Economic Rationales for Government Intervention

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Foreword

Justifying government intervention in the private behaviour of individuals and firms is the first critical step in ensuring public investments are made as wisely as possible. While the literature on justifying government intervention is diverse and wide ranging, in practice there is a heavy reliance on efficiency principles drawn from the field of static equilibrium analysis in economics that pertain to market failure. These principles refer to concepts such as externalities, public goods, non-rivalry, non-exclusiveness, information asymmetry and so on.

While useful, the field of static equilibrium analysis is based on analyses of timeless equilibriums. It ignores the issue of dynamics, that is, what happens through time. Issues that affect dynamic efficiency are not encompassed in static equilibrium analysis. Hence, justifications for government intervention based on the grounds of improving dynamic efficiency of the economy, and markets within it, are easily overlooked. Yet the arguments for intervening to improve dynamic efficiency may be just as strong, even stronger, than the arguments for intervening to improve static efficiency. Stern argues this is the case with climate change for example. It may also be the case in agriculture.

In this paper the rationales for government intervention to improve the dynamic efficiency of the economy, or a market, are explored and considered with particular reference to agriculture.

The paper was commissioned to create a resource for the Practice Change Portfolio in DPI. However, we have made the paper available to others to stimulate discussion about the issue of dynamic efficiency as a potential justification for government intervention among those responsible for making and implementing government policy in the agricultural and natural resource sectors.

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Introduction

The only rationale for considering intervention in the operation of an entity is that it is functioning poorly. Poor functioning may be defined as wrong or insufficient output or excessive wastefulness in the way the output is produced.

Justified belief that some aspect of the functioning of an organisation or economy is deficient is a necessary, but not sufficient, rationale for intervention. The scarcity of management time means that the deficiency must be "material", must be "of significant magnitude", to warrant attention.

It must also be the case that (a) interventions are available that address the cause of the deficiency, unless symptomatic relief completely eliminates the deficiency, and (b) the intervention selected contributes at least as much to performance as it costs.

The rationale for government intervention in an economy may concern the efficiency of the economy (the focus here) or the social outcomes of the economy. Efficiency rationales exist when the poor functioning of the economy is due to some inherent feature of the economy itself. Social rationales are choices society makes which indicate a rejection, to some degree, of the effects of the otherwise good functioning of the economy. These are choices to privilege members of society, and resources, differently to the way the economy does at a point in time.

Economic theory has useful analytical tools for distinguishing problems from non-problems in the functioning of the economy, diagnosing causes of problems and identifying useful interventions. This is particularly helpful given the complexity of economies and the characteristic of all complex systems that intuitively-appealing understandings of their internal functioning are often wrong. Tools have also been developed which can assist in the structuring of the analysis of problems with the outcomes of economies; this is the domain of welfare economics.

Government Intervention

"Government intervention" is used here as shorthand for "government intervention in the operation of the economy". Since the economy is one of the mechanisms by which a society moves to satisfy its objectives, intervention is usually triggered by dissatisfaction with the way the economy is performing in this regard. To identify all the categories of justifications for intervention, and to specify the dimensions across which the impact of interventions should be judged, it is necessary to contemplate that subset of social objectives whose degree of satisfaction is susceptible to plausible differences in the way the economy operates.

In the Australian political context the authority and capacity to intervene in the economy is distributed across federal, state and territory, and local, governments. These different roles inevitably condition the relevance of specific justifications for intervention for any specific level of government. In this report the focus is on intervention by state or territory governments.

The importance of comprehensiveness, and abstraction from specific issues, arises from the inherent dynamism in society, particularly in available technology and its effect on the ways, and extent to which, society's needs and wants may be met. We should expect the evaluation of existing government intervention, and possible new interventions, to change through time.

Relevant Economic Constructs

Economic Efficiency

Notwithstanding the complexity and mass of detail and interactions within national or state economies, the quality of performance of an economy is conceptually a simple matter: an economy is performing at its best when "economic efficiency" is maximised.

Economic efficiency refers to the adroitness with which a society consumes its resources to meet its needs and wants: the value for money of its use of resources (Palmer and Torgerson 1999). Maximum efficiency occurs when the right mix of goods and services is produced at least cost. The process through which this occurs involves two steps. One is the identification, either by market processes or by government determination, of the quantity of the particular goods and services that will be produced and distributed to members of society to meet their needs and wants.

The second step is the choice and management, by those in command of productive enterprises, of the technology to be used to convert resources into goods and services. Technology is the conversion instrument that determines the goods and services that can be made and the physical productivity of resources used to do so. These resources include human resources. This determines the collective demand for resources and, given resource availability, the price of resources.

Figure 1 (below) relates to this discussion of efficiency.

Physical measures of efficiency

Each chosen technology embodies a conversion ratio of resources into goods and service outputs. This is a physical ratio that may be expressed, for example, in terms of energy or some other dimension. This can be defined as "engineering efficiency". It is an expression of the output potential of an input or set of inputs.

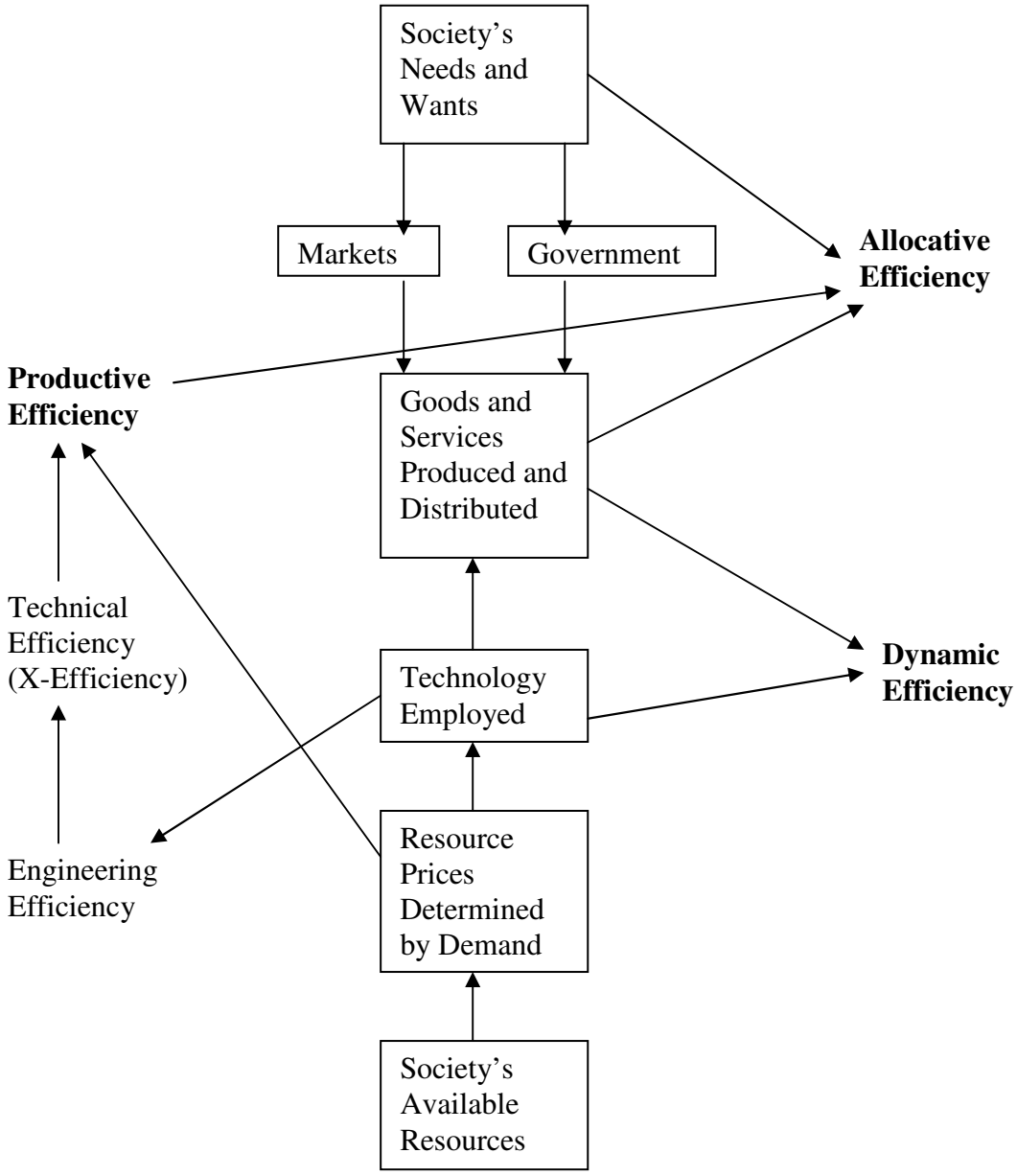
"Technical efficiency" (Palmer and Torgerson 1999), or "X-efficiency" (Frantz 2007), is the extent to which engineering efficiency is actually achieved. Factors which can inhibit the achievement of relevant engineering efficiency include management incompetence, low levels of staff motivation or skill, low penalties associated with technical inefficiency (due to weak competition, for instance) and a performance-satisficing, rather than performance-maximising, approach in the enterprise. The effect is to waste inputs; less output is made than could have been. The field of general management (see Robbins *et al.* 2008) is almost entirely focused on maximising technical efficiency.

