# MARKET FAILURE AND GOVERNMENT SUPPORT FOR SCIENCE AND TECHNOLOGY: ECONOMIC THEORY VERSUS POLITICAL PRACTICE*

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*The economic justification for government support for science and technology has been commonly based on the concept of market failure. The general theoretical argument is that governments should intervene in cases where the free market fails to achieve an efficient allocation of resources. In this paper, the inadequacies of the concepts of market failure as they apply to policy are outlined. Its use in the political process, given these restrictive shortcomings, is also considered. Examples are drawn from Australian experience in science and technology policy over the past few years to support the claim that the concept is neither a sufficient basis nor an adequate guide for government intervention. Rather it has been used to justify politically determined decisions. Special reference is made to the Australian Industrial Research and Development Incentives Scheme.*

Keywords: market failure, science and technology policy, Australian government

## INTRODUCTION

Technology is now accepted as having a central role in the performance of the economy. Yet only ten years ago, the relationship of technology to the economy was the subject of continuing debate in both political and academic circles. There were even those who doubted whether technology and its claimed progenitor, science, contributed much at all.[1] While there developed a growing acceptance that technology did contribute to the economy, though in far more complex and interactive ways than previous 'linear' models had suggested, the debate was not so much resolved as simply overtaken by events. On the one hand, there was the shift of concern to analysis of the social, and particularly the employment effects of technological change, symbolised in Australia by the Myers Report.[2] On the other,

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the effects of the world recession, and the increasingly sophisticated industrialisation of the nations in the Asian Pacific region, combined with the apparently spectacular capabilities of such new technologies as microelectronics, served to project technology as a key to economic recovery and a necessity for future economic well-being.

The urgency with which the programme of technology-assisted recovery has been promoted, in Australia and in many other countries, has carried with it the compulsion, rarely questioned, that governments must play a major role in supporting and promoting the development and diffusion of appropriate forms of technology. In Australia, this has seen the publication of 'technology strategies' by the Commonwealth government and five of the six states.[3] The switch from non-interventionism to economic nationalism (at least in terms of rhetoric[4]) has occurred remarkably swiftly, leaving little place for consideration of the forms of government intervention which might prove most effective.

Analysis and discussion of the issue of the appropriate role for government has taken place almost entirely in terms of the concept of market failure. The general theoretical argument has been that governments should intervene only in cases where the free market can be shown to be inadequate. While these arguments have been subject to criticism within the economic literature, there appears to have been almost no evaluation from policy and political perspectives, particularly in the Australian context. This paper will seek to examine the assumptions and value of the concept of market failure, the ways in which it has been used, and its adequacy as a guide for government policy.

## THE CONCEPT OF MARKET FAILURE

Classical economic theory asserts that competitive markets, under conditions of perfect competition, will bring about a socially optimal allocation of resources.[5] However, the market system is not, and has never been claimed to be, a perfect system in practice. There are instances where the market system will fail to achieve optimality in resource allocation. These instances have commonly been labelled 'market failures'.

The concept of market failure was first applied to science and technology by Nelson and Arrow. Nelson drew attention to the welfare economics of scientific research and the role of public policy in correcting market failure.[6] Arrow extended the concept of market failure to include the generation of technical knowledge.[7] They both argued that markets can fail to work as adequate mechanisms for allocating resources to science and technology because decisions made by firms and individuals are based upon private profits and gains, and

these frequently differ from social gains. Where private and social costs (or benefits) diverge, the operation of the market will lead to a non-optimal allocation of resources. Arrow summarised the sources of market failure as indivisibility, inappropriability and uncertainty. These have become accepted as the major sources of market failure with respect to science and technology.

*Indivisibility* can be of two kinds. The first type occurs in industries where there are many small competing companies. The rapid diffusion of technological change among all the producers would increase social and economic benefits, but individual firms do not have the resources or capability to develop or introduce the technology on their own account. As an example, in this situation the industry as a whole would benefit from a centralised technological capability, provided either by government or the industry itself. The second type occurs where the costs associated with the development of an advanced technology are so large that they are beyond the financial capacity of even the largest private company. Here government assistance is necessary if the technology is to be developed and commercialised.

