The Australian Journal of Agricultural and Resource Economics

Journal of the Australian Agricultural and Resource Economics Society

The Australian Journal of Agricultural and Resource Economics, 54, pp. 9–25

Climate change and the Australian agricultural and resource industries

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There is a limited case for assisting trade-exposed emissions-intensive industries during a transitional period during which Australian resource industries but not all of their major competitors are subject to emissions constraints. There is no case for protecting Australian industry from all adjustment and loss of asset values during the transition. The valid case is analogous to anti-dumping assistance, being confined to the case where weaker emissions constraints elsewhere would force adjustments that would be reversed later. The case for assistance is limited by the effect of others' weaker emissions constraints on global resource prices.

Key words: agriculture, climate change, climate change economics, environment, resource industries, trade policy.

The mainstream science and standard economic analysis together tell us that the Australian agricultural and resource industries are likely to be affected profoundly by climate change and the global response to it. They are likely to be affected profoundly whether or not there is an effective global mitigation effort, and whatever the nature of Australia's contribution to that effort.

The Australian economy and community as a whole, and the agricultural and resource sectors within the national economy, would maximise their prospects for future prosperity if there were comprehensive global mitigation, within which all significant economies were subject to quantitative emissions constraints, and trade in emissions entitlements introduced similar costs of abatement at the margin across all substantial economic activities in all substantial economies.

This is easier said than done. The building of a comprehensive global agreement has required some countries to move ahead of others, and national mitigation regimes will be operating in an *ad hoc* world for some time. There are immense challenges to efficient global and national resource allocation, to effective operation of a multilateral trading system, and to public policy integrity more generally, in the *ad hoc* world that accompanies the movement to

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Paper presented at the 53rd Annual Conference of the Australian Agricultural and Resource Economics Society, 11th February 2009, Cairns, Australia.

doi: 10.1111/j.1467-8489.2009.00481.x

greenhouse gas mitigation in some countries and not others, and for some activities and not others.

This study begins by summarising some conclusions of the Garnaut Climate Change Review (Garnaut 2008) on how the Australian agricultural and resource industries are likely to be affected by climate change and its mitigation. It then focuses on one important and difficult issue. This is the application of policies to support trade-exposed, emissions-intensive industries prior to the application of a comprehensive global agreement and similar emissions pricing in all substantial economies.

1. The platinum age, the global financial crisis and climate change

When I addressed this conference 3 years ago, I drew attention to the implications for the resources sector of sustained rapid economic growth in the large developing countries, first of all China. I was later to describe the phenomenon of sustained rapid growth in the early 21st century, in which the large developing countries played central roles, as the Platinum Age. In the early 21st century, the beneficent processes of rapid, modern economic growth were entrenched in the populous countries of Asia—most importantly China, but also India, and other large countries of South and Southeast Asia. In the third quarter of the 20th century, sustained rapid economic growth had spread beyond its places of origin in Western Europe and its overseas offshoots in North America and Australasia, and the special case of Japan, into a number of smaller countries in East Asia. The large economies of Asia had begun to establish the necessary conditions for modern economic growth in the last quarter of the century: China from 1978; Indonesia from the mid-1980s; India from 1991. In some early years of this century—one might now say in the years leading up to the Great Crash of 2008—modern economic growth on a global scale had reached its apogee. A higher proportion of the world's population was participating in sustained rapid growth in productivity and incomes than ever before.

Rapid global growth in the Platinum Age was highly intensive in use of metals and energy. This was because growth was concentrated in countries at stages of development in which increased economic activity used metals and energy intensively.

Supplying rapidly growing global demand would require continuing expansion of productive capacity in the resources industries. Prices and expectations of prices would need to remain high enough to induce the necessary investment. For a considerable period, real prices of metals and energy would need to remain well above the average levels of the last quarter of the 20th century. In this, the Platinum Age of the early 21st century would be like two earlier periods of strong global economic expansion: the late 19th century into the early twentieth up to the First World War; and the 'Golden Age' after the Second World War up to the cessation of rapid growth in Japan in 1974.

I noted 3 years ago that most resources prices were then as high as would be necessary to induce the required increases in supply on a continuing basis.

Market prices were to go much higher in the subsequent two and a half years. This was because markets had not anticipated the China boom in particular and global Platinum