

**Industrial Policy for Restructuring:
Best Practice Policy Instruments
In a Market Economy**

**Rakesh Mohan
Director General
NCAER**

**National Council of Applied Economic Research
Parisila Bhawan, 11 I.P.Estate, New Delhi 110 002**

Much of the work reported in this paper was done at the United Nations University, Institute for New Technologies, Maastricht, Netherlands in 1993-94. I would like to record my debt of gratitude to Mr. Charles Cooper, Director of UNU-INTECH who made this possible.

CONTENTS

I.	Introduction	2
II.	Catching Up, Staying Abreast, Falling Behind and Being Caught Up: The Rationale for Industrial Policy.	5
III.	Governing Industrial Development: Policy Instruments for Market Economies	14
	3.1 What Constitutes Industrial Policy ?	14
	3.2 Product Market Interventions	16
	3.3 Factor Market Interventions	22
	3.4 Regional Development Policy	34
	3.5 Technology Policy	36
IV.	Industrial Framework Conditions	51
V.	References	59

I. INTRODUCTION

Following the debt crisis of the 1980s a large number of developing countries, particularly in Latin America and Africa, and to a lesser extent in Asia, have undergone what have been termed as 'Structural Adjustment Programmes'. A certain degree of orthodoxy has developed around these programmes although clear evidence on either their success or failure is still inadequate and widely debated. Most of these programmes advocate 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. This set of measures are generally covered by the term 'social safety net'. 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.

The set of countries that are now developed have had a long history of industrial development, technological development, and of structural change since the industrial revolution. They have adjusted continuously in the face of a constantly changing world economic environment. Not only do these countries have a long economic history that is well documented, they also have a more recent record of rapid growth and structural change in the post World War II period. This paper therefore uses the experience of developed countries as a whole, and European countries in particular, in their practice of industrial and technology policies to derive approaches for addressing the kinds of questions that need to be posed now.

Are the reforms that are currently being undertaken by many developing countries sufficient to push their economies onto accelerated 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 practised in the past?

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 industrial economy be made more endogenous. These are the questions that this paper is attempts to address.

Much of the current policy advice advocates the adoption of an open trade regime. It is of interest therefore to examine the relative openness, or otherwise, of the trade regimes as followed by the developed market economies. These countries have had relatively open economies for a long period of time, although the degree of openness has varied in different periods. Since the Second World War there has been a general trend towards a reduction of tariffs in OECD countries, although there may have been some opposite movement in terms of non tariff barriers since the early to mid 1970s (see David Henderson, 1991). Correspondingly, there has been considerable industrial restructuring in all the OECD countries in the post war period: the pressures for restructuring having been greater since the oil price rise of 1973 and the emergence of Japan as a key competitor in a wide variety of industries in the 1960s and 1970s, followed later by the Newly Industrializing Countries (NICs) (see Geoffrey Shepherd, Francois Duchene and Christopher Saunders, 1983). Europe has long felt a technological lag relative to the United States and more lately to Japan as well (see FHG-ISI, 1993). Hence there has been very explicit concern with policies designed to foster broader and faster technological development Europe. The approaches adopted by

different countries have been very varied and accompanied by different degrees of perceived success (see Ergas, 1987a).

As a practitioner of economic policy and administration, my interest is clearly in the art of the possible, but as a lay but active researcher, I also have a deep involvement in helping to transfer the lessons of economic research to the practice of actual policy making. Another aim of this paper is to induce the advisers of economic reform programmes in developing countries to analyze more carefully the experience of administering change in their own environments. This would help the practitioners of economic reform programmes in developing countries to be better equipped with the hows along with the whys and whats involved in these programmes.

The broad debate on the administration of economic change and industrial restructuring is 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. An explicit consideration of this issue was undertaken 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. Examination of the industrial and technology policies of European countries is of great interest in this respect as well since the state has been far more active in policy making and institution building in these countries relative to the United States. It is thus of particular interest to study the governmental and other institutional processes related to the promotion of industries in these countries. The collapse of East Asia in the past twelve months has now spawned a whole new genre of studies attempting to unravel the undoing of the East Asia miracle. Thus the debate is now joined anew. My attempt in this paper is to document the various kinds of industrial and technology policy that have commonly be put in practice and then to provide indicators for what might be the best practice approaches to industrial policy for the continuous restructuring that industry needs to go through in this ever changing world.

II. Catching Up, Staying Abreast, Falling Behind and Being Caught Up: The Rationale for Industrial Policy.

"The advantages of a coordinated effort to strengthen the institutional environment of industry, as revealed by Germany at the turn of the century, have been so great that no country has been able to ignore them since."
(Duchene and Shepherd, 1987a:7)

Great Britain and the Netherlands, as the first countries in the world to industrialize, developed relatively slowly but consistently throughout the eighteenth and nineteenth centuries. In fact the U.K. was not a particularly dynamic leader (Maddison, 1991). Its labour productivity grew at only about 1.2 percent a year throughout most of the nineteenth century, while that growth was even slower at about 0.3 to 0.4 percent per year in the previous hundred years or so. In these formative years of the industrial economy in the world there was little, if any, by way of industrial or technology policy. Government was not at all active in the promotion of industry. Being a new activity, there were no examples to follow and thus industrial development was relatively autonomous. Ever since, however, many other countries, all in the West until the post Second World War emergence of Japan, have not only caught up but overtaken the U.K. Thus every follower country has had to develop faster than the earlier countries and rapid productivity growth has been the basis for this catching up process. So far, the rapid growth of every country that has succeeded has been based on industrial development: it is possible that the tertiary sector could be the lead sector in the future. The quest for rapid productivity growth, along with that for industrial expansion, has therefore been the rationale for the government to take keen interest in what the state can do in support of such fast industrialization. Catching up with the leader(s) is the first and most important rationale for the search for policies that actively promote the development of industry. For developing countries this has been the most important motivator for instituting industrial policies.

