THE INTERNATIONAL REALPOLITIK OF SCIENCE AND TECHNOLOGY POLICY*

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Reasons are considered for growing government intervention in scientific and technological progress, justifications for such interference and variations in the objectives sought by developed nations through their science and technology policies. Many governments of developed countries now place high priority on using science and technology policy to maintain and enhance the international competitiveness of their industries. It is hoped thereby to increase their living standards and reduce unemployment. The belief is widespread that to be effective such policies should be directed towards encouraging selected industries and technologies, as in Japan and Germany. Since Australian policies broadly have not been industry specific and technology specific, they need to be re-assessed in the light of these developments.

INTRODUCTION

The economic and political dominance of the world by European countries and their new settlements in the last few centuries has rested on their superior science and technology. However, this superiority is no longer assured, as the Japanese example indicates. A number of developing countries (Taiwan, South Korea, Malaysia and so on) have demonstrated their ability to industrialise and adopt capitalistic technology more rapidly than was previously imagined possible. Their industrial exports are now perceived in some developed countries as a threat to their own industries. Government management or control of science and technology has increased and governments have become more concerned about their formulation of science and technology policy. The reasons for this are complex and no doubt subject to dispute. Nevertheless, a number of observations appear in order. While the community at large still looks to advances in science and technology as a means of

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improving the lot of mankind, it questions the social benefits of unbridled scientific and technological change. Indeed, many members of the community have become fearful of the possible unwanted effects of technological change — for instance, nuclear risks, unemployment and global pollution. To gain the maximum benefits from scientific and technological change and to avoid unwanted environmental and social consequences, there has been a growing community demand for science and technological effort to be more closely supervised through the government to meet social goals. The belief has gained ground that the direction of scientific effort should not be left to scientists, technocrats or even business managers acting alone, but that government, reflecting community-wide interests, should play a greater role in directing technological change. Specific concerns such as defence, environmental damage and the depletion of non-renewable resources and, more recently, increased international economic competition accompanied by economic recession, have brought demands for improvements in the science and technology policies of governments.

Apart from these pressures, however, it is necessary for governments in modern economies to give greater consideration to goals or priorities and to efficiency in their science and technology policies because they are responsible for a high proportion of science and technology expenditure in capitalist and quasi-capitalist countries and are active performers in the educational and research development fields. By their policies of various kinds, whether well designed or randomly formulated, governments also influence the performance of individuals and companies in adding to science and technology and employing it irrespective of whether governments partially fund this activity.

THE QUESTION OF GOVERNMENT INTERVENTION AND THE REALPOLITIK

Much of the discussion about the international realpolitik of science and technology policy revolves around the question of whether the government should be involved in scientific and technological development and its role if it is to be involved. Economists (on the basis of standard theories of welfare economics) suggest that government involvement in science and technology may be favoured by the following circumstances:

1. Individuals or individual companies are often unable to

appropriate an adequate share of total gains from private scientific and technological efforts.
2. Risks and uncertainties associated with such efforts may not be adequately taken into account by private agents.
3. There may be social failures in the transmission of scientific and technological information, especially in relation to backward and relatively ignorant groups.
4. There are imperfections in capital markets; that is, in the provision of funds for scientific effort and technological change.
5. Avoidance of wasteful duplication of scientific services.
6. Considerations of national security.
7. There are often external industry-wide economies of development, coupled with the failure of markets to co-ordinate and direct some large-scale desirable initiatives. This gives rise to a selective field or selective industry policy approach.

In cases of national security, cases in which there are large spillover ramifications for the future of society, governments may need to intervene in scientific and technological development. While in the case of military ability this has long been recognised, diplomatic, economic and social defence could also require such interference. This has become increasingly recognised as relative supplies of oil have dwindled and the economies and societies of nations dependent on oil and other energy imports have become increasingly subject to the policies of oil-exporting countries.