*Inappropriability* arises from the production of benefits external to the producer. For example, a firm's investment in technology development can produce results of practical value in many applications. However, the innovating firm may be able to reap only a small share of these wider (or external) benefits. When firms originating the technology cannot capture all the benefits, the incentive to invest may be insufficient for the firm to proceed, leading to a general pattern of under-investment in technology development.

*Uncertainty* is inherent in the research process. Companies may be unwilling to jeopardise their profitability and sometimes their survival, by engaging in activities that have a high risk of failure. Hence, there will tend to be underinvestment in research, especially if firms are unable to spread the risk over a number of projects to decrease the impact of failure.

There have been many attempts to further elaborate the concept of market failure.[8] For example, to the three major sources, Tisdell has added a fourth source — the lack of property rights in potential inventions.[9] He argues that undiscovered knowledge is viewed by firms as a common resource and that the allocation of resources in such cases is not efficient. There may be a tendency for firms to 'rush to invent', leading to an over-investment in research and hence a dissipation of much of the social benefit. It should be noted that this form of market failure apparently operates in the opposite direction to those proposed by Arrow.

Another proposed source of market failure is imperfect markets.[10] It has been argued that the output of many projects is not traded in

perfect markets (for example, urban transport, health and defence) and the consequent divergence between social benefit and private benefit can lead to inefficiencies in producing or distributing knowledge in these areas. A further series of imperfections has been listed by Pavitt and Walker, who identified five possible reasons for government funding of scientific research.[11] These include management imperfections resulting from a lack of technical competence; knowledge imperfections amongst potential buyers of innovations; external social costs in terms of safety, health and job satisfaction; inadequate or inappropriate economic incentives; and inadequate investment by industrial firms in longer term, more radical innovations.

These various attempts at refining the market failure theory extend its application to a wider range of inefficiences, and allow it to take account of particular historical contingencies, such as health and safety legislation. However, these extensions have also emphasised an inherent weakness in the concept as a guide to policy makers.

## INADEQUACIES OF THE CONCEPT OF MARKET FAILURE FOR POLICY MAKING

The central assumption that market failure provides a basis for government intervention has been challenged, on grounds of both economic interpretation and administrative efficiency. Thus, Demsetz has questioned Arrow's conclusions about risk, arguing that if the cost of a risk shifting and sharing system is greater than its advantages (owing to the preferences expressed in the market), the absence of such a system does not necessarily mean that the allocation of resources is not optimal in this respect.[12] In addition, Demsetz has criticised the failure to recognise that public intervention is also likely to be imperfect. In many instances, corrective government (non-market) actions cannot use low cost means of acquiring information. The costs of administering 'ideal' government correction of externalities might be greater than the potential gains to society.

We have also been reminded that there is an assumption that the political actors in government who devise market-correcting measures act solely to maximise social efficiency without regard to their own power, prestige, income or vote appeal.[13] Quite evidently, this is not the case. In addition, however, the concept itself has severe limitations in terms of providing an operational guide to policy makers. Setting aside difficult problems, such as the determination of cost and benefit, it provides no mechanism for identifying market failure, or even where one might be identified, let alone whether it is on a scale sufficient to warrant correction.

According to the theory, governments should intervene up to the point where social and private costs (or benefits) no longer diverge. However, the concept provides no criteria for identifying when this point has been reached. Likewise, the problem of measuring the divergence between social and private costs has long been recognised.[14] For policy makers to use the concept of market failure empirically, separate evaluations using comparable methodologies would be necessary for each case under consideration. Even if this elaborate process were feasible, it would still not be possible to determine if "a step was taken in the right direction" until the "complete course has been charted".[15]

Further, market failure can also present contradictory policy prescriptions to policy makers. For example, Hirschleifer has argued that an inventor, in addition to capturing at least some of the social benefits of his invention, can also use superior knowledge of the invention and its distributive effects for speculative purposes.[16] This instance raises the possibility of an over-allocation of resources to research and development (R & D), whereas the theory predicts an underinvestment in R & D.

In summary, the major shortcomings of the concept of market failure for policy are:

- no clear cut criteria for identifying a market failure or whether it should be corrected;
- little guidance on the extent of intervention necessary;
- difficult to use in practice as the notion of measuring private and social costs (or benefits) is not well developed;
- an implicit assumption of zero administrative costs.