Equally potent has been the fear of falling behind. As the latecomers of industrialization begin to catch up and threaten the existing industries of the leaders the fear of losing this competition often engenders policies that seek to prolong the status quo. Whereas policies that seek to promote industrial and technological development can

generally be characterized as positive and forward looking, those that emerge from the fear of falling behind are often negative and backward looking. As will be seen repeatedly, such policies, usually designed to resist the new competition in some form, ironically tend to accelerate the falling behind. **The fear of new competition is then the progenitor of a host of industrial policies which tend to retard adjustment and change. Unfortunately, it is to these policies that the term "industrial policy" has been taken to encompass in recent years.** The rapid development of East Asia over the past twenty years has also engendered the fear of being caught up. In developed countries particularly in Europe. Such fears also lead to negative policies aimed at delaying the day when these countries will actually catch up. The result is a slowdown in the industrial restructuring which should take place in the face of the emerging competition.

Developing countries, though motivated by the desire to catch up find it difficult to in fact put in place the forward looking policies required to face the new competition. Typically it is the entrenched old interests emanating from the hitherto protected industries who have the most to lose. These fears are akin to the fears of falling behind and usually lead to negative policies or slow down the positive forward looking policies required. Catching up or staying abreast both require continuous industrial restructuring: this is what industrial policy should seek to promote.

Finally, another reaction of the leaders to the potential competition that they see is that of staying abreast. This motivation spawns yet another genre of industrial and technology policies, with greater emphasis on the latter. This genre is, perhaps, the most difficult to devise since the territory is uncharted: uncertainty and innovation constitute the order of the day. These policies have to be positive and forward looking, but in pursuit of a target that is shrouded in heavy mist. They have to be geared to rapid adjustment of existing industries with the promotion of factor mobility being the key task. Keeping ahead or staying abreast requires a constant spawning of new industries and new technologies and this is inherently difficult.

The convergence of the Western European countries, the United States, and Japan in the post World War II period (Maddison, 1991; Verspagen, 1991; Soete and Verspagen, 1993) has led to intensified competition and the policy response oscillates between the fear of falling

behind and the quest for staying abreast. The fear of falling behind has got accentuated in recent times because of the perceived threat of the newest pack in the race, the so called Newly Industrializing Countries (NICs). Western European countries have always seen themselves as catching up with the United States (or the U.K. earlier). Even though they may have actually done so in terms of income in recent years, the dominant mode of thinking remains that of catching up. Some of the confusion and loss of confidence in policy making that is observed today in Western Europe may merely reflect the fact of having caught up. There simply are no easy answers at the frontier and innovation is difficult. At the same time, the very rapid emergence of Japan as a technology leader and the NICs as efficient producers, had provided the appropriate threat of rapidly developing latecomers: hence the emergence of many policy responses related to falling behind. As argued by Soete and Verspagen(1992), governments can have an important role in catching up since best practice technologies are known and productivity can grow fast. The relatively fast growth record experienced by most countries in Western Europe in the immediate post War period until the oil crisis of 1973 was a period of catching up when policy was both easier to devise and implement. It is also probable that in such a period it was also easier for firms to make productivity gains without external assistance: thus the confidence in policy effects could well be inflated and misplaced. Anyhow, the practice of industrial policy in Western European countries in the post World War II period therefore provides a good a variety reflecting each of the genres of policy making alluded to.

Catching up also involves a process of shifting comparative advantage. It is argued that comparative advantage is not merely dependent on given factor endowments as argued by traditional trade theory but that it is created by specific investments made by governments or by firms over a period of time (Porter, 1990). Government policy choices affect the shifts that take place in the comparative advantage of nations and what is characterized as competitive advantage of firms. These policy actions cover a very wide area including activities such as specific investments in infrastructure in technology creation, in education, in capital equipment, and institutional development, among others. Technology accumulation, capital accretion, expanding educational stock and infrastructure improvements done over a period of time essentially change relative factor endowments, which amounts to a shift in comparative advantage. **To the extent that many of these goods are public goods, the role of the government in their enhancement is clear.** Others are semi public goods or private

goods: **there the role of the government is more indirect in the creation of framework conditions.** The maintenance of a stable macroeconomic framework and the promotion of a well operating financial intermediation system would, for example, boost the savings rate and hence the rate of capital investment. Higher rates of capital investment also imply a higher rate of technology enhancement through embodied technological progress. In fact, catching up implies the achievement of shifting comparative advantage as countries change their structure of industries to ever higher value adding industries and activities. The static market role as an efficient allocator of resources is inadequate to achieve this transition.