"Operating efficiency" and "operational efficiency" are also terms sometimes used for technical efficiency.

Productive efficiency

Both engineering efficiency and technical efficiency involve only physical relationships. The technology chosen to produce a good or service will be chosen on the basis both of engineering efficiency and the cost of inputs. The objective of a producing enterprise is not to use the most engineering-efficient technology; it is to use the cheapest. (Note that we are considering different technologies to produce exactly the same output. However, the same criterion applies to different technologies with *similar* outputs: for example, a technology with higher engineering efficiency that offers better performance in the final output will only be employed if the customer value of the better performance exceeds the cost of the "better" technology. The use of gold, rather than poorer conductors, in loudspeaker cables is an example: production is limited because few consumers will pay the substantial premium for the best engineering efficiency to be had.)

Figure 1: Economic Efficiency Map



"Productive efficiency" refers to the extent to which output is produced at least cost (Palmer and Torgerson 1999, Fallon 2005). It depends on technology choice, which should be based on engineering efficiency and resource (input) prices, and technical efficiency in the operation, the general management, of the technology. Colloquially, productive efficiency is "doing things right". In the general management literature it is called "efficiency" (Robbins *et al.* 2008). Popularly, it is also referred to as "cost effectiveness".

Allocative efficiency

"Allocative efficiency" is the extent to which the goods and services produced, and distributed, maximise the welfare of society (Palmer and Torgerson 1999, Fallon 2005). It peaks when there is no other mix of the economy's outputs, and no other pattern of distribution of them to members of society, which would enhance the satisfaction of society's needs and wants. Another (derived) way allocative efficiency therefore can be defined is the extent to which the allocation of society's resources (to outputs) maximises society's welfare. This, of course, is a valid reflection of desired outputs only to the extent that demand for resources arises via maximum productive efficiency. Colloquially, allocative efficiency is "doing the right things". In the general management literature it is called "effectiveness" (Robbins et al. 2008), although strategic management is the literature, of the two, most closely linked to it.

Economic efficiency can only be maximised when allocative efficiency is maximised and productive efficiency is maximised *given maximum allocative efficiency*: when the right things are made as cheaply as possible. Allocative efficiency determines the appropriate specific choice of technology that underlies productive efficiency.

Beginning with the set of resources available to society, economic efficiency is maximised by a process of stepping through the output possibilities, enabled by technologies, which maximise resource productivity. Engineering efficiency indicates the highest levels of output available from resources. Productive efficiency indicates the least cost translation of engineering efficiency, thereby identifying levels of output available at least cost. (Technical efficiency is a consideration only in the context of actual production). These physically-based output possibilities indicate, notionally, the entire variety of quantities of goods and services that can be produced efficiently and from which a specific set can be chosen.

The technically efficient production of less-valued goods and services is wasteful, of course. Resources used are wasted to the extent that they could have been used to produce a mix of goods and services which provide greater satisfaction of needs and wants. Economic efficiency depends on resources being consumed, at least cost, to produce the right goods and services in the right quantities. Physical, technical aspects of efficiency play a role but it is a subservient one to the choice of desired outputs. Any deficiency in productive efficiency will diminish economic efficiency, of course, and distort allocation of resources by using more than are necessary.

Inefficient activity

Technical waste occurs when more input is consumed than need be, with existing technology and inputs, to create a unit of output. Economic waste (allocative or productive inefficiency) occurs when the output mix is wrong or more is spent to achieve an output than need be. The latter can be so if a more expensive technology is chosen or there is technical waste in the use of the chosen technology, or both.

The distinction between technical waste and economic waste is central to economic performance at both the enterprise and economy levels. This is all the more important because technical waste is the more apparent of the two. It is clear that water leaking from irrigation infrastructure, or hospital emergency staff being idle, is 'wasteful' compared to what might occur. However, when evaluating technical waste, or "x-inefficiency" (Frantz 2007), it is very important to understand exactly what output is desired, the technology being used and relevant costs.

In a hospital, any wish for short waiting times for emergency treatment necessarily implies idle times for staff. Idle time is part of the technology for this desired output characteristic. The apparent technical inefficiency, the technical waste, is not real: it arises from a lack of understanding of the desired output, the technology, or

both. Removing this 'waste' would lead to all fluctuations in demand for emergency treatment mapping directly into waiting times, and the duration of trauma.

Water loss from infrastructure occurs due to design features or physical deterioration. In either case, any move to reduce losses will involve the investment of funds. This is quite different to x-inefficiency. It is not a matter of sloth or clumsiness. Removing the 'waste' is not a matter of costlessly moving towards the engineering efficiency potential. Given the existing infrastructure, there is no technical waste; it is achieving its potential. A proposal to reduce the leaking is an investment proposal which needs to be evaluated as one would any other. Even when the leaking has arisen from system deterioration this does not give system repair any special status as the appropriate response. Economic efficiency will only be served if the variety of technologies available to deliver the desired outcome is considered, along with their costs. What is more, the relevant desired outcome is likely to be broader than simply 'reducing leakage'. 'Optimising water utilisation in Victoria' may be more appropriate (see Watson 2008).

The process of reviewing current desired outcomes and current alternative technologies, triggered by indications that better technical efficiency may be available, is the core of the diffusion of innovations. Implicitly assuming the optimality of existing technology, by re-investing in it without a review of options, can impede the pursuit of greater productive efficiency.

Dynamic efficiency

This discussion of efficiency has been static, or timeless, in nature. At a practical level there is a further aspect of efficiency to consider. It relates directly to technological change. Because technological change is the source of per capita economic growth, there is notionally an optimal allocation of some of society's current resources to technological research and development. That is, there is a string of future benefits available to society from increasing the engineering efficiency of technology, the productivity of resources. There is thus good reason to allocate some current resources to the production (including discovery) of new technology and away from current production of goods and services.

This amounts to investment in future efficiency and can be overdone or underdone. The term that is used is "dynamic efficiency". It refers to the appropriateness of the degree of diversion of resources from production (for consumption) to research, development and extension (the deployment of innovation). A related concept with such a future orientation in general management is "adaptability" (Anderson 1984).

Sand in the machine

There are "technical" difficulties that economists identify in the way the economic system operates such that its assumed operational features are not completely present, although these only matter to the extent that the features are valued by society. This becomes apparent when interventions intended to correct for these deficiencies, and their likely full set of consequences, are evaluated.