## THE USE OF THE CONCEPT OF MARKET FAILURE

The inadequacies of the concept of market failure would appear to raise serious practical problems for policy makers. It is clearly not a sufficient condition for government intervention. Yet market failure still carries considerable weight as an authoritative justification for government intervention. Just how is the concept of market failure used by policy makers given its obvious inadequacies as a guide for policy?

As might be expected, special interest groups have used the concept of market failure to gain support for their views and projects, often against economic and national interests. As an illustration of the use of market failure, Eads has commented on a number of examples from United States experience.[17] These indicate that the concept has been used (in the US at least) to justify government intervention.

> The theory of externalities in its simplest form predicts that under a certain set of assumptions there will be a general tendency for private industry to underinvest in technological change and states that governmental intervention aimed at correcting this tendency may be proper. The practical outcome is that someone — perhaps even a party having a substantial private financial interest in the outcome — perceives that an industry is achieving a rate of technological change below the level that the particular party believes is desirable.

Eads goes on to explore some of the mechanisms for bringing about intervention:

> After suitable publicity has increased public awareness that a problem exists, a prestigious panel is thereupon convened. After an appropriate interval it produces a report stating that while, of course, everyone knows that the economy would operate best if the market were left free to operate, in the particular case at hand the market has 'failed' and cannot be trusted to bring about the socially desirable result. It is at this point that the theory of externalities is invoked.

Interestingly, Eads lays no blame on those who so employ the concept of market failure. Rather it is the inadequacy of the concept itself which is criticised for failing to provide a proper guide for those formulating policy for technology.

In Australia, especially over the last few years, the concept of market failure has been used very vigorously in the political debate over the allocation of resources to science and technology. However, the concept seems to have been used to oppose government intervention in science and technology, rather than support the case for intervention. It is because of this prominent role of market failure in the political process that the experience from Australia over the past few years provides an excellent opportunity for evaluating in detail the economic basis, political use, and consequences of the concept of market failure.

## THE AUSTRALIAN EXPERIENCE

The appeal to market failure as a basis for policy with respect to science and technology, for industry in general, was particularly prominent during the life of the Liberal-National Country Party (Fraser) governments between 1975 and 1983. Their general economic approach espoused minimal government intervention in the private sector and reduced public expenditure. Coupled to this was an industry policy which accepted the need for a technologically-efficient manufacturing sector achieved through the virtues of market forces rather than government intervention.[18] In this political climate, the Industries Assistance Commission and the Treasury in particular drew

on the rationale of market failure to oppose general government intervention.[19] Even the then Department of Science and Technology, presumably committed to the support of science, succumbed to the prevailing philosophy, but argued that market failure provided the economic rationale for government intervention.[20]

The review of Productivity and Innovation Programs of the Department of Science and Technology, which was initiated in 1981, provides the first example of the use of the concept.[21] The Department of Finance, in its submission, exploited the weakness of the concept to prescribe how extensively governments should intervene:

> . . . the mere existence of such externalities does not justify public intervention or indicate the appropriate Government response. Both the extent of any external benefits and reasons why the innovator cannot appropriate such benefits fully are relevant.[22]

Likewise, the Treasury in its submission focussed on this weakness. It stressed that for public intervention in industrial innovation processes to be justified on economic grounds, it would be necessary not only to demonstrate that market failure would lead to less than optimum private investment in innovation, but also to determine whether such intervention would produce net social benefits.[23]

Notwithstanding the very great difficulties of measuring the extent of market failure, admitted by both the Treasury and Department of Finance in their submissions, they were able to use this obvious difficulty of measurement to impose restrictions and limitations on those wishing to intervene. This view carried over to the Committee's conclusions:

> Government intervention in industry matters should be restricted. It could be justified only on certain economic grounds or where the Government itself wishes to achieve a specific policy objective. In either case, the public benefits must exceed the public costs.[24]

The ploy of stipulating the need to measure costs and benefits, notwithstanding the difficulty of this in practice, has also been used to good effect by the Industries Assistance Commission in its discussion of industrial research and development (I R & D) funding:

> To subsidise I R & D without regard to social costs and benefits could draw resources away from other more valuable uses, and lead to losses in community well-being.[25]