The issue then is whether the market operates as an efficient inter-temporal allocator of resources which is required for constantly shifting comparative advantage. The minimalists would argue that it does and that the state, at best, needs to set the institutional and incentive structure right, whereas others would argue that the State has to be much more active in the areas of industrial and technology policy in order to achieve rapidly the shifts required. Most observers would agree that in the cases of Japan and South Korea, the State did act through a range of policy actions to achieve the kind of catching up that they have in the last forty years, as did Germany in the last century.

A whole area of industrial policy action has arisen, not from observation of falling behind in industrial performance, but perception of falling behind in the practice of industrial policy. "Market signals are distorted and the market is imperfect because of foreign government interference to promote or protect industries" (Tyson and Zysman, 1983a: 34). These policies are essentially those of the mercantilist variety. It is argued that national industrial policy is required to specifically match foreign industrial policies (including trade policies) which are aimed at critical national sectors (Tyson and Zysman, 1983b; Tyson, 1992). All the work related to the new strategic trade theory provides further arguments for such directed policies in the international context (Krugman, 1986). Much of this work is connected with the impact on international trade arising from the existence of economies of scale and imperfections in the technology market. The rationale of much of the work of international bodies such as WTO (earlier, GATT) and the Commission of the European Union (earlier the Commission of the European Communities) is concerned with setting the rules of the game such that this genre of industrial policy making is minimised if not eliminated. Actions to limit levels of "allowable" industrial subsidies, restrictions on promotion of specific sectors through import

protection, and removal of restrictive practices in distribution, are some of the kinds of measures taken by international bodies to reduce "competitive" industrial policy making.

The economic rationale for industrial and technology policy can also be sought more systematically in the traditional theory of market failure. "The basic argument is that the invisible hand is conspicuous mainly by its absence and the state is needed to supplement market forces" (V. Curzon Price, 1981:19). The state is entitled to intervene, or should intervene in areas where the market cannot function, or has difficulty in functioning. Working within the assumption of efficiently operating markets, industrial and technology policy is then geared either to improve the functioning of markets or to supplant them where they cannot function. What are these market failures? It is best to examine each market briefly. Problems can be observed in the functioning of both product and factor markets.

Looking at product markets first, there are various sources of market imperfections. The most important source is the existence of barriers to entry of new firms to contest existing product markets. These barriers arise primarily from the existence of economies of scale which give first movers great advantages. Capital market imperfections contribute further to the severity of these entry barriers. First mover advantages are accentuated by practices such as product differentiation and brand name propagation. These practices are bolstered by advertising which itself benefits from economies of scale in marketing. Other barriers to entry arise from the existence of proprietary technology or high costs of technology acquisition which deters new entry of firms. A whole host of policies arise from the perceived existence of product market imperfections, ranging from public sector investment to infant industry protection, among others.

Capital market distortions essentially arise from the existence of imperfect information. Small businesses do not have adequate access to capital because the costs of obtaining information on their capabilities can be prohibitively expensive for the capital market to generate. Industries subject to economies of scale require lumpy investments. Once again, adequate capital may not be available due to the risk evaluation and the lack of adequate information. The general assumption is that the relationship between cost and risk is not favourable enough for the generation of adequate funds from the capital market for industrial investment (Pinder, 1982b). The immobility of physical capital also gives rise to industrial adjustment

problems if the financial market is not institutionally equipped to deal with this rigidity. A great variety of industrial policy interventions arise from the existence of imperfect capital markets, all giving rise to some form of government subsidisation of industrial investment, directly or indirectly.

Labour market distortions arise from the various rigidities that may exist which impede the mobility of labour and restrict wage flexibility. Many rigidities exist which constrain the ability of workers to move both occupationally and geographically. Excessive trade union power also leads to various inflexibilities related to both wage levels and work practices. Similarly, excessive employer power also leads to inflexibility in the labour market where the worker is constrained from exercising his free choice in terms of the opportunities available to him. Allocation of labour to the most productive pursuits is then made difficult as the economy undergoes changes in product markets or in technology. Other labour market imperfections arise because of inadequate access of labour to education and training, and imperfect information about required labour skills. Similarly, on the demand side as well, the costs of searching for the right skills are considerable. Furthermore, because of the problem of inadequate appropriability, the private sector generally does not invest enough in education and training. Education and training being a semi public good, much of it must be provided by the government, and this may be inadequate for the industrial needs at hand. These various imperfections then give rise to a large range of government interventions, ranging from relocation subsidies for the aid of labour mobility, redundancy payments, unemployment insurance and the like.

There is general recognition of market failure in the generation of technology. Investment in technology by private firms is likely to be sub-optimal primarily because of problems in full appropriability of the returns from these investments. The whole area of technology policy arises from this theoretical basis. "Government should act to correct the failure of private markets to support pre commercial R & D. It should create incentives for private investment at this important point where firms cannot appropriate the economic benefits of investment" (NAS/NAE/IOM 1992). Moreover there are significant positive externalities that arise from the generation of new technology which requires public investment. Investment in research and development is, by definition, a high risk activity which the market is likely to fund inadequately. With the increasing sophistication of technology, R & D activity is itself

exhibiting economies of scale, thus leading to market failure. Basic research has no immediate returns, and is therefore largely conducted in the public sector. Nearer the R & D activity is to the production of a product, the more appropriable is the investment and the more it should be done within firms. But there are no clean dividing lines between basic and applied research, between pre-competitive and competitive research, between development and testing, and between marketing and servicing. More recent thinking on the subject argues that it is erroneous to think of the R & D process in linear terms: from basic to applied to development research. Thus the task for technology policy has become more complex and the range of required interventions more varied (see Soete and Arundel, 1993).