This fact is somewhat masked by the use in economics of terms such as "market failure", "public goods" and "externalities". The implicit signal that these terms have some absolute, technical meaning is misleading. All of them rely on social preferences for content; all of the terms are "loaded". Market failure may not matter. Randall (1983) appealed for the restriction of discourse in this domain to bleakly dispassionate technical features of economic systems and their technical implications. Not much notice has been taken and all three terms are now used with gay abandon and a variety of meanings, with seemingly little awareness of the value judgements underlying their specific application.

Randall (1983) argues that the set of technical characteristics that can persist and corrupt the features we seek from free market economies reduces to "non-rival goods", "non-excludable goods" and "congestible goods". Non-rival goods are goods and services whose consumption by others has no impact on the possibility of consumption by another. Non-excludable goods are goods and services of which it is impossible, at meaningful cost, to ration consumption. Congestible goods are goods and services which are non-rival for users up to some threshold number, but then rival.

Each of these characteristics threaten the role of price as a resource-attracting and output-rationing mechanism. This role is central to the efficient allocation by free markets of resources to society's desired goods and services. A problem affecting allocative efficiency causes the economy to produce the wrong set of goods and services, by type and/or quantity, assuming that resource availability and society's preferences should determine the "right" set.

Another feature of the operation of an economy that influences efficiency is the pressure producers perceive to eliminate waste in their productive processes. As noted, this is called technical efficiency (or x-inefficiency) within a firm and contributes to productive efficiency at the level of the economy as a whole. The pressure on firms to eliminate x-inefficiency comes from competitive intensity which is conceived of in terms of downward pressure on output prices, and therefore on profitability, which raises the importance to firm profitability of minimising waste. Downward pressure on prices is greatest when competing outputs are identical (homogeneous). It is alleviated to the extent that output is differentiated (heterogeneous), one firm compared to another.

Competition, in this (specific, economic) sense of very similar products causing customers to focus on price as the choice criterion, can be very different to rivalry. In this sense, competition is not a process (Blaug 1997), in contrast to its popular meaning. Rivalry between competing firms can be intense but not involve price competition. Few firms, if they have any choice, wish to compete using price. To do so impacts directly on revenue and may be seen by customers to signal either that products are very similar or that customers need to be bribed to buy what is an otherwise inferior product.

Intense competition of this economic kind is rare. The weaker the competitive intensity, the poorer we expect productive efficiency to be. X-inefficiency is therefore common and society's productive efficiency lower than it could be.

An important source of economic development over the last two centuries has been the access to "economies of scale" that task specialisation has enabled. Over some range of total output most products become cheaper and cheaper to produce as output increases. This can also be true of increasing experience of producing a product and increasing production scope, where a variety of different products share productive capacities in a single firm. Engineering efficiency (potential technical efficiency) is enhanced, often considerably. However, each of these sources of efficiency tends to increase firm size and reduce competitive intensity in an industry. There is a contest here, for society, between increased productive efficiency, arising from higher available resource productivity due to these "economies", and reduced productive efficiency, due to greater x-inefficiency being enabled by reduced competitive intensity.

According to Frantz (2007), the accumulated evidence suggests strongly that x-inefficiency arising from reduced competitive intensity often substantially offsets gains in productive efficiency available from scale economies. As well, x-inefficiency dwarfs allocative inefficiency across industries (Frantz 2007).

Society's preferences

It is plain that society, and government, would prefer an economy to operate with the highest feasible levels of allocative and productive efficiency. This will inevitably involve choices about appropriate levels of competitive intensity, probably on an industry-by-industry basis[1], and consideration of interventions to repair deficiencies in efficiency arising from rivalry, excludability or congestibility issues.

Other preferences will apply. For example, to the extent that rationing of goods and services using price is perceived to disadvantage some members in society inappropriately, intervention may be considered. Likewise, where free market operations drive wages to low levels for types of labour in high supply, intervention may be considered. Government determines what the feasible levels of allocative and productive

[1] Logically, "industry" should here be defined as comprising organisations producing substitutes: goods and services which are alternative ways of satisfying a given consumer need. That is, "industry" means competitors in this context.

efficiency are by the nature of the interventions it makes, which impact on the economy, to define the relationship between the economy and society.

This is a balance of wealth foregone and social ideals trimmed, of efficiencies achieved and non-economic social goals preserved. The interference in the economy to refashion the interface between society and the economy are non-economic rationales for intervention, effectively specific manifestations of the view that the economy should serve the society.

The preferences described thus far have been couched largely in static terms: the situation at some point in time, either eternity or some settled equilibrium point before then. The discussion has been about end-states. This is inadequate for consideration of government intervention for two reasons.

First, the economy is arguably never at an equilibrium. Thus, the operating features of the economy that may attract government interest may be concerning but ephemeral and subject to natural resolution (see Randall 1983). A current example is the recently oft-cited threat the internet poses to newspapers. Another general example is technological change which injects a lift in economies of scale and/or scope into an industry which leads to considerable rationalisation and reduction in competition. Fast food outlets are an example.

The technological change, and trade, which drives economic development is a dynamic process. At any point in time an industry will not be at equilibrium and analysis of issues deserving attention must be informed by likely dynamic paths and notional equilibrium states. Such projections are necessary to identify the likely persistence of a seeming problem.

Second, and less obviously, the capacity of firms, and the economy, to adapt to relevant change depends on capabilities which are the product of investments made over time. That is, a focus exclusively on allocative and productive efficiency makes no allowance for a need to change to adapt to a changing context. At the level of the firm, this is analogous to focusing entirely on maximising current performance, by producing competitive products as technically efficiently as suits, while making no forward-looking preparations to cope with relevant change (Ghemawat and Ricart i Costa 1993). This is an element of strategic management. Specifically, it will be the response of managers to their perception of the costs and benefits of committing resources to immediate performance or to adaptive capacity; this in a context of uncertainty about the future. The correctness of this strategic choice is reflected in long-run performance and, most tellingly, survival.

At the level of an economy, survival is less fragile than it is for individual firms. The adequacy of the economy's adjustment to relevant change is assessed (if minimally – see below), at any point in time, with reference to the balance between consumption and investment. This is a measure of what was defined previously to be dynamic efficiency.

Dynamic efficiency occupies a space that does not exist under static analysis. Whereas static analysis is focused on end-states, on equilibrium states, dynamic efficiency focuses on the losses in output accumulated in the transition to an end-state (Blaug 1997).

For both the economy and firms within it the management challenge is to manage dynamic efficiency dynamically. For both, the decision to be made is the extent of trading-off of current static efficiencies against preparedness for an uncertain future. This challenge is increased by our incomplete understanding of how one makes "preparedness".

It is assumed in management theory (see Anderson 1984, for example) that preparedness by a firm, for allocative dynamics, resides in research and development of new output possibilities, and for technical efficiency dynamics, in high levels of staff motivation. (Motivation is also prominent in theorising about x-efficiency; see Frantz 2007.) Part of the preparedness for the future also rests in resilience to change, via customer and shareholder goodwill and flexible production systems, for example.

At the level of the economy, in Australia, policy to manage dynamic efficiency is revealed most coherently in trade practice regulatory domains.

Summary

An economy is a major machine society uses to convert its resources into desired goods and services. In free market economies price formation is central to the valuation of resources and the allocation of output. Factors which cause the free market to stumble with either may be reasons to contemplate intervening in the operation of the economy.

Discourse about market failure, public goods and the like connotes an absolute character to the significance of economic stumbles which is not real. These are characteristics the significance of which depends on authorised judgements as to the set of goods and services the economy should produce, how resources should be valued and how goods and services should be distributed.

The core operational characteristics of the economy of interest are the allocative, productive and dynamic efficiencies it delivers. These are competitive to some extent and society needs to make judgements about the balance between them.