The comparative lack of theoretical and empirical evidence available to those policy makers advocating intervention was also stressed. For instance, the IAC argued that in the case of R & D support to small firms:

> Any policy offsetting this feature is difficult to justify. Among other things, it requires an assumption on the part of policy makers of what is the appropriate scale of R & D effort for various firms in different industries, as well as a belief in the policy makers' superior knowledge of the factors which affect the firms' decision making.[26]

Professional knowledge was also claimed to cast doubt on the existence of market failure and so deny interventionists an economic justification for their proposals. For example, the IAC used this approach in dealing with the issue of risk:

> While risk affects the way resources are used, it is not clear that this implies any resource inefficiency and a consequent role for government. . . The Commission considers that there is not a sound basis for endorsing a general policy of assisting high risk activities, simply because they are high risk.[27]

As a third example, we note that much has been made of the administrative inefficiencies of government intervention. A major thrust of this line of argument has been to decry the ability of governments, and especially bureaucrats, to 'pick winners'. Thus, according to the Treasury:

> Any program of general government intervention to direct technological progress along a pre-selected path would see the economy lose the flexibility to adapt to the whole range of diverse opportunities for economic progress that evolve and, just as important, the capacity to discard those 'lame duck' activities which cease to be successful.[28]

In similar vein, the IAC has commented on the problems of 'picking winners':

> Where assistance is provided to nominated activities this is automatically at the expense of other areas which compete with the assisted activity for resources. Thus, if the government nominated and encourages a 'sunrise' activity, this reduces the ability of alternative emerging activities to attract resources and grow. No guarantees can be provided that the nominated industries or technologies will in fact be winners in terms of their capacity to contribute to overall domestic growth and welfare.[29]

The Liberal government was an adherent (at least as far as rhetoric was concerned) to this view. In its major 1977 White Paper on Manufacturing Industry, it asserted:

> The White Paper does not nominate 'desirable' industries . . . The Government cannot accurately predict — let alone govern — changes in the Australian industrial structure, and wrong predictions by it could seriously hinder the adjustment process and retard the competitive position of Australian industry.[30]

It is possible to accentuate the costs of government intervention to the point where it appears as though the costs greatly exceed the benefits. For example, the Treasury has debunked 'picking winners' by asserting the likely failure of the approach:

> . . .the choice of particular technologies and characteristics to promote is an exercise in 'winner picking' by bureaucrats who have no special expertise or ability to divine the pattern of technological change. Basic economic considerations suggest that attempts by government to accelerate diffusion in these ways may generate more social costs than benefits.[31]

Similarly, the IAC has argued that:

> . . .the ability of alternative emerging activities to attract resources and grow will be reduced as a result of the government nominating particular industries for special encouragement. Therefore, if the government nominates ultimately inappropriate or unsuitable activities the community will be worse off because resources will have been allocated inefficiently and the growth of other suitable activities will have been retarded.[32]

It is interesting to note that the above examples involve assertions about the measurement of costs and benefits, without referring to empirical evidence.

All governments selectively support some of their constituents, on grounds of ideology, special need, demonstrated sympathy, political power, or electoral contribution. However, in the absence of an articulated philosophy tested in the electoral process, and with a demonstrated credibility, any policy which supports selectivity will be open to charges of bias and inadequacy. Such is the position of interventionist policies with regard to science and technology in an environment where market failure determines the rules of play. Any single firm which perceives or can claim itself to be disadvantaged by government action can mount the cry that the market is being interfered with to its own disadvantage. Thus, in Australia, the economic concept of market failure has been principally used to provide a justification (usually *post hoc*) of a politically determined stance of non-intervention. This is not to argue, of course, that the government has actually adopted non-interventionist policies. Rather, intervention has been on the basis of special interest, rather than economic or political philosophy.

In order to provide more evidence of the use and effect of the market failure concept in Australian technology policy, some elements of the history of the justification of the Australian Industrial Research and Development Incentives Scheme (AIRDIS) are examined. A

closer look at the scheme is particularly appropriate as it is one of the major sources of Australian government financial support for industrial research and development carried out by industry, and at first glance at least, would appear to have its economic rationale in market failure.