Markets may fail to steer industry and associated research and development into areas or industrial fields of the greatest national gain or advantage because decisions about resource use are made upon a basis that is too individualistic and isolated. While it may not be profitable for an individual firm to branch out into a new field, the position may be quite different if many firms can be convinced to enter that field almost simultaneously. They may then obtain external economies and economies of agglomeration. External economies (dependent upon the development of the whole industrial field)[1] may be achieved because specialists spring up to deal with different parts of the activities of the industry. In addition, industry overheads, such as the promotion of the industry abroad, can be spread over a greater output and the benefits of any research results obtained can be taken advantage of by a larger group. The problem and the mechanism are somewhat similar to that envisaged in the development of new regional towns and cities.[2] The implication of this view is that the government may need to co-ordinate and encourage the development of selected

industries or selected industrial fields and back its industrial strategy by giving support to science, industrial research and development and technological advance appropriate to the *selected* industries or fields. This approach further ties in with the idea that the most significant profit to be made from international trade is from being a technological leader or near-leader in an appropriate field. Japanese industrial policy has been to a large extent based on this point of view.[3]

Policies of this kind are often accompanied by selective protectionism. Protection from foreign imports may be afforded to infant industries or infant industrial fields until effective experience and learning have built-up and the scale of the whole industry or field has reached a stage where the home industry is more than competitive. The government may also interfere in technological exports to guarantee maximum gains for the home country and to ensure that imports of technology are obtained on the best possible terms from a national point of view.

While selective industrial science and technology policy may bring significant national gains, it involves social risks. A selected industry may prove to be uneconomic in the long term and negative or poor returns may be obtained on the large national investment involved in fostering it. While this suggests caution in evaluating this approach, it does not provide a case for rejecting it without serious consideration. The argument basically revolves around whether the selection of industries for development should be left to market forces or whether a case exists for the government to interfere and co-ordinate and encourage the development of specific industries. Will free markets ensure the best industrial specialisation for a country? If not, how can the best specialisation be identified, and can governments be expected, given the political constraints upon them, to guide the economy towards its best industrial specialisation?

The selected industries or selected field approach to science and technology (deliberate concentration on a few selected industries or fields) requires some centralism and planning in science and technology policy. A pluralistic approach is not possible. The overall planning approach to scientific and technological research effort is well developed in Germany and Japan, but pluralism prevails in the United Kingdom and the USA.

INTERNATIONAL GAINS FROM SCIENCE AND TECHNOLOGY

Apart from the importance of superior science and technology for military and cultural domination, new technology theories of international trade see it as being very important from the point of view of enabling the developed countries to extract maximum gains from international trade. To maintain high incomes in the developed countries, it is necessary to maintain a technology gap, or so it is believed.

The countries that are first or nearly so to develop new technology and use it commercially in industry obtain an initial monopoly. By exploiting this they may earn high incomes initially. Their multinational companies may assist these countries in maximising gains from new technology by ensuring diffusion (as the product cycle progresses) of the technology to technologically less advanced countries. However, monopoly gains are only temporary. After a number of years the technology becomes well known and can be readily imitated by all and sundry. Above-normal income can no longer be earned from the technology. If developed countries continue to use it, their incomes may tend to move towards those in less developed countries or increasing protection of the industry at home becomes necessary.

Consequently, it can be said that the developed countries are on a technology treadmill; they must keep running to remain where they are. Their advantages are a series of temporary ones and shrewd strategies are needed at the national level. Knowledge is the main commodity that has in the past given the European powers and their settlements world dominance. If this is true how long is that superiority likely to last? The Japanese example indicates that other countries, by adopting particular policies, may be able to join the league.