The observation of market failures gives rise to different forms of government intervention. The State can assume a developmental role where it itself acts as an entrepreneur, either by investing public resources in productive enterprises or by promoting private investment and production by the use of appropriate incentive structures. It can also deal with market failures by adopting a regulatory role where it sets the economic rules of the game in such a way that the observed market failure is corrected (Malcolm Sawyer, 1990). Proponents of government intervention believe that these market failures are pervasive, and not liable to correction without strong government intervention. Those opposed to intervention argue that most market imperfections can be corrected by the provision of better information and that the best government role is to generate appropriate markets of information. Moreover, and this has been emphasized more in the last two decades, they also argue that government failure is more rampant than market failure. Consequently, government action should itself be subject to market tests (as argued in World Bank, 1993).

Much of the rationale for deregulation that is in vogue today derives from the observation of government failure, or market failure resulting from government action. Thus industrial policy consisting of deregulation can be derived from the observation of market failure, but market failure arising from the consequences of government intervention. For example, administrative fixation of interest rates would cause distortions in capital markets; the setting of minimum wages could lead to the clearing of labour markets at unnecessarily high levels of unemployment; controls on imports would distort international trade. The restoration of market functioning then involves deregulation.

An equally powerful rationale for industrial policy as that of market failure is that arising from equity considerations. There is nothing necessarily equitable in the allocation of resources that arise from the operation of the market, even if it is efficient and not plagued by imperfections. **Continual industrial restructuring is a feature of the most successful industrial economies.** This requires the reallocation of the different factors of production: labour, capital, and land. The process of restructuring leads to many losses that have no relationship with the power of the losers to have avoided those losses. Restructuring may result not only from loss in competitiveness which could, in principle, be foreseen, but also from such phenomena as changing taste patterns, and also market developments such as the oil price rises of 1973 and 1979 which were not foreseeable. The discovery of new materials as substitutes for old ones can also cause the decline of whole industries. Such developments are also not necessarily foreseeable. Workers may, for example, undergo de-skilling, as a result of comparative advantage shifting from their sector of industry, and then need to re-invest in training. Similarly, given the immobility of physical capital, capital owners may also undergo unforeseen losses. Hence there is ample reason for the government to intervene in order to compensate for such inequity. The social costs of adjustment constitute powerful reasons for remedial action by the government. Losses due to adjustment also frequently arise at the regional level when the activities that constituted the traditional specialization of the region become uncompetitive and have to cease. This kind of decline often causes negative externalities in that even other activities that remain perfectly competitive suffer from the poor image of that region. The relative backwardness of whole regions, such as the Mezzogiorno region of Italy, have drawn intensive attention: equity considerations are the rationale for the whole area of regional development policies that are observed in most countries of the world. Indeed, the greater portion of European Community funds that are used in the promotion of industry are in the practice of regional policy.

This brief review of the various kinds of rationale that are used for the practice of industrial policy reveals the wide area of action that can be indulged in under this rubric. The basic issue is whether the medicine is often worse than the cure. Much of recent discussion on industrial policy, in both developed and developing countries has revolved around the relative evaluation of government failure and market failure. The disillusionment with the widespread government interventions practised by developing countries in the 1950s and 1960s and the accompanying economic literature on rent seeking and pursuit of directly unproductive

activities has resulted in greater emphasis being given to government failure in that context. Thus structural adjustment measures have emphasized deregulation, opening of the economy to world trade and the withdrawal of governments from activities traditionally characterized as industrial (and technology) policy. The ideological revolutions of Mr Reagan and Mrs Thatcher in the Anglo Saxon world have been antipathetic to the idea of government action in the industrial field though, ironically, at least in the trade area, there has probably been far greater government intervention than in previous periods.

In the post World War II period there has probably been more respect for the capabilities of government in the other Western European countries as a result of the successful operation of prosperous welfare states throughout this period. European governments have maintained far reaching commitments to their citizens, not only to maintain overall full employment but, implicitly, "to maintain employment in specific regions, firms, and even jobs" (Robert Lawrence, 1987: 303). Thus the contagious infection of deregulation has spread to these countries rather more slowly and their governments unabashedly remain more engaged in the practice of industrial, trade, and technology policies than the Anglo Saxon countries. The development of the European Common Market has been slow over the last thirty five years. The Maastricht Treaty brought a significant accelerator to policy change towards deregulation and market opening. This has brought in its wake, much greater explicit thinking about industrial and technology policies. Western European countries therefore form an interesting laboratory to observe the formulation, practice and efficacy of such policies.

III GOVERNING INDUSTRIAL DEVELOPMENT: POLICY INSTRUMENTS FOR MARKET ECONOMIES

3.1 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? This 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 current 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 observing how industrial policies differ across nations and what impact do they have, positive or negative. 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. 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.

3.2 Product Market Interventions

Much of the rationale for the efficient operation of market economies lies in the efficient operation of 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.

3.21 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.

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 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. However, the use of such measures against third countries has probably increased during this period (Finger and Laird, 1987).

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.

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. 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).