## THE AUSTRALIAN INDUSTRIAL RESEARCH AND DEVELOPMENT INCENTIVES SCHEME

The Australian Industrial Research and Development Incentives Scheme (AIRDIS) is the major policy instrument available to the Commonwealth government for the encouragement of industrial research and development. The Scheme provides a system of direct grants to private companies undertaking R&D. Financial assistance for IR&D was first introduced in 1967 through the Industrial Research and Development Grants Act 1967. This Act was replaced in 1976 by the Industrial Research and Development Incentives Act 1976. Since 1976, several further amendments have been made.[33]

The initial impetus for setting up a system of grants in 1967 can be traced to concern over Australia's poor level of performance in R&D and innovation in general.[34] The rationale for the scheme has been consistently presented in terms of the suggested contribution of increased IR&D to improving industry efficiency, competitiveness, and adaptability, or increasing economic growth. Second reading speeches by the responsible Ministers at the time of amendments to the Act in 1972, 1973, 1976 and 1978 made no mention of market failure as a rationale for the Scheme.[35] The Myers Report in 1980 was the first government document which applied the concept of market failure to AIRDIS.[36] Based on its consideration of the Scheme in terms of correcting market failure, the Myers Report recommended a review of AIRDIS. As a result of this review, the Act was amended in April 1981. The Minister for Science and Technology pointed out, in introducing the amendments:

> The fundamental purpose of the program is to correct [this] market failure. . . The Government has also decided that policy measures should be cost effective, be designed to improve rather than impede the operations of the market and that objectives should be spelled out clearly.[37]

The justification for the Scheme has apparently changed, following the Myers Report, from industrial to wider economic considerations. However, the Australian Industrial Research and Development Incentives Board (which administers the Scheme) was still required to allocate resources in such a way that government industry policy

objectives would be furthered. The government's acceptance of market failure criteria might be regarded as a compromise between doing away with the Scheme altogether and the need to impose the economic policy objectives of expenditure restraint and reducing intervention. It is also interesting to note that about this time the Scheme was severely hampered by financial restrictions placed on it by the Department of Finance.[38]

The Fraser government's continued uneasiness with the Scheme was evident in the fact that in August 1981 (only months after the IRDI Act was amended) AIRDIS was referred to the IAC for review. The terms of reference for this enquiry instructed the IAC to have regard to:

> (a) the Government's desire to encourage the development of more efficient and internationally competitive industrial activities; and
>
> (b) the Government's policy of fiscal restraint.[39]

As might be expected, the IAC's report on the Scheme relied heavily on arguments based on market failure.[40] For example, the IAC drew on the authority of its economic expertise to conclude that risk was unlikely to be a source of market failure.[41] It also argued that to subsidise IR&D without regard to social costs and benefits was not in accord with the desire for less government intervention (and presumably, fiscal restraint).[42] As the IAC correctly observed, imposing market failure requirements (especially abstract concepts like externalities) would make the Scheme difficult to administer. However, this did not prevent the IAC from stressing the importance of market failure and recommending changes based on those factors.

Following the IAC Review, the government decided to continue AIRDIS, apparently reflecting a keen appreciation of the political costs of removing the Scheme altogether. The guidelines for the Scheme were changed to reflect greater emphasis on market failure (particularly externalities). The reality of the situation was that AIRDIS continued to operate much as before, with dual rationalities, one for correcting market failure, the other promoting government policy objectives.[43]

With the election of the Labor government in March 1983, further amendements were made to the Act. However, in this new political environment, the Minister for Science and Technology made it quite clear that the Australian Industrial Research and Development Incentives Board would be expected to give priority to the government's aim of encouraging 'sunrise industries'.[44] The emphasis had clearly shifted to achieving government policy objectives; market failure did not rate a mention in the second reading speech. It is interesting to note that the Act is at present under review once again.

## ANALYSIS

It is evident that 'economic' organisations such as the Departments of Treasury and Finance and the Industries Assistance Commission have opposed intervention by relying on the shortcomings of the concept of market failure to support their position. The examples cited show that, typically, these arguments centre on shortcomings such as the difficulty of undertaking empirical measurements, problems in identifying a market failure, the extent of government intervention, and the assumption of zero government costs.