The Decision to Intervene

Public Benefits

"Public benefits", like "public goods", is a term that clouds communication and analysis (see Randall 1983). Any specification of the outcomes of the operation of an economic system which may conflate, for any observer, "sand in the machine" of the economy and societal valuations of outcomes is problematic. It is important, then, to locate valid indicators of public benefit as they stand at the time of analysis. Indeed, even the significance of the consequences of sand in the economic machine can only be assessed with reference to such a guide.

One domain where the public interest in economic contexts and, importantly, responses to *competing* public interests, are considered explicitly is the set of formal institutions required to determine trade practices. These include the Trade Practices Commission and Australian Competition and Consumer Commission (ACCC) and the review body for decisions of the latter, the Australian Competition Tribunal (formerly the Trade Practices Tribunal).

While trade practices oversight is focused on the operation of the economy, and does not extend to the definition of exogenous social preferences, it does contemplate matters which involve the interface between the operation of the economy and such preferences (see below). Of interest here is the framework applied to, the lens through which is viewed, the appropriateness of the operation of specific elements of the economy. This is, therefore, a domain that, while informed by economic reasoning, is grounded in reality.

"Public benefit" is not defined in legislation. However, the Australian Competition Tribunal has defined public benefit as

> … anything of value to the community generally, any contribution to the aims pursued by the society including as one of its principal elements (in the context of trade practices legislation) the achievement of the economic goals of efficiency and progress. Plainly the assessment of efficiency and progress must be from the perspective of society as a whole: the best use of society's resources. We bear in mind that (in the language of economics today) efficiency is a concept that is usually taken to encompass 'progress'; and that commonly efficiency is said to encompass allocative efficiency, production [sic] efficiency and dynamic efficiency.
>
> ACCC (2007:30)

"Economic public benefits result from improved economic efficiency" (ACCC 2007:31). The forms of economic efficiency are further explained, by ACCC, as follows.

> Productive efficiency relates to the production of goods and services using the most cost-effective means. For example, the achievement of economies of scale may increase productive efficiency.
>
> Allocative efficiency relates to the optimal level of resources being employed in a market at a given time. When allocative efficiency is achieved, because of the responses of firms to market signals, the socially optimal mix and level of output will be produced and allocated through sales and purchases to those parties who most value the relevant products. Allocative efficiency is reduced when there is market failure—for example, if producers have market power, they may reduce the quantity of production to increase the price. Similarly, agreements between competitors about price will ordinarily distort market outcomes.
>
> Dynamic efficiency is a less precisely defined term. It generally refers to the economically efficient use of resources over time—incorporating innovation and responses to change in the market. Arrangements that provide incentives for efficient investment in research and development will promote dynamic efficiency.
>
> ACCC (2007:31)

Fels (2001:2) notes:

> A key objective of the *Trade Practices Act 1974* (TPA) is to prevent anti-competitive conduct, thereby encouraging competition and efficiency in business, resulting in a greater choice for consumers in price, quality and service.
>
> The TPA, however, recognises that the public interest may not always be met by the operation of competitive markets. The authorisation and notification processes in the Act address this eventuality by allowing the Australian Competition and Consumer Commission (the Commission) to grant exemptions from the application of many of the restrictive trade practices provisions of the TPA in certain circumstances.

Specific consideration of benefits by the ACCC and the Competition Tribunal have included:

> public benefits of an economic nature, including:
> • economic development, e.g. in natural resources, through the encouragement of exploration, research and capital investment;
> • fostering business efficiency, especially when this results in improved international competitiveness [the latter is declared a benefit in TPA Section 90(9)];
> • industry rationalisation resulting in more efficient allocation of resources and in lower or contained unit production costs;
> • expansion of employment or prevention of unemployment in efficient industries or employment growth in particular regions;
> • industrial harmony;
> • assistance to efficient small business, for example guidance on costing and pricing or marketing initiatives which promote competitiveness;
> • improvement in the quality and safety of goods and services and expansion of consumer choice;
> • supply of better information to consumers and business to permit informed choices in their dealings;
> • promotion of equitable dealings in the market;
> • promotion of industry cost savings resulting in contained or lower prices at all levels in the supply chain;
> • development of import replacements [declared as a benefit in TPA Section 90(9)]; and
> • growth in export markets [declared as a benefit in TPA Section 90(9)]

and

> non-economic public benefits:
> • the likely reduction in carbon, nitrous oxide and greenhouse gas emissions flowing from a joint venture's upgrading of a sodium cyanide plant in Gladstone, Queensland;
> • encouraging the provision of information on formula feeding from public health professionals that is accurate and balanced and not undermining the decision of women to breastfeed (these public benefits were found to outweigh the detriment from restricting advertising and other promotional activities in relation to infant formula);
> • promoting public safety by:
> – ensuring the safe use of farm chemicals and national uniformity in the storage of farm chemicals;
> – only allowing scuba gear to be hired to certified divers;
> – requiring tyre retreaders to adhere to certain operational practices, including a code of practice;
> • fostering fitness and recreation (this public benefit was found to outweigh the anticompetitive detriment from a sponsorship agreement which required certain divers to wear the sponsor's gear when competing and prevented the sponsor's competitors from advertising at diving events);
> • reducing the risk of conflicts of interest (this public benefit was found to outweigh any anti-competitive detriment from prohibiting solicitors from acting for both vendor and purchaser in matters concerning the sale of land);
> • facilitating the transition to deregulation:
> – the dairy industry was deregulated on 1 July 2001. In February 2001, the Commission released a draft determination proposing to authorise dairy farmers in Queensland to negotiate collectively with a milk processor; and
> – similarly, on 27 June 2001, the Commission authorised Victorian chicken farmers to negotiate collectively with chicken processors. The authorisation was granted in anticipation of full deregulation of the industry following an NCP [National Competition Policy] legislation review;
> • maintaining the viability of efficient firms. For example, the Commission recognised in a recent draft determination that efficient private hospitals can provide benefits to the communities in which they operate including: the choice and convenience provided to local patients; employment opportunities for medical, nursing and support staff; the provision of infrastructure necessary to attract specialists; and other wider regional benefits such as the positive effect that purchasing local services can have on employment in the local community.
>
> Fels (2001:6-8)

"The public" refers to all economic agents: consumers, employees, shareholders and producers. The ACCC has interpreted its role, in part, to have a distributional concern by placing implicit weights on the achievement of benefits for different agents, with the heaviest being on those for consumers. From an economic perspective, this may lead to socially suboptimal efficiency levels being achieved in pursuit of (moot) welfare distribution objectives that may be better, and more authoritatively, addressed through the tax and transfer system (see Fallon 2005).

Nevertheless, the above lists provide some insight into the complexity of factors with which policymakers have to deal. They also signal, clearly, the obligation ACCC arrogates to itself to take both static and dynamic efficiencies into account. The lists help contextualise, and "flesh out", triggers for consideration of intervention as they may appear. This takes us some way past the abstract tidiness of economic models. Arguably, the strength of the latter is not in identifying issues but in identifying which issues are actually problems, and analysing their causes and possible solutions.

It is apposite to note that the ACCC, and the bulk of taxation of, and transfers between, individual economic agents, are controlled by the federal government.

Analysing Dynamic Efficiency

Static efficiency concerns, as a basis for government intervention, are thoroughly considered in Sandall *et al*. (2009). Here, the wish is to extend consideration of possible economic sources of inefficiency to round out the set of such causes. This substantially involves consideration of dynamic efficiency.

There is no agreed definition of dynamic efficiency. As noted earlier, the essence of the notion of dynamic efficiency is the balance between current consumption and current investment, broadly defined. In the macroeconomic context, dynamic efficiency is measured, for example, in terms of investment in capital: "an economy is dynamically efficient if it invests less than the return to capital and is inefficient if it invests more than the return to capital" (Abel *et al*. 1989:2).