Apart from this matter and apart from the social will of the advanced countries to keep ahead in science and technology, the question must be posed of whether that is really feasible. Are there in fact limits to scientific progress? Is there a limit to what can be learned? If there is no such limit, is it likely to become more costly to make scientific and technological advances in relation to the gains? In fact, are there diminishing returns to scientific and technological effort? This is, of course, speculation, but the philosopher Rescher has recently argued that this is so.[4] I shall return to his view, but let us note now that the implication of this would be that the developed countries would gradually lose their technological edge over the developing ones. If, in fact, scientific

and technological progress were to cease, it would only be a matter of time before most nations would be on a technological par. If the underlying reason for the decline in the relative superiority of the technology of the developed countries is a real one, the cost or economic burden of trying to keep up the advantage may mean that the policy is not worthwhile. The cost may become extremely high especially if all the developed countries tend to duplicate one anothers' science and technology efforts.

WHAT CAN BE EXPECTED FROM SCIENCE AND TECHNOLOGY IN ECONOMIC DEVELOPMENT?

Scientific and technological progress has in general been welcomed by economists and has been a source for optimism about the future of mankind. At least since Adam Smith in the eighteenth century,[5] economists have stressed the important role of science and technology in raising living standards. When Malthus pointed out at the end of that century that the tendency of population to increase combined with diminishing returns in production might cause incomes to fall to subsistence level with economic growth,[6] Ricardo was quick to point out that this tendency could be staved off by technological progress.[7] Ricardo's view was eagerly taken up and embellished by Engels, Marx's friend and benefactor. It is worthwhile quoting Engels at length.

> Yet, so as to deprive the universal fear of over-population of any possible basis, let us once more return to the relationship of productive power to population. Malthus establishes a formula on which he bases his entire system: population is said to increase in a geometrical progression (1, 2, 4, 8, 16, 32 etc) the productive power of the land in an arithmetical progression (1, 2, 3, 4, 5, 6 etc). The difference is obvious, is terrifying: but is it correct? Where has it been proved that the productivity of the land increases in an arithemetical progression. The extent of land is limited. All right! The labour-power to be employed on this land-surface increases with population. Let us even assume that the increase in yield due to increase in labour does not always rise in proportion to labour: there still remains a third element, which, of course, never means anything to the economist — science — whose progress is as unceasing and at least as rapid as population. What progress does the agriculture of the century owe to chemistry alone . . . But science increases at least as much as population. The latter increases in proportion to the size of the previous generation, science advances in proportion to the knowledge bequeathed to it by the previous generation, and thus under the most

> ordinary conditions also in geometrical progression. What is impossible to science?[8]

It is interesting to note that Rescher in his recent book on scientific progress missed this important passage and accordingly was at a loss on the basis of Engels' *Dialectics of Nature* to understand the basis for current Soviet Marxist views on scientific progress. According to Rescher, "Soviet writers tend to reject the idea that there are any limits or limitations to scientific progress. For it is felt that a limit on science entails a limit to technological progress . . . Soviet writers on scientific growth almost unanimously dismiss the picture of logistic development of science often favoured in the West."[9]

While possibly not as optimistic as Engels, mainstream economists during the remainder of the nineteenth century and this century have continued to be optimistic about the contribution of science and technology to continuing economic development. This can be seen, for example, from Samuelson's introductory economics text.[10] For most mainstream economists it has been claimed the doomsday philosophies like those of Meadows, linking the growth of science and economic growth to impending disaster for mankind,[11] have been but a ripple on the surface or a reason for only a marginal change in course. This has led one non-orthodox economist to quip that most mainstream economists are trying to find the optimal seating arrangement on the Titanic. In all fairness, a number of economists, for example, E.J. Mishan and Kenneth Boulding, have expressed their doubts about the desirability of economic growth and the value of commonly held social and economic goals.[12] Mishan specifically points out that new technology may not serve the needs of man. He says in *The Costs of Economic Growth*:

> The younger generation will be facing the future with honesty only when it brings itself to face the strain of thinking through the consequences, tangible and intangible, certain and speculative, of the current drift into the future and, in doing so, recognizes that in the new world the old liberal harmonies are not to be found; that on many issues painful choices have to be made, and in some cases the needs of men and the needs of technology may prove to be irreconcilable.[13]

On the whole, established economists remain optimistic about progress in science as the means to reduce or avoid the possible harmful side-effects of economic growth, such as increasing levels of pollution, environmental degradation and resource depletion. Science, however, may have to be channelled in the correct direction, possibly by the government. Representatives of this

optimistic view include Nordhaus and Beckerman.[14] For example, Nordhaus has argued persuasively that science and technology provide us with the ability to maintain and even increase our living standards despite the growing depletion of fossil fuels.