There appears to have been a strong link between the prevailing political climate, which favoured cost effectiveness and a reduction in public sector activity, and the use of the concept of market failure. The example of AIRDIS supports this. The decision taken by the Fraser government in 1982 to continue AIRDIS can be seen as a compromise between competing political forces. In an environment influenced by fiscal restraint, the concept of market failure was used as a lever to achieve political objectives (namely, less intervention and more fiscal restraint).

This case study of AIRDIS highlights the political utility of the concept of market failure. Domination of AIRDIS rationale, if not practice, by this concept dated from 1980, following the Myers Report up until the 1983 Amendments. The political environment during that period favoured cost effectiveness and a reduction of public sector activity. Market failure was able to provide a justification, first for focusing attention away from policies which could have promoted intervention (for example, science and technology policy), and secondly, it established a series of barriers to those arguing for increased funding for AIRDIS.

With the evidence of a link between the concept of market failure and a preconceived political position, just how does the concept become intertwined and supportive of a political position (in this case, fiscal restraint and non-intervention)? From the examples used above, we suggest that the market failure strategists opposing intervention have been able to promote their case by placing the onus of proof on those wishing to intervene. In the instances we have used, it is implied that interventionists must show that market failure exists and demonstrate that government intervention will actually not make things worse. It is precisely because of the presumption of market optimality that the onus of proof is made to lie with those who allege that it fails. Through this presumption, the market failure strategists are able to rely on the authority of the economics discipline as a whole to use the onus of proof argument to make interventionist proposals seem economically foolhardy.

By doing this, the market failure strategists can demand that the political debate must be carried out on their terms. So, the neo-classical model of the free market becomes the ideal position from which interventionist proposals are judged. Market failure strategists are then able to use their 'professional knowledge' or 'superior understanding of how the market will allocate resources' to oppose intervention. Common examples of this ploy are the debunking of bureaucrats for not being able to 'pick the winners', and the argument that interventionist proposals do not adequately take into account the costs and benefits because the innovation literature is not sufficiently well developed. While we do not wish to undermine the neo-classical economic model in any way, we suggest that the market failure strategists have been able to exploit the shortcomings of market failure and combine it with the authority of the economics discipline as a whole to establish an 'economic' argument which is implicitly designed to oppose intervention. As we have seen, this can combine rather conveniently with the prevailing political ethos — minimal government intervention and reduced public expenditure. This is not to say that the concept cannot be manipulated in the other direction, as Eads has observed. However, in the examples chosen from the Australian experience, the direction was very much towards opposing intervention.

Even though the concept has severe shortcomings and is open to political manipulation, how is it that market failure still carries authority with politicians and policy makers? We suggest that the nature of the political process may offer some insight into the value of the concept. In all political processes there exists a variety of opinions on the most appropriate policy options open to governments. To accept or deny the desirability of a particular policy necessarily involves normative value judgements on whether it should (or should not) be adopted. Economic values, on the other hand, can be defined in positive terms concerned simply with the degree of efficiency of a particular activity. The transition from positive analysis (i.e., whether an activity is efficient) to normative argument (i.e., whether a policy should be adopted) requires only the rarely-questioned assumption that efficient allocation of resources is desirable to society.[45] In this way many a difficult normative policy argument can be transformed into a straight-forward determination of economic efficiency. Values are no longer in need of identification or justification.

As a basis for government intervention, or avoidance of government intervention, the concept of market failure thus has considerable appeal to politicians and policy makers alike. It is closely related to the notion of economic efficiency (which can in turn be put forward as a desirable social goal, especially in periods of fiscal restraint). On the other hand, it holds out the promise of empirical

justification, through the idea of divergence between private and social costs or benefits. In addition, the difficulty of determining how much weight to assign the role of science and technology in the economy raises special difficulty for policy makers. Arguments for greater government support for science and technology have to overcome this uncertainty in their bargaining for scarce resources. Schell's comments on his experience with the US Domestic Policy Review of Industrial Innovation bears out the importance of positive arguments in the political context:

> So you can find yourself, as we found ourselves about a year ago, being picked apart because of the inability to validate empirically the innovation problem in the United States . . . what we did in the end was to make the argument on the basis of economic theory when we talked about the role of innovation in the economy.[46]

Another attractive feature of the market failure approach to policy makers is that it essentially covers the middle ground. By opposing intervention through market failure arguments, the government of the day is relieved of responsibility for many outcomes, including failures. (Curiously, market-oriented governments seem only too ready to claim the responsibility for successes.) However, an outright interventionist position places the government of the day in the position of being responsible for failures not only through action, but also through inaction. Little wonder that the market philosophy appears more attractive to politicians and bureaucrats. Finally, as might be expected, information serves a strategic role and all involved in the political arena try to use it to their advantage. Politicians very often seek the type of advice which will support their broader political position. In summary, market failure theory has in general provided a spurious economic rationale for politically determined decisions.