However, "a path cannot be judged as dynamically inefficient prior to eternity, because there is always the possibility that 'excess' capital will be consumed later" and the criterion is weak, being "the dynamic analogue of the standard Pareto criterion", and thus not being judged in terms of social welfare criteria (Abel *et al*. 1989:15). Fortunately, while dynamic inefficiency in the economy is theoretically possible, it is not a problem in practice (Abel *et al*. 1989). This may indicate little more than that a binary measure of dynamic efficiency, at this level of aggregation, is unhelpful to policymakers.

In the context of private firms, dynamic efficiency is an orientation to management. It is the extent to which a firm appropriately balances attention to current performance and to flexibility. It can also be expressed in terms of single-loop and double-loop systems, responses to uncertainty, organisational design (mechanistic vs organic) and learning (Ghemawat and Ricart i Costa 1993). As minimalist as the macroeconomic measure of dynamic efficiency may be, measurement at the firm level is extremely difficult, mainly because performance, at any point in time, is the product of a complex causal system (Gardebroek and Oude Lansink 2007) and, at any point in time, some valuation of current levels of adaptability has to be made. More satisfying efforts have been made to approach measurement at the industry level (as by, for example, Pietola and Myers 2000, Silva and Stefanou 2007).

In both macroeconomic and microeconomic contexts, maximum dynamic efficiency is optimal resource allocation to investment in the long run; that is, the equating of marginal costs of investment with marginal benefits. For the economy both costs and benefits are society's; for the firm they are private costs and benefits. As is suggested below, the alignment of social and private benefits may face systemic problems as it affects dynamic efficiency and thus trigger contemplation of intervention.

Market failure due to dynamic efficiency

Dynamic efficiency is ultimately measured by the consequences of the adequacy of preparedness of an entity for adaptation to change. Insufficient preparedness will, in the medium term, cause an economy to drag its feet excessively in maintaining, or capturing available increases in, allocative and/or productive efficiency. It will cause a firm to become irrelevant to its markets, in product or price terms, and, possibly, disappear. In Australian agriculture, for example,

> Farm performance is strongly correlated to vulnerability to drought. Apart from local climatic circumstances, how drought affects farming families and farm businesses depends on farm management practices, the degree of income diversification and the store of capital that farmers can draw on — the natural and physical capital of their farm, their financial and human capital and that embodied in their social networks.
>
> Productivity Commission 2009: xxii

Excessive preparedness will, in the short-term, cause an economy to be more productively inefficient than it should be, with compounding effects. It will cause a firm to be excessively technically inefficient, less profitable and less competitive in capital markets.

The dimensions of these possible consequences, like static efficiency, have physical determinants at their core. This results from cybernetics (see Ashby 1956). Relevant change, per se, is not of concern. What matters is relevant change which cannot be forecast *and* cannot be adapted to in a timely fashion. This is not defined by change alone. It is a residual derived from the rates of change relative to lead times in adaptation and, in the context of relevant forecast horizons thus implied, the magnitude of uncertainty about that change.

Instantaneous adaptation means that relevant change should have no impact on agent performance. Nor should slower rates of adaptation matter to performance provided that high-confidence forecasts (even of change distributions; ie, Knightian risk) are possible (but see below). Any non-instantaneous capacity to adapt, however, exposes performance to less than perfect control if relevant change cannot be forecast with confidence; that is, when forecasts are characterised by what is variously called Knightian uncertainty, "ambiguity" or "unknown unknowns" (Wright 1983).

Several matters are in play here. One is the extent of volatility in production decision-making parameters. This has no absolute significance or meaning; it is foolish to describe the ease or difficulty of negotiating operating environments in terms of their volatility. Rather, it is necessary to measure volatility in parameters over time-frames that are pertinent to the speed of adaptation of which an agent is capable.

So, another matter that pertains is adaptive capacity, essentially in terms of speed of response to variations beyond absorption/resilience. This goes to production systems' rigidities, about which relatively little is known in agriculture (but see Murray-Prior and Wright 2004).

Another is trends. Specifically, the significance of change is partly the noise component and partly the trend. Forecasts may differ in confidence across these components. For example, there appears to be greater confidence about trend forecasts of climate change, for a region, than volatility about trend.

Another matter relates to the impact of change and seems to link to costs of adaptation. Probability theory indicates that, prior to infinity, in the context of risk or uncertainty; "good" decisions may be wrong and may be so serially. The significance of this depends, largely, on the significance of a decision to performance. This is determined by the extent to which commitment of resources is reversible and the resources represent a significant proportion of those available.

For firms with high dependence on single, high-commitment productive enterprises, such as specialist woolgrowers, dairies and hairdressers, high levels of volatility in decision parameters will flow through to fluctuations in financial performance. Serial misfortune can collapse such firms faster than it can more diversified, flexible firms.

The question from an economy-wide perspective is whether this matters. The answer would seem to depend on the source of the volatility or, more saliently, which type of efficiency is under duress. The challenge is to contemplate incentives to intervene, in the interests of dynamic efficiency, such that normal creatively destructive processes in the economy are not impeded and guesses about possible futures not reified inappropriately. The trap for government is that interventions for dynamic efficiency modify the future; inappropriate intervention is non-neutral – it will lead to reductions in economic efficiency.

A market may "fail" dynamically, therefore, by systematically sub-optimising investment for the future, given the path of technological change and its impact on consumer preferences. That investment is in information search and extrapolation: research, development and deployment. There are several main sources of such sub-optimal investment.

First, Schumpeter (see Blaug 1997) argued that suboptimisation is inevitable under perfect competition. In the context of this report, his argument might read:

> the Australian agricultural sector (x) so closely approximates a perfectly competitive structure, in salient ways, that agents in it can be expected systematically to allocate resources excessively to current production to the exclusion of building adaptive capacity for the future. The path through time of allocative and productive efficiency of this sector will thus be sub-optimal.

The core of Schumpeter's argument that perfect competition is inferior is that, in management terms, perfectly

competitive states render rational strategic management impossible. This latter proposition is not controversial. Rivalry is characteristic neither of perfect competition nor of most Australian farms, so *competitive* strategy is meaningless. The only gaming over time (that is, strategy) that remains is driven by the relentlessly declining terms of trade of farms. Productivity increases are the only source of controlled performance enhancement. Whether performance is at a sufficient *financial* level, over a given period, to enable survival of the firm has little to do *systematically* with deliberate allocative actions by the farmer. It has much more to do with weather, realised prices and debt (see below).

Beyond economics and management perspectives, systems theorists describe perfect competition as a management context where threats and opportunities are unaffected by rivalric activity and effectively impossible reliably to identify in advance (Emery and Trist 1965). In these circumstances the "optimal strategy is just the simple tactic of attempting to do one's best on a purely local basis" (Schutzenberger 1954: 101, quoted in Emery and Trist 1965: 24). It is naive to seek to optimise firm behaviour for the future. Strategy is an empty notion.

An implication of the dynamic efficiency argument is, therefore, that industry evolution is not linked systematically to farm adaptation to expected prices: financial performance is weakly connected to deliberate attempts to adapt to expected changes in market-based and input-based threats and opportunities due to the direct link between price variability, weather variability and net revenue variability. Consequently, technical competence as a farmer is not sufficient for farm survival, and may not be a necessary condition, given the level of uncertainty in the operating environment. Success may belong to those with the deepest pockets.

High levels of efficiency will only be achieved incidentally in these circumstances. This, in itself, will distort resource allocation across an economy. The distortion does not arise because uncertainty smothers dynamic efficiency. It arises because the same causal factors mean that some, at least, of the inefficient in the industry are not expelled. This is the essence of the social cost of industry stagnation: the investment in enhanced (static) efficiency through time is irrational to the entrepreneur. The strategic attention instead turns to forms of insurance against threats. (Farm Management Deposits are an example in Australia; see Productivity Commission 2009.) Schumpeter's creative destruction, of producers using less efficient technology by innovators (Tisdell 2000), is not the driver of industry change.