Trade policy has also been used in a positive fashion for the promotion of exports. 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 European countries are for capital goods through the provision of concessional export credits usually disbursed through state owned Export Import Banks or their equivalents. The competition among them on the level of permissible export credit subsidies has had to be regulated in recent years by the agreements reached through the OECD (Surrey and Walker, 1983). The other method used for export subsidies is through the use of tied aid for projects in developing countries. To the extent that the price of equipment sold by firms belonging to the donor country is higher than world prices, that amount is really an export subsidy to domestic firms rather than aid to the donee.

The maneuverability that countries enjoyed with respect to trade policy over the past fifty years is no longer available. 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 may now increasingly lie in the realm of technology policy.

3.22 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. 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.

Competition policy is one area of policy which most countries (including in particular European countries) have been relatively slow in implementing. 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. In European countries, there has been much greater tolerance of cosy cartels and of other oligopolistic activities. Here it is probably correct to, say that competition policy is still evolving at both the national and European Union level. 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 takeovers: 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 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. European countries have intervened widely in this fashion, most recently in the nurturing of so called high tech industries. Government intervention in product markets such as steel, coal, and shipbuilding has been pervasive, but in these areas much of the intervention has essentially nurtured declining industries. 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.

Policies on foreign direct investment are usually dominated by non economic factors related to perceptions of 'economic sovereignty'. Policies on foreign direct investment are also intrinsically connected with the foreign trade regime in force. When trade policy is restrictive of imports, large incentives are built in for investment of the tariff jumping variety. If there is a good rationale for import restrictions the same rationale would apply for restrictions on foreign direct investment. On the other hand, a restrictive trade policy could also be designed to encourage foreign direct investment if that is considered to be beneficial for the domestic economy. There are wide variations in the attitude of different countries to foreign direct investment even most European countries maintained capital controls on both inward and outward investment until the late 1970s (Margaret Sharp, 1992b). But considerable U.S.

investment flowed to Europe in the 1960s and 1970s in order to take advantage of the fast growing European economy of that period. Undoubtedly, some of this investment was of the tariff jumping kind. It also gave rise to many fears about American domination of the European economy, particularly in France. Some attitudes are reflected in active encouragement of foreign investment, as in the United Kingdom, with the basic objective of infusing greater competitive dynamism in the domestic economy, whereas others are reflected indirectly through regulations such as local content requirements, exclusion of foreign owned firms from public procurement and the like.

The last decade has seen a significant opening to foreign investment by developing countries. 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.

3.3 Factor Market Interventions

3.31 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 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. In countries attempting to catch up, the very lack of well functioning capital markets, and, perhaps, the lack of availability of adequate savings, is sought to be corrected by the state by providing capital assistance for setting up infant industries. 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 are made in these countries 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. Large amounts of capital assistance are given as instruments for the promotion of backward regions in most countries, within each European country and on a European Union wide basis.

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 in these past twelve months by the unfortunate events in East and South East Asia.

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. 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 usually 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.

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. 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. 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 managements 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.

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. 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.

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. 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.

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 and 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 short-sightedness 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.

Other direct interventions are also used to promote the mobility of locked in capital. Subsidies have, for example, been given as incentives for the express purpose of scrapping machinery, as was done in the United Kingdom to encourage the scrapping of obsolete looms in the textile industry in the late 1950s and early 1960s (Sharp and Shepherd, 1987). Subsidies are also often available to declining industries for investing in new equipment for attaining competitiveness. Such measures are only successful if the industry as a whole is competitive and it is only some enterprises that are failing. When the industry as a whole is in the process of losing its comparative advantage, such capital market interventions merely postpone the required industrial adjustment and hence retard capital mobility rather than enhancing it.

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 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. Such subsidies are among the most important fiscal subventions being made by the European Community to regions as distinct from countries. 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.

3.32 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.

Given the externalities and spillovers involved in technical education and training, there is always great need for appropriate government interventions. At the same time, 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 are 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. 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 European countries are usually cited among the important factors explaining differences in relative industrial and technological performance of these countries.

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 developed 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.

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.

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.

3.4 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 principle 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.

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 reasons.

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.

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.

3.5 Technology Policy

"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.

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 emphasize the importance of technology differences between firms and countries as explanators of comparative trade performance (see, for example Ray Vernon, 1970; Gary Hufbauer, 1986; Dosi and Soete, 1988). 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 most discussion on strategies for the development of the less developed countries does 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). 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.

The current thinking in Europe regarding the complexity of technological change and of designing policies for supporting such change 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 emphasizing 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'. 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.

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 characterized 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 by European countries, 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.

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 defense 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. 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 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 convergence of the main European economies towards economic and technological levels of the technology leader, the United States. They can no longer play the game of the technological follower and let the leader set priorities at the technological frontier. The attention of these European countries, individually and at the European Community level, has naturally turned to the fostering of frontier technologies. Their industrial competitiveness with respect to the key competitors, the United States and Japan, depends crucially on how well they foster advances in the new and generic technologies. One example of a developing country attempting to pay specific attention to the support for service technologies is the current Indian thrust towards information technology.

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.

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 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 centralized 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 organizations 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 organizations 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

receive substantial government funding through different channels. Private sector funding for basic research is relatively small but can be significant in some sectors.

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 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 is a great variety of practice 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 industrialized 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 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 organization 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.

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 realization 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 subsidized 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.

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 led 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 electronification 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 cooperative 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. European countries exhibit a large variety of institutional systems devoted to technical education and training and there is no tendency of convergence of these systems. 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 organization 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 organization 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.