Empiricists also emphasize the role of science and technology in economic development. When Rostow claimed in the 1950s that it was necessary for a nation to invest 10 per cent or more of its net national product in order to begin on a path of sustained development and economic growth,[15] this 'big push' doctrine was challenged. Blum, Cameron and Barnes pointed out that historical "research indicates that almost every developed country of today entered a phase of sustained growth with investment ratios below the magic figure of 10 per cent; and that the rise in that rate followed, rather than preceded, the adoption of new technologies."[16] In Great Britain sustained economic growth began in the eighteenth century, as Phyllis Deane points out, even though the investment ratio was below 5 per cent.[17] Economic growth occurred because new inventions were being embodied in the capital stock and education was improved. Economic development in France and Germany seems to have had a similar genesis. More recently, the applied economist Edward Denison estimated that almost a half of the growth in American GNP between 1929 and 1959 was due to increased education and improved technology.[18]

Whether or not less developed countries (LDCs) can repeat the pattern of European development is debatable. A number of writers believe that the fact that European countries (and a few others) have developed makes it more difficult for LDCs to make economic progress. In particular, those holding the centre-periphery theory of economic development argue that developed countries (the centre) dominate economic change in the pèriphery (LDCs) in such a way that scientific and technological breakthroughs in LDCs are extremely unlikely. Scientific and new technological change in LDCs is bound to be marginal and such countries are very dependent upon the import of foreign technology which may be inappropriate to their endowment of resources. In the circumstances, it is argued that existing LDCs cannot repeat the pattern of European economic development and, according to Marxists, are exploited by the developed countries. In contrast, neo-classical economic theory maintains that the greater world trade which can be expected to accompany economic growth in any part of the world is likely to be a powerful force for increasing incomes throughout the whole world and altering specialisation in production by countries so that all gain. Development in any part of the world provides greater opportunities to LDCs to develop

because incomes in these countries increase, so providing local funds for investment and more funds are available for foreign investment in LDCs. Neo-classical economic theory sees foreign investment (free international capital movement) as a means to raise incomes throughout the world, whereas Marxists see this as a means of neo-capitalist exploitation. Thus, there are at least two competing theories of current economic development to take account of when considering scientific and technological change in LDCs.[19]

There are also other pessimistic views about the role of science and technology in economic development. They have, for example, been put forward by members of the neo-Marxist Frankfurt School, and with modification appear to have been embraced by Hilary and Steven Rose.[20] Broadly this School sees scientific and technological change under corporate capitalism and bureaucratic socialism as being geared to production and the domination of nature and man. Man is increasingly alienated and oppressed by technological change in capitalistic systems, including bureaucratic socialist systems as in the Soviet Union. The Roses point out that one member of this group:

> Marcuse, in a century of massive growth in the scale and power of science, discerns science and technology as a particular mode of rationality aiding human oppression, either directly as the technology of repression, or individually through biological manipulation: 'Technology seems to institute new, more effective and more pleasant forms of social control and social cohesion'. Thus political questions are dissolved into technical issues to be resolved by experts. Technological rationality becomes political rationality.[21]

Other neo-Marxists, such as Ernst Mandel, emphasize that scientific and technological change becomes of increasing importance in late capitalism as a means for staving off an economy-wide decline in profits or surplus value.[22] They claim that the whole of the capitalist apparatus, including the instruments of government and its institutions, and even educational bodies such as universities, is directed towards maintaining surplus value through developments in science and technology. In the process labour is exploited, degraded and alienated according to this view. Despite this pessimism, it seems clear that at least in developed countries, standards of living have risen markedly in the last two hundred years and on the whole the lot of the working class has improved. While Marx's prediction of the increasing immiserisation of the working class under capitalism and with the passage of time has not, as yet, come to pass, alienation of participants in industrialised economies is a continuing problem.