The second systemic source of potential dynamic inefficiency is uncertainty. As Cutler Review Panel (2008, p.44) suggested

> Typically, markets either fail, or simply don't exist, when there is a high level of uncertainty about the future, as there often is in the case of innovation. In such circumstances, government can play a pivotal role in facilitating innovation and providing the basis for strong productivity growth and increases in the standard of living in the future.

So, even when the incentive exists to explore future enhancements to allocative and productive efficiency, missing or incomplete markets diminish private sector search effort.

A third source of dynamic inefficiency, linking the other two sources, is the myopic influence, on customer and strategy definition, of current technology on private agents (Salmenkaita and Salo 2002). The relevant future is perceived through the prism of present activity. This is, arguably, unavoidable because the success of agents is so dependent on productive efficiency: dexterity in utilising technology. So, while the dynamic efficiency that springs from the actions of current economic agents will relate to responses they make to trend changes that bear on their strategic management context, the direction for search effort is restricted by current activity. (One aspect of this private sector context, currently, is reduced cash flows which are impacting heavily on research and development effort (OECD 2009). This is an ephemeral problem.)

At the core of this line of reasoning is Schumpeter's argument that *discontinuous* change is less likely to spring from existing firms than new ones (Salmenkaita and Salo 2002). The path dependence inherent in extant firms is a rigidity constraining radical change. The same applies to clusters or "agglomerations" (Salmenkaita and Salo 2002), notwithstanding their value as mechanisms for access to scale economies and related externalities (de Groot *et al*. 2008).

Dynamic efficiency is exposed to three main sources of threat with two effects. The effects are lack of incentive for future-oriented information search due to high levels of competition (as distinct from rivalry), and

restricted purview of research effort due to either uncertainty or myopia induced by current activity. The restricted purview manifests as missing or incomplete markets.

Dynamic efficiency and agriculture

Schumpeter's interest in the role of the entrepreneur, and subsequently entrepreneurial firms, led him to argue that a driver of innovation, both in production processes and output, is the quest for supernormal profits (profits *above* those achieved under perfect competition). This translates into a quest for some degree of monopoly (Tisdell 2000). One extremely common manifestation of this is the wish by producers of goods to differentiate their output from that of other producers. Another is the observation that can be made of the discipline of Marketing, that its whole purpose is to avoid price-based competition, which is the hallmark of perfectly competitive industries. The implication of this is that, to the extent that innovation requires plausible expectations of supernormal profits over some period, perfect competition impedes innovation. Perfect competition is mislabelled: "it is not only impossible but inferior" (Schumpeter quoted in Blaug 1997: 69). In the terms of the Sandall *et al.* (2009) analysis, perfect competition is a market failure, occasioned by *lack* of influence over either prices paid or received, undermining future productive efficiency.

This has important implications for ways one should contemplate market failure but, generally, since few industries approximate perfect competition, limited practical meaning for government intervention. Agriculture is different, however. Just *how* perfectly competitive Australian agriculture is matters little: the lack of control over price, and output quantity, means that it bears the worst features of perfect competition from an entrepreneur's perspective. One implication of this is that the prospects for achieving supernormal profits from research and development are typically inadequate to trigger it. This corrodes dynamic efficiency. That is, perfect competition equates with industry stagnation, which was Schumpeter's argument.

Arguably, the possibility for product differentiation sufficient to enable control over prices received on Australian farms is slight and the loss to allocative efficiency as a result of competitive intensity likewise slight as a result. Notwithstanding the expanded role in farm performance this implies for technical efficiency, though, the near-perfectly competitive state of most sub-sectors within agriculture causes farm-sponsored research into productivity enhancement to be virtually non-existent at the individual farm level. The non-rivalric character of perfect competition does enable, however, incentives for collective investment in research provided that its non-rival and non-excludable implications are removed (eg, Kondinin Group, MacKillop Farm Management Group, industry R&D funds).

Publicly-funded research and extension activity for agriculture have been interventions which have been justified historically on the basis that both often have non-rival or non-excludable features (Marsh and Pannell 2000). That is, (static) market failure concerns apply. But, predictably, an intrinsically dynamic issue (production system innovation) is not well-framed through a static prism. The justification is unbounded: "such market failures are pervasive across most sectors of the economy" (Mullen *et al.* 2000: 639).

Notwithstanding this pervasiveness of market failures, arguably no other economic sector receives the focused attention in research, and its promulgation to agents, that agriculture does. Minsky and Whalen (1996) lament this fact in the US context, flagging the virtue they see, incidentally, in agricultural minimum price schemes as sponges of uncertainty. An implication of this, which should not surprise, is that the presence of non-rival and non-excludable features is useful for analysis of a problem but is not an indication of the necessary existence of a problem for society.

The question arises, then, as to how agriculture has come to enjoy its unique status. One possible answer is that the lack of control over financial performance on farms is more severe than in other sectors. The returns to innovation are too uncertain to attract investment in research by individual farmers, nor sufficient research by collectives of them. The historical justification for intervention may have been static efficiency but the unique attention to agriculture may be based on the clarity and magnitude of the threat to dynamic efficiency that arises from volatility in performance relative to other small-to-medium businesses; this and the remorseless decline in farmers' terms of trade which demand productivity enhancement to maintain average gross margins.

The on-farm specifics of this threat are as follows. In the absence of supernormal profits, there is little, if any, reserve of resources available for commitment to research in productive efficiency enhancements or in flexibility to adapt activity to maintain allocative efficiency by changing output. Moreover, because the commitment of any resources, by any firm, to maintaining or enhancing future efficiency comes at the opportunity cost of current efficiency, the pressure of farmers' terms of trade constrains their ability to discount current performance for future performance potential. (Under static frameworks of analysis, any degree of subjugation of current effort for future performance is readily attributed to *risk aversion* which may be argued, as a construct, to be a somewhat unhelpful artefact of static, inadequately-specified analyses of decisions made in dynamic contexts; see Marshall *et al*. 1997.)

Compounding the situation is (commonly) considerable price variability, to some extent a consequence of the perfectly competitive character of the farm industries, and typically very long production cycles. With attendant substantial sunk costs in single production cycles, this imposes serious constraints on prompt adaptation to relevant change and delivers volatility to financial bottom lines. (There is an unfortunate disconnect between the financial and economic perspective on sunk costs and the realities of cash flow management and bankers' demeanours.)

In effect, the uncertainty of financial performance in the current period causes massive discounting of future performance; near-perfect competition forces (many) farmers to act as though no relevant change will occur to which they will need to adapt. In relatively stable environments, this can be an effective "strategy".

The diminished incentive for most Australian farmers to engage individually in search effort, coupled with the related poor opportunities for product differentiation, mean that threats to dynamic efficiency arising from missing or incomplete markets are considerable.

Identifying Problems

There is widespread agreement amongst economists that, if the performance of the economy is important to society, welfare concerns as to the distribution of wealth, and associated access to the output of the economy, are most appropriately addressed by tax and transfer mechanisms (Fallon 2005). The core rationale is that maximising efficiency leads to maximum wealth available for redistribution and that subsidising individual encounters with the economy, through the economy, will reduce efficiency and wealth. This view is adopted here and subsequent discussion is focused on problems of efficiency other than those sourced in wealth distribution.

Conceptually, intervention directly in the economy involves a limited range of objectives. In terms of static efficiency, either prices or production, or both, are sought to be modified. In terms of dynamic efficiency, adaptive capacity is sought to be modified.

At the same time, intervention must reflect the sophistication of our understanding of market operations. As Kay (2007) argues, the feature of market economies even more impressive than their allocative efficiency, relative to command systems, is their pace of innovation. This is achieved through experimentation, trial and imitation. Government intervention predicated on explicit assumptions about appropriate, specific technological preparation for the future will damage market performance by distorting this intrinsic evolutionary process of markets.