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 standardized 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 standardization of components reduces transactions 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.

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.

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 organized.

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 leakages 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.

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 European 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.

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 organizations. 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.

IV. Industrial Framework Conditions

I have reviewed the many policy instruments that are used in advanced industrial market economies for influencing the course of industrial 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 I have clarified at the outset this paper has been motivated by a desire to explore the various ways that industrial development can be influenced after significant deregulation has occurred and after the opening of an economy to substantial international trade. As has become obvious in this review 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. In this concluding section of what constitutes the realm of industrial policy making I attempt to examine the institutional context in which industry functions in market economies. This is of great consequence to developing countries in the process of deregulating and opening their markets.

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 commercialization of activities hitherto not regarded as commercial. In Europe, the United Kingdom has led the way on privatization which then spread to the rest of the European Union. However, the process of regulating these privatized 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 privatization 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 coordinated 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 specialized niches as flower trading and transport. Even with the onset of privatization 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 coordination and planning will be dominant.

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. 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 coordinated by it, and at different levels of government remains an important component in the industrial policy armoury of different countries and regions.

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 organized.

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 organizations who share major public characteristics" (Hancher and Moran, 1989: 275). It is large bureaucratic organizations, 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 organizations, 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 marketized 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.

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 industrialization. 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 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 organizations 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 industrializing developing countries have to observe, analyze and gain from experiences already gone through. 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 many industrializing developing countries obscures the real relative profitability of different industries thereby distorting the incentive structure and possibly resulting in an inappropriate industry composition. Similar is the operation of import tariffs in many countries with a highly variegated structure. 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 characterizes many developed countries in not imposing highly differentiated indirect taxes on different products and industries needs careful study by the late industrializers. 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.

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 developing countries until recently.

There is much less discretionary activity in the direct implementation of rules, regulations and procedures: much of activity is conducted at arms 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 chapter activity become more specialized. 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 globalization of industry, the globalization 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 industrializers 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 specialized capability for the governance of complex systems but also a guiding vision which lifts the aspirations of its industrial entrepreneurs and corporations.

References

Arrow, Kenneth J. 1962.

"Economic Welfare and Allocation of Resources for Invention", in N.B.E.R., **The Rate and Direction of Inventive Activity**. Princeton, N.J.: Princeton University Press.

Borras, Michael. 1983.

"The Politics of Competitive Erosion in the U.S. Steel Industry", in John Zysman and Laura Tyson, **American Industry in International Competition: Government Policies and Corporate Strategies**. Ithaca and London: Cornell University Press.

Cawson, Alan, Kevin Morgan, Douglas Webber, Peter Holmes, and Anne Stevens. 1990.

Hostile Brothers: Competition and Closure in the European Electronics Industry. Oxford, U.K., Clarendon Press.

Dahlman, Carl J., Bruce Ross-Larson, and Larry E. Westphal. 1987.

"Managing Technological Development: Lessons from newly Industrializing Countries", **World Development**, Volume 15, No. 6:759-775.

Dertouzos, Michael L., Richard Lester and Robert M. Solow. 1989.

Made in America: Regaining the Productive Edge. Cambridge, Mass.: M.I.T. Press.

Dosi, Giovanni. 1981.

"Institutions and Markets in High Technology: Government Support for Micro-electronics in Europe", in Charles Carter, **Industrial Policy and Innovation**. London: Heinemann.

Dosi, Giovanni, Christopher Freeman, Richard Nelson, Gerald Silverberg and Luc Soete. 1988.

Technical Change and Economic Theory. London: Pinter Publishers.

Dosi, Giovanni and Luc Soete. 1988.

"Technical Change and International Trade", in Giovanni Dosi and others, **Technical Change and Economic Theory**. London: Pinter Publishers.

Dreher, Carsten. 1991.

"Modes of Usage and Diffusion of New Technologies and New Knowledge: The Case of Germany", Brussels: Commission of the European Communities, Monitor - FAST Programme. FAST Occasional Paper 231.

Duchene, Francois, and Geoffrey Shepherd. 1987a.

"Sources of Industrial Policy", in Francois Duchene and Geoffrey Shepherd (eds.), **Managing Industrial Change in Western Europe**. London: Frances Pinter.

Duchene, Francois, and Geoffrey Shepherd. 1987b.
"Western Europe: A Family of Contrasts", in Francois Duchene and Geoffrey Shepherd (eds.), **Managing Industrial Change in Western Europe**. London: Frances Pinter.

Enos, John. 1991
The Creation of Technological Capacity in Developing Countries. London: Pinter Publishers.

Ergas, Henry. 1984.
Why do Some Countries Innovate More Than Others. Brussels: Centre for European Policy Studies, CEPS Papers, No.5.

Ergas, Henry. 1987a.
"Does Technology Policy Matter?", in Bruce R.Guile and Harvey Brooks (eds.), **Technology and Global Industry: Companies and Nations in the World Economy**. Washington D.c.: National Academy Press.

Ergas, Henry. 1987b.
"The Importance of Technology Policy" in Partha Dasgupta and Paul Stoneman, **Economic Policy and Technology Performance**. Cambridge, U.K.: Cambridge University Press.

Evenson, Robert E. 1990.
"Intellectual Property Rights, R & D, Inventions, Technology Purchase, and Piracy in Economic Development: An International Comparative Study", in Robert E. Evenson and Gustav Ranis, **Science and Technology: Lessons for Economic Development**. Boulder, Colorado: Westview Press.