## IMPLICATIONS FOR POLICY

The foregoing discussion has highlighted the use of the economic concept of market failure as a political tool to justify or oppose government intervention to support science and technology. Interestingly, in the Australian context, particularly in periods of economic downturn and financial restraint, it has been at its most powerful when used to oppose or destroy interventionist proposals. There are a number of implications for support for science and technology.

First, the eternal political question about where public responsibility ends and private responsibility beings, and the need for public funds not to upset the balance of competition, is in no way

adequately addressed by market failure. Adherence to market failure arguments has placed constraints on the debate about the role of governments in supporting science and technology. Furthermore, in Nelson's view these contraints tend to prevent public R&D from generating anything significantly different from what private R&D would have devised.[47] Of course, this refers to public R&D oriented towards the commercial end of the spectrum rather than basic research.

Second, economists claiming to have professional knowledge of how a market should allocate resources can distort the debate by focusing on stylised straw-man alternatives. This tends to direct policy discussions away from dealing with economic organisations in a realistic manner. Consequently, policy is not considered in terms of what measures might improve an already complex regime, but tends to revert to comparing admittedly imperfect intervention to stylised perfect markets. Quite frequently this can become interwoven with implicit political arguments in support of a free market.

The final point is closely related to the previous one. The combination of market failure arguments with political concerns can not only upset the balance of competition between firms, but it can also prevent realistic discussion of solutions other than those favouring the free market interests. As Nelson has pointed out:

> In fact, the empirical work on economies which rely heavily on central planning mechanisms, and on those parts of free enterprise economies which are heavily monitored by higher authorities, often tends to show high administration cost, inflexibility, and difficulty in exploring and sensibly screening technological alternatives. But there are examples to the contrary. And there is any number of examples of relatively unfettered private enterprise systems with a demonstrated inability to develop or adapt to a new technology.[48]

The point is that arguments based on market failure provide a pre-emptive judgement on the desirable mix between private and public support for science and technology. This in itself can prevent consideration of the wide variety of organisational structures that may be necessary in a modern economy.

From the analyst's perspective, it is time to move beyond the extreme simplifications of the market failure approach. There is a need for studies to be placed in the context of the mixed political economy of modern industrial states, and to follow Nelson's lead in exploring in far more detail the effects of particular economic circumstances and policies on investment performance in science and technology by firms with specific characteristics and in various industries. Market failure approaches, like cost-benefit analyses, may be useful conceptually. However, in the real world, their usefulness

rapidly evaporates as political forces assert their influence. In concluding, we ask, along with Meehan, the question:

> If the concept has no applicability, what is gained by developing a formal decision-making apparatus that depends on it?[49]

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25. IAC, *op. cit.,* p. 91.
26. *ibid.,* p. 59.
27. *ibid.,* p. 90. Risk here refers to the classic Arrow source of market failure — uncertainty.
28. Australian Treasury, *op. cit.,* p. 36.
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30. Australian Government, *op. cit.,* pp. 17-18.
31. Australian Treasury, *op. cit.,* p. 40.
32. IAC, *New Technology and Industry Assistance, op. cit.* Arguments such as those used by the IAC imply that government support for key industries or technologies is not in line with enhancing overall welfare. It is implicitly stated that a private enterprise system is the best in terms of responsiveness and innovativeness. This is a conclusion which welfare theory does not explicitly reach, yet in arguments such as those used by the IAC they are made to appear inextricably linked. This tends to obscure the close links between positive and normative arguments about the appropriateness of government policy. The issue has been raised by Richard Nelson, 'Assessing private enterprise: an exegesis of tangled doctrine', *Bell Journal of Economics,* 12, 1, 1981, pp. 93-111.
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