The economic justification for intervention in pursuit of dynamic efficiency nowhere implies that government has greater wisdom than markets or private agents in them. The justification is for the sponsoring of more and broader research effort than would otherwise occur. While direction and priorities must be specified (see Cutler Review Panel 2008), research is the output of interest. More defined outputs, such as output from existing industries (eg, motor vehicles) or evolving industries (eg, renewable energy), cannot be sponsored validly with reference to threats to dynamic efficiency.

Attention to possible problems and needs for intervention can be aroused in only a few ways. An agent or other member of the public may object to the current mix of outputs of the economy or perceptions of its allocative, productive or dynamic efficiency. Public concern about current pollution and CO_2 emissions are examples of claimed allocative inefficiency. Lamentations about education funding and asset depreciation rates are expressions of concern with dynamic efficiency.

Alternatively, a change, or proposal for change, may flag possible challenges to efficiency. This could be change in the economy, such as merger activity or changes to production technology available. It could be change exogenous to the economy, such as shifts in consumer preferences, changes in labour supply or changes in natural resource availability.

Either source is a trigger for consideration of intervention if there is a present or threatened lessening of efficiency or, in the case of exogenous change, the change causes society, through government, to seek a new non-economic benefit. An example is the decision, by a number of Australian state governments, to construct desalination plants to absorb what is perceived to be expanding volatility in rainfall. The non-economic benefit is zero risk of reduced supply of urban water, regardless of future rainfall patterns.

Arriving, or anticipated, exogenous change may generate a variety of intersecting issues. There may be impacts on productive efficiency if production possibility frontiers (defined by engineering efficiency) move. There will be requirements for the economy to adapt. Depending on the magnitude of the impacts of the change, agents may plead for protection from the change or support for their adaptation.

Exogenous change may modify an economy slightly or substantially. There may be changes to the economy's output mix, prices and volumes, and to the distribution of welfare (Pant *et al*. 2000).

The impact of change on an economy is precisely the domain of relevance to dynamic efficiency.

Problem materiality and persistence in agriculture

Volatile output prices can induce firm-level production decisions which reduce realised allocative efficiency. This occurs when assumed relative prices fail to manifest at the time of sale of output: the wrong mix of products has been produced. What happens at the aggregate, industry level is another question. Plainly, the possibility exists for offsetting decisions so the cumulative effect on the economy is indeterminate. For this reason, policymakers can validly display some indifference to the failure of firms due to unsuccessful strategic decisions about what to produce. While impacts on individuals may be severe and worthy of welfare attention, allocative efficiency is unlikely to be touched by any changes in firm ownership, or rationalisation, that results.

Volatility which impacts on technical efficiency, by moving the production possibility frontier, is less likely to have offsetting effects across an economy. Severe weather, for example, is most unlikely to do many firms good in terms of technical efficiency. In the absence of offsets, change of this kind reduces society's productive efficiency.

The fact that productive and/or allocative efficiency may be reduced is not a symptom of dynamic inefficiency. Both components of economic efficiency are in persistent flux (i.e. disequilibrium) as the economy, and its driving forces, change. Either effect matters only to the extent that the efficiency reductions persist; that they are systemic.

The earlier consideration of definitions of efficiency is salient here. The greater threat to economic efficiency in agriculture comes from change touching productive (technical) efficiency rather than allocative efficiency. However, any fundamental separation of technical efficiency from output preferences creates the possibility of valuing technical efficiency on some intrinsic basis: rating production virtuosity above output value. By implication, the trend in value of output is of central importance. It is by reference to trend values that the productive efficiency of the economy can be related to the technical efficiency of firms. That is, appropriate future output mixes cannot be ignored. Who might identify these mixes reliably? The answer to this is "no-

one". Instead, the question effectively becomes one as to whether changes in trend relative prices may occur and, typically, the projection (the null hypothesis) is that they won't.

That is, the role of allocative decisions in valuing losses in productive efficiency is defined away by an assumption that grounds are insufficient to anticipate changes in trend relative prices across farm output. This causes attention to be on physical (engineering) components of productive efficiency. It can also gull analysts into ignoring the importance of output value as they contemplate intervention: analysts forget that an assumption of stable output value distributions is being made.

A somewhat related example may be climate change. Defining this as an exogenous change to the economy, and assuming that the common suggestions of increased volatility of weather (a trend change in variance, one might say) are valid, an implication is that government support of research designed to maintain or enhance productive efficiency may need to shift focus from productivity enhancement to resilience. (For relevant discussion see Productivity Commission 2009: 180ff.) The Productivity Commission (2009: 184) counsels, in the agricultural context, that

> The challenge for public policy is to elicit investments that:
> • would not otherwise have been made — programs need to be designed to ensure that public funds stimulate *additional* research and development rather than simply displace privately funded research and development
> • generate total private and spillover returns that exceed the costs associated with the policy measures (including administration and compliance costs and efficiency distortions of taxation required to finance the measures).
> It is important to provide balance in the allocation of funding for agricultural research and development activities between projects designed to: improve risk management for climate variability; develop climate change adaptation technologies and strategies; and improve production more generally.

but that, in the rural research and development corporation context, "the extent of industry capture of research priorities needs to be monitored to ensure that there remains a strong public benefit component that warrants government funding" (Productivity Commission 2009: 182). Or, as Cutler Review Panel (2008) explain, government needs actively to monitor and manage its research priorities.

Significant here is the suggestion that research of value to society's dynamic efficiency exists which will not be defined as worthy autonomously in private firms or even in research entities partly sponsored by producers. As one might expect in a dynamic context, maximising dynamic efficiency for the economy as a whole requires watchfulness of the needs of society beyond producer perceptions of them. In terms of the Sandall *et al.* (2009) analysis, this line of reasoning points to market failures of incomplete and missing markets arising from non-exclusive costs or benefits in production (research and development) or consumption and non-exclusivity in research and development and non-rivalry in consumption, respectively.

Government intervention is itself a dynamic process involving ongoing assessment of allocative efficiency and productive efficiency and dynamic efficiency. The centrality of the efficiency of the economy to societal wealth creates an incentive for government to avoid harming incentives for private sector efficiency. It creates, also, an incentive to intervene when those incentives are distorted by pricing problems, as discussed, or by systematic impediments to dynamic efficiency.

Intervention, on the basis of any economic rationale, is most secure from government failure when it is deft. Critical to this is sensitivity to the incentives flowing through the economy which drive autonomous responses by agents. In the specific context of dynamic efficiency rationales, the appropriate role for government would be expected to be intrinsically variable. New capacities that emerge from intervention, if they have value, will offer private benefits the presence of which signals the need for reconsideration of the persistence of the rationale for the specific intervention.

The challenge for government is to be active in pursuit of productive and dynamic efficiency when the levels of both are well hidden. Dynamic efficiency and productive efficiency, like x-efficiency, cannot be observed. There are no metrics for optimising interventions to maximise either. Interventions to enhance dynamic efficiency may best be viewed as actions to lubricate adaptation. Depending on the context under consideration, this will be some form of change to information in the economy. This may be the provision of

existing information to agents who do not have it, for some systemic reason, or investment in the search, which is unlikely to occur otherwise, for new information.

Any more technology-specific, or product-specific, intervention immediately begs the question as to government competence to better project output value than can private firms and investors. There is no evidence of such competence.

The case of agriculture and climate change is stereotypical. Here we have a sector which has long had government intervention in the form of information provision and net revenue smoothing mechanisms, some of which are unique to agriculture. I argue that both these forms of intervention are more plausibly explained by government concerns about dynamic efficiency than static efficiency. The information provision is designed to improve productive efficiency, particularly, but is arguably motivated by the substantial importance attaching to productive efficiency due to weak control over allocative efficiency: the importance of minimising the cumulative financial damage of x-inefficiency. Seeking to shift production possibility frontiers to their known limits is good for society, but is good whatever sector is involved. In agriculture, it is more clearly important in creating robustness to relevant uncertainty. Net revenue smoothing is entirely to do with creating robustness by absorbing uncontrollable revenue volatility.