Evenson, Robert E. 1993.
"The Study of Technology in Economic Development : Lesons from Agriculture for Industry". Keynote Address at First United Nations University Institute for New Technologies (UNU/INTECH) Conference. Maastricht, NL.

Finger, M.J. and S.Laird. 1987.
"Protection in Developed and Developing Countries: An Overview", **Journal of World Trade Law**, Volume 21, No. 6., December.

Foster, Christopher D. 1992.
Privatization, Public Ownership, and the Regulation of Natural Monopoly. Oxford, U.K.: Blackwell.

Fraunhofer Institut für Systemtechnik und Innovationsforschung (FhG-ISI). 1993.
"Technology at the Beginning of the 21st Century". Karlsruhe, Germany: FhG-ISI.
Processed.

Freeman, Christopher. 1987.
Technology Policy and Economic Performance. London: Pinter Publishers.

Freeman, Christopher. 1988.
"Introduction", in Giovanni Dosi and others, **Technical Change and Economic Theory**.
London: Pinter Publishers.

Hagedoorn, John and Jos Schakenrad. 1991.

"The Role of Interfirm Cooperation Agreements in the Globalisation of Economy and
Technology", Brussels: Commission of the European Communities, Monitor - FAST
Programme. FAST Occasional Paper 280.

Hancher, Leigh, and Michael Moran (eds). 1989.
Capitalism, Culture and Economic Regulation. Oxford U.K.: Clarendon Press.

Henderson, P. David. 1991.
"The World Trading System", in John Llewellyn and Stephen Potter, **Economic Policies
for the 1990s**. Oxford, U.K.: Blackwell Publishing.

Hosomi, Takashi and Ariyoshi Okumura. 1982.
"Japanese Industrial Policy", in John Pinder (ed.), **National Industrial Strategies and
the World Economy**. London: Croom Helm.

Hufbauer, Gary C. 1986.
Synthetic Materials and the Theory of International Trade. Cambridge, Mass.:
Harvard University Press.

Jacobs, Dany. 1991.
"Modes of Usage and Diffusion of New Technologies and New Knowledge: The Case of
the Netherlands". Brussels: Commission of the European Communities, Monitor - FAST
Programme. FAST Occasional Paper 231.

Krugman, Paul R. (ed.). 1986.
Strategic Trade Policy and the New International Economics. Cambridge, Mass.:
M.I.T. Press.

Lall, Sanjaya. 1987.
Learning to Industrialize: The Acquisition of Technological Capacity in India. London: Macmillan.

Lall, Sanjaya. 1990.
Building Industrial Competitiveness in Developing Countries. Paris: O.E.C.D.

Landes, David. 1969.
The Unbound Prometheus. Cambridge, U.K.: Cambridge University Press.

Lawrence, Robert Z. 1987.
"Trade Performance as a Constraint on European Economic Growth", in Robert Z. Lawrence and Charles L. Schultze, **Barriers to European Growth: A Transatlantic View.** Washington D.C.: The Brookings Institution.

Lawrence, Robert Z. and Charles L. Schultze (eds.). 1987.
Barriers to European Growth: A Transatlantic View. Washington D.C.: The Brookings Institution.

Llewellyn, John, and Stephen J. Potter. 1991.
Economic Policies for the 1990s. Oxford, U.K.: Blackwell Publishers.

Lundvall, Bengt Ake (ed.). 1992.
Towards a Theory of Innovation and Interactive Learning. London: Pinter Publishers.

Maddison, Angus. 1991.
Dynamic Forces in Capitalist Development: A Long Run Comparative View. New York and Oxford, U.K.: Oxford University Press.

Mody, Ashoka, Jerry Sanders, Rajan Suri, Chandu Rao and Fernando Contreras. 1991a.
International Competition in the Bicycle Industry: Keeping Pace With Technological Change. World Bank Industry and Energy Department Working Paper, Industry Series No. 50, Washington D.C.

Mody, Ashoka, Jerry Sanders, Rajan Suri, and David Van Zoest. 1991b.
International Competition in the Footwear Industry: Keeping Pace With Technological Change. World Bank Industry and Energy Department Working Paper, Industry Series No. 51, Washington D.C.

Mody, Ashoka, Jerry Sanders, Rajan Suri, and Eric Thompson. 1991c.
International Competition in Steel Mills: Keeping Pace With Technological Change. World Bank Industry and Energy Department Working Paper, Industry Series No. 52, Washington D.C.

Mody, Ashoka, Jerry Sanders, Rajan Suri, and Mohan Tatikondan. 1991d.
International Competition in Printed Circuit Board Assembly: Keeping Pace With Technological Change. World Bank Industry and Energy Department Working Paper, Industry Series No. 53, Washington D.C.

Mody, Ashoka, Rajan Suri, and Jerry Sanders. 1992.
"Keeping Pace With Change: Organizational and Technological Imperatives", **World Development**, Volume 20, No. 12 : 1797-1816, December.

Moran, Michael. 1989.
"Investor Protection and the Culture of Capitalism", in Leigh Hancher and Michael Moran (eds), **Capitalism, Culture and Economic Regulation.** Oxford U.K.: Clarendon Press.