Nevertheless, questions raised by Rescher as to whether scientific progress can continue in the future as in the past remain.[23] Let us, however, look at the science and technology priorities of developed OECD countries.

SCIENCE AND TECHNOLOGY PRIORITIES OF DEVELOPED OECD COUNTRIES

While expressed and apparent government priorities swung towards quality of life, including environmental objectives, in the late 1960s and early 1970s and even continued to do so later in some countries, the emphasis now has shifted towards promoting science and technology for the sake of increasing the international competitiveness of industry. Science and technology strategy under government direction is seen as a powerful means to raise exports, raise standards of living, expand employment and meet the challenge emanating from changes in the international division of labour — the gravitation of manufacturing industry to developing countries.

There has been growing acceptance by governments of the product-cycle and monopoly-gains from trade model and the desirability of using selective industrial priorities as a means to deal with the immediate problems of unemployment and slower growth than in the past. Rising energy prices have reinforced this trend. How deeply ingrained this view has become is clear from the recent recommendations of a Manchester University economist, Stubbs, for Australia, a country grappling with similar economic problems to those of most industrialised countries. Stubbs advises:

> In this study we have sought to show that technological change is a key element in industrial competitiveness and that countries which have not managed to incorporate it fully into their manufacturing industries (e.g. Britain) have performed markedly less well than those which have (e.g. Japan, West Germany). We believe that if Australia is to maintain its employment levels, the existence of an efficient manufacturing sector is essential . . . There are good theoretical reasons for government to take a leading role in the development and distribution of human capital, and pressing reasons in realpolitik why it must do so, on a more ambitious scale than formerly . . . The international transfer mechanism of technological capacity has grown sharply in its sophistication in the last four decades. Nations that sleep or even doze technologically will waken to find that they have lost opportunities for employment and comparative real incomes lag behind their neighbours.[24]

As can be seen from a review of the science and technology policies of other OECD countries, this theme is becoming common, for example in the Netherlands and Sweden, and is likely to become of more significance in the USA where the international industrial competitiveness of many traditional industries, such as automobiles, has fallen greatly. The current international economic position of the USA exemplifies the Vernon thesis based on the product cycle. Bell has said of this situation:

> American manufactured goods are pricing themselves out of the world market. From the view of theoretical economics, in the inevitable 'product cycle' of goods production a more advanced industrial society finds itself at a price disadvantage when a product becomes standardised, inputs are predictable, price elasticity of demand is higher, and labour costs make a difference, so that less advanced but competing nations can now make the product more cheaply. And this is now happening in American manufacturing. In the world economy the United States is now a 'mature' nation and in a position to be pushed off the top of the hill by more aggressive countries, as happened to England at the end of the first quarter of this century.[25]

It would not be surprising to find increasing American government interest in the realpolitik of using science and technology policy to maintain or reduce the slide in the competitiveness of American industry.

Is the recent growing emphasis on using government science and technology policy as a means to enhance the international competitiveness of its domestic industry a desirable one? A number of observations appear to be in order. This reaction on priorities is a response to immediate problems of unemployment, inflation and slower growth in industrialised countries. Governments are looking for medium-term solutions to these problems and must appear to the electorate to be attempting to solve these community-wide problems. Increased national industrial competitiveness, by giving a technological edge over other nations, holds out the national promise of increased employment through greater exports and economic growth, less inflation as a result of greater productivity, and higher standards of living through economic growth. It is theoretically possible for all of these ends to be simultaneously achieved. On superficial appearance at least, Germany, Japan and Sweden, and to a lesser extent the Netherlands, have in the past been able to achieve these goals simultaneously, whereas the USA and UK in particular have not.[26] Is this difference due to the way in which the first mentioned set of countries has been able to integrate science and technology with industry and industrial policy yet remain flexible and technologically progressive?