Climate change seems to pose a new trend change in temperature and rainfall and a new change in the amplitude of volatility in each. There are, as part of the context for this, trend changes occurring persistently in output demand from Australian agriculture.

The Productivity Commission (2009:xxi) said of Australian agriculture that

> Given the frequency of drought, it is easy to overlook that the Australian agriculture sector is highly successful. It leads domestic productivity growth, is an innovative adopter of technologies, and has proved resilient to myriad forces of change. For example, despite facing long-term pressure on commodity prices and rising input costs, sectoral output continues to increase — with more than half of that exported.

but

> This sectoral success masks a complex story of diversity and contrasting fortunes:
> • in 2005-06, the largest 30 per cent of farms generated 82 per cent of the value of agricultural operations, whereas the smallest 50 per cent generated 7 per cent
> • as a group, the bottom 25 per cent of broadacre farms has not recorded a profit in any year from 1988-89 to 2007-08.
>
> Productivity Commission 2009:xxii

Applying Schumpeterian logic, the near-perfectly competitive character of much of agriculture makes for sluggish adjustment. The above data do not indicate a thrusting sector of the economy in command of its fate and striving to deploy its resources to maximise customer satisfaction. It takes imperfect competition to generate that.

Rather, aggregate output eventually moves more closely to reflect trends in demand, while the factors discussed here encourage shrewd farmers to fixate on pushing production possibility frontiers out from their origin.

Increased climate variability is going to flow to net revenue on farms, moderated by increases in gross margins captured from enhanced productive efficiency and by enhanced physical resilience to weather events on farms. Smoothing of net revenue volatility will continue to be useful. Trade-offs between scale economies and various forms of diversification, including geographic, will be re-assessed.

To be available in a timely fashion, given the perfectly competitive state of much of agriculture, this information will need to be sourced with government assistance.

At its core, the economic rationale for intervention in agriculture, in the face of climate change, is essentially a matter of dynamic efficiency. The rationale arises strongly because the lack of control over financial performance on farms leaves the sector with a low capacity to invest in its capability to adapt. In the face of

secular change to previously stable distributions of input availability, the robustness of the sector is threatened. There will be a risk that substantial productive inefficiency will be incurred over time due to ignorance of the change and its implications for production. The period over which this occurs may be counted in decades. The substantial adjustment that has to occur in agriculture will damage the economy less the sooner it is known to be rational.

Summary

Dynamic efficiency is where intervention will be weighed for the purpose of attempting to optimise paths of allocative and productive efficiency. Impediments may arise from competitive structures (too much competition or too little) or from government expectations of change that is going to redefine operating environments in ways that existing organisations will struggle to anticipate or adapt to.

The latter is undoubtedly provocative to the extent that it seems to imply industry policy or "winner-picking" policies. These are categories of response rather than rationales for intervention. The only intervention that would seem to be justified on the basis of this "assumed insight" outside producing organisations is in information search and/or deployment that would not otherwise occur.

Arguably, this has long been the real incentive for public funding of research, development and extension related to agriculture. The rationales usually offered, non-rival and non-excludable outcomes of enquiry, are true but, in themselves, not at all specific to agriculture, while the public assistance is, in large measure. The real rationale seems to rest on the threat to farm sector dynamic efficiency with which these "market failures" correlate.

Conclusion

The rationale for intervention in markets, or the economy generally, is that material inadequacies in the outcomes of the functioning of the economy are judged to warrant modification. These judgements of its efficiency may be unrelated to deficiencies of a technical kind in the way the economy functions. Those that are, however, are what we define as "economic efficiency rationales". The rest may more appropriately be defined as "social rationales". The latter include concerns about the effects of income distribution (impacting, for example, on the sicker, older and younger members of society) and, interestingly, some "public goods" which *only* reflect social rationales.

Attention in the economic literature to economic rationales has displayed two unfortunate characteristics. The clearest, perhaps, is the exclusion of dynamic considerations. Mainstream focus on "market failure" has been restricted to static efficiencies, allocative and productive efficiency, and the consequences of technical problems and the failure of the assumption of perfectly competitive states to obtain. Other matters (not directly considered here) such as information asymmetry and externalities are often included despite the fact that neither have substantive content in a comparative static, equilibrium framework of analysis.

What does not appear is much attention to a dimension of efficiency which has long been an explicit concern of Australia's most persistent watchdogs over the functioning of the economy in efficiency terms related to technical economic problems.

The second characteristic in the literature is something of a loss of plot. There is appropriate concern that repair to technical market deficiencies should be rational and duly attentive to all impacts of intervention. There is less sensitivity to the importance of the materiality of efficiency problems *as distinct from* the presence of "market failures". This can lead to an approach to the functioning of the economy more akin to a mechanic's than a driver's: responses are driven more by concerns about proper functioning of the vehicle than the journey.

Both of these characteristics come together when dynamic efficiency receives explicit attention. Static efficiency has, axiomatically, to be traded off against dynamic efficiency. Optimising this is not easy if a comparative static approach dominates. Nor is it easy if information is analysed in time-independent ways, given that information (including knowledge) is at the core of dynamic efficiency, assuming pro-competitive interventions keep monopoly power at levels low enough to sustain the private benefits of dynamic efficiency under imperfect competition.

The main issues here are not esoteric. Those administering public policy are explicitly concerned with static and dynamic efficiency. Farmers, in Australia and elsewhere, have long enjoyed public intervention to provide information for reasons that can not be linked convincingly to static efficiency concerns, because static efficiency concerns do not explain agriculture's unique status in this regard.

Finally, climate change drags attention to dynamic efficiency. From a static perspective, climate change is not very interesting. It has a clear trend with increased variance projected to be about it. In some ways it is less threatening than output price variability. Agriculture will adjust; there can be no doubt. That is not the point. The point is that, in real time, the adjustment path can be more or less resource-costly and, to the extent that information that may make the path less costly (net of the cost of information) is unlikely to be sought, there are dynamic efficiency grounds for intervention to assist. The economic rationale turns on characteristics of the economy, and agents within it, that imply such an information search shortfall.

Jointly, the considerations in this report lead to an elaboration of the economic justification tree in Sandall *et al.* 2009. Re-casting it as a table, below, and grouping "market failures" in efficiency sources of government concern, a more comprehensive overview emerges as a result of including dynamic efficiency.

TABLE 1: ECONOMIC TRIGGERS FOR GOVERNMENT INTERVENTION

MATERIAL CONCERNS WITH:	**CONDITION:**
ALLOCATIVE EFFICIENCY	
DUE TO NON-EXCLUSIVITY IN OUTPUT PRODUCTION AND NON-RIVALRY IN CONSUMPTION	MISSING MARKETS
DUE TO NON-EXCLUSIVE COSTS OR BENEFITS CREATED IN PRODUCTION OR CONSUMPTION	INCOMPLETE MARKETS
DUE TO AGENT INFLUENCE OVER PRICE PAID OR RECEIVED	IMPERFECT MARKETS
PRODUCTIVE EFFICIENCY	
DUE TO AGENT INFLUENCE OVER PRICE PAID OR RECEIVED	X-INEFFICIENCY ENABLED
DYNAMIC EFFICIENCY	
DUE TO NON-EXCLUSIVITY IN RESEARCH OUTPUT AND NON-RIVALRY IN CONSUMPTION	MISSING MARKETS
DUE TO NON-EXCLUSIVE COSTS OR BENEFITS CREATED IN RESEARCH PRODUCTION OR CONSUMPTION	INCOMPLETE MARKETS
DUE TO LACK OF AGENT INFLUENCE OVER PRICE PAID OR RECEIVED	PERFECT MARKETS

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