National Academy of Sciences, National Academy of Engineering, Institute of Medicine (NAS/NAE/IOM). 1992.
The Government Role in Civilian Technology: Building a New Alliance. Washington D.C.: National Academy Press.

Nelson, Richard R. (ed.). 1993.
National Innovation Systems: A Comparative Analysis. New York and Oxford, U.K.: Oxford University Press.

O.E.C.D. 1992a.
Industrial Policies in OECD Countries: Annual Review, 1992. Paris: Organisation for Economic Cooperation and Development.

Picciotto, Sol. 1989.
"Slicing a Shadow: Business Taxation in an International Framework", in Leigh Hancher and Michael Moran (eds), **Capitalism, Culture and Economic Regulation.** Oxford, U.K.: Clarendon Press.

Pinder, John (ed.). 1982a.
National Industrial Strategies and the World Economy. London: Croom Helm.

Pinder, John. 1982b.

"Causes and Kinds of Industrial Policy", in John Pinder (ed.), **National Industrial Strategies and the World Economy**. London: Croom Helm.

Porter, Michael E. 1990.

The Competitive Advantage of Nations. London: The Macmillan Press.

Price, Victoria Curzon. 1981.

Industrial Policies in the European Community. London: Macmillan.

Prosser, Tony. 1989.

"Regulation of Privatized Enterprises: Institutions and Procedures", in Leigh Hancher and Michael Moran (eds), **Capitalism, Culture and Economic Regulation**. Oxford, U.K.: Clarendon Press.

Reich, Robert. 1992.

The Work of Nations :Preparing Ourselves for 21st Century Capitalism. New York: Vintage Books.

Rosenberg Nathan. 1976.

Perspectives on Technology. Cambridge, U.K.: Cambridge University Press.

Sawyer, Malcolm. 1990.

"Industrial Policies of the Labour Governments of the 1960s and 1970s", in Keith Cowling and Horst Tomann, **Industrial Policy after 1992: An Anglo German Perspective**. London: Anglo German Foundation.

Sharp, Margaret, 1992.

"Industrial Policy in Global Environment". Paper presented at a Conference on "Adjustment of Policies, Organisations and Firms to Global Competition: Seeking New Forms of International Cooperation", held at San Diego, California. 2-3 October, 1992.

Sharp, Margaret and Geoffrey Shepherd. 1987.

Managing Change in British Industry. Geneva: International Labour Office.

Shepherd, Geoffrey. 1983.

"Textiles: New Ways of Surviving in an Old Industry", in Geoffrey Shepherd, Francois Duchene and Christopher Saunders (eds.), **Europe's Industries: Public and Private Strategies for Change**. London: Frances Pinter.

Shepherd, Geoffrey, Francois Duchene, and Christopher Saunders (eds.). 1983

Europe's Industries: Public and Private Strategies for Change. London: Frances Pinter

Soete, Luc and Anthony Arundel (eds.). 1993.

An Integrated Approach to European Innovation and Technology Policy: A Maastricht Memorandum. Brussels and Luxembourg: Commission of the European Communities.

Soete, Luc and Bart Verspagen. 1992.

"Competing For Growth: The Dynamics of Technology Gaps". Paper presented at the International Economic Association Conference on "Economic Growth and the Structure of Long Term Development", Varenna, Italy. October 1-3,1992.

Soete, Luc and Bart Verspagen. 1993.

"Technology and Growth: The Complex Dynamics of Catching Up, Falling Behind and Taking Over", in A.Szirmai, B.van Arkadie and D.Pilat, **Explaining Economic Growth**. Amsterdam: Elsevier Science Publishers.

Surrey, John and William Walker. 1983.

"Electrical Power Plant: Market Collapse and Structural Strains", in Geoffrey Shepherd, Francois Duchene and Christopher Saunders (eds.), **Europe's Industries: Public and Private Strategies for Change**. London: Frances Pinter.

Tyson, Laura D'Andrea. 1992.

Who's Bashing Whom: Trade Conflict in High Technology Industries. Washington D.C.: Institute for International Economics.

Tyson, Laura D'Andrea and John Zysman. 1983a.

"American Industry in International Competition", in John Zysman and Laura Tyson, **American Industry in International Competition: Government Policies and Corporate Strategies**. Ithaca and London: Cornell University Press.

Tyson, Laura D'Andrea and John Zysman. 1983b.

"Conclusions: What to do Now?", in John Zysman and Laura Tyson, **American Industry in International Competition: Government Policies and Corporate Strategies**. Ithaca and London: Cornell University Press.

Vernon, Raymond (ed). 1970.

The Technology Factor in International Trade. New York: NBER/Columbia University Press.

Verspagen, Bart. 1991.

"A New Empirical Approach to Catching Up or Falling Behind", **Structural Change and Economic Dynamics**, Volume 2, No. 2. 359-380.

Westphal, Larry, Yung W. Rhee, and Garry Pursell. 1978.

Korean Industrial Competence: Where It Came From. World Bank Staff Working Paper 469. Washington D.C.

World Bank. 1991.

World Development Report: The Challenge of Development. New York: Oxford University Press.

World Bank. 1993.

The East Asian Miracle. New York: Oxford University Press.

Zysman, John and Laura D'Andrea Tyson (eds.). 1983.

~~**American Industry in International Competition: Government Policies and Corporate Strategies.**~~ Ithaca and London : Cornell University Press.