Nevertheless, to play at the game of international competitiveness on a grand scale is not riskless. Governments as participants may select the wrong industries and technologies for encouragement or may unwittingly choose the same science and technology fields in which to distinguish themselves as do other countries, and thus be unwillingly drawn into international cut-throat technological competition. All may lose as a result of this competition and as more countries enter the competition the likelihood of economic loss increases because the development of science and technology is not costless. This development requires alternative uses of resources to be foregone.

A basic question is raised: Does the quest for economic growth, full employment and a low rate of inflation through the increased international competitiveness of industry as a result of improved technology offer long-term salavation for mankind from its current and apparently deepening economic problems? Is it possible that increased industrial competitiveness on a global scale, fed by appropriate science and technology policies, could increase unemployment and reduce economic growth globally? Labour-saving devices worldwide in a world of inflexible wage rates and relatively inflexible hours of work could increase unemployment and strengthen any existing tendency to underconsumption of production. As a result, companies may intensify their efforts to promote high consumption; for example, through advertising. Even if economic growth should be achieved, it may be insufficient to restore full employment, may have an adverse impact on the quality of life and environmental conditions and hasten the depletion of non-renewable resources. If a few countries enter the race and others do not take it seriously, the few may gain, but if all enter or a large number enter the prospects may be different — the number of losers is bound to rise.

Yet technological progress is not the real villain in this scenario. It is man. It can be argued that man is seeking an easy way out of his current economic problems and is prepared to enter into a Faustian bargain for this purpose. He believes that after all economic growth might still satisfy his dreams, at least in the near future, even if it brings ecological catastrophe and non-renewable resource depletion closer. In the immediate future economic growth allows difficult collective decisions about the redistribution of income and the distribution of work to be side-stepped, provides hope and reduces immediate resource constraints. Yet if writers such as Daly and Gabor are correct,[27] it brings the day of resource crisis closer, the day when difficult decisions can no longer be avoided. Daly argues that the long-term survival of mankind can best be handled

by planning for steady-state economies now. This means, amongst other things, setting up institutions to limit the rate of resource depletion and the rate of population growth and to regulate the distribution of income. Whether one agrees or not with current doomsday philosophies, it is apparent that promising measures in the shorter period may be disastrous in the longer period, or worsen economic and social conditions in the long term. Priorities, therefore, need to be established about the competing claims of the present and the future, including the 'rights' of present and future generations.

Mishan has suggested that the defence argument for economic growth is not as strong as it is commonly assumed to be.[28] This may well be so, but Mishan minimises the difficulties for maintaining national defence in the absence of economic growth. Mishan suggests that technological progress in defence equipment could be fast or faster in the absence of continuing growth in the output of material goods, and that it is technology rather than men and materials that are important in modern war. The facility to produce war equipment and develop new technology may show complementarity with a nation's ability to undertake industrial production despite Mishan's suggestion to the contrary.

As far as exports are concerned, the product-cycle thesis suggests that a country may suffer a reduction in export earnings if it is not technologically progressive and growth orientated. This can result in a fall in the national standard of living in a country moving towards a steady-state economy. Exports and material standards of living, however, are not ends in themselves. A fall in exports and in material living standards could be worthwhile from the point of view of achieving more basic ends.

CONCLUDING COMMENTS

A swing has been observed in the OECD countries towards explicit priorities in government science and technology policy, a policy mainly designed for functional purposes. Actual priorities in most countries shifted towards quality of life, including environmental objectives in the 1960s and the first half of 1970s. Now science and technology for increased international industrial competitiveness is being emphasized as an objective, a trend that began in most countries towards the last half of the 1970s.[29] This emphasis appears to be a reaction to alterations in the international division of labour as a result of several developing countries successfully launching production of the traditional manufactures of mature

industrial countries, the occurrence of world recession accompanied by unemployment and inflation, reduced economic growth and rising energy costs. Several governments and societies see the strategy of increased international competitiveness of domestic industries encouraged by appropriate government science and technology policies as a means to solve unemployment, reduce inflation and increase economic growth. Countries such as Japan and Germany appear to have used such policies successfully. They can work, but they are not certain to do so. Furthermore, the more countries that indulge in these policies, the greater the chance of them not being successful in the world as a whole. They are not explicitly beggar-my-neighbour policies, but they could become so in an inflexible economic world. Thus new difficulties for this realpolitik strategy could arise on a global scale even ignoring possible adverse long-term effects on the environment, the depletion of resources and the social fabric of society.

It can also be claimed that the widespread demand for explicit national priorities in government policies flows from the growing realisation that spillovers (in terms of the environment, international industrial competitiveness and otherwise) are of increased significance in interdependent modern industrial economies and require greater attention to be given to collective or societal rationality. The liberal strategy of laissez-faire, of sectors of government and corporations blundering along in an uncoordinated or poorly co-ordinated fashion, poses increasing dangers to the community, even though the alternatives to it are not riskless. The quest for greater collective rationality, a trend predicted by Daniel Bell and at odds with the preferred administrative procedures of writers such as Lindblom and Milton Friedman,[30] has required governments to make their science and technology priorities more explicit and increase their overall co-ordination of government departments and agencies implementing science and technology policy. The drive towards collective rationality has operated both within government sectors and between them.

To put the above in historical perspective, it should be pointed out that in the past several countries have experienced sustained economic growth and development without a selective government approach to industrial policy and to science policy. Britain, for example, began its initial industrial economic growth, without such policies. However, it might be argued that this was unncessary because Britain was first in the field, and that nations attempting economic growth subsequently will or do find it progressively more difficult to succeed and maintain economic growth in the absence

of a selective government approach to the support of their industry and science. Indeed this was the argument advanced by List.[31] Nevertheless, one can certainly find nations that developed later and have sustained economic growth without such policies; for example, the United States and Sweden. Whether or not countries that have commenced their economic growth recently, such as Taiwan, S. Korea and Malaysia, will be able to sustain a similar growth pattern to that of the earlier developers remains to be seen. Furthermore, despite the historical record, we cannot be sure that the developed nations will be able to maintain their comparative position in the long run without selective policies. At the same time, selective policies cannot be regarded as a sure quick-acting panacea for our current economic ills.

One must also remain open-minded about the likely effectiveness of selective policies in promoting long-term economic growth, bearing in mind Professor Habakkuk's observation that,

> There is no simple formula for economic development. Rapid and sustained economic advance has become a common state of affairs in relatively recent times . . . One cannot even generalise about the most important economic variables . . . When we ask why one country has enjoyed economic progress whereas the other has remained backward, the answer is not always obvious.[32]

In these circumstances, it is not surprising that Australian policy advisers, including those in Government Departments, remain divided about whether or not Australia should follow (or indeed is capable of following) a selective guided approach to scientific and technological development. Those favouring a selective approach have also to agree about the appropriate types of science and technology and associated industries to be given special support. Even though the issues involved are difficult to resolve, they cannot be laid to rest, given current international conditions, without further debate.

It is clear that Australian debate about these issues is in fact likely to intensify. The Prime Minister (Mr Fraser, in early 1983) stated recently that the question of introducing and developing new technology in Australia is one of the important ones which the Government will need to consider in 1983. In his address, he pointed out that "our broad policy for encouraging new technology is not industry specific: rather, we have allowed industries to make their own decisions and to determine the direction of expenditure on new technology".[33] The Prime Minister asked the Minister for Industry and Commerce to consider during the year "whether or not this policy should be maintained or whether specific policies for

specific industries and technologies should be introduced''.[34] Though the Government changed at the March 1983 election, the issues still remain important and need to be addressed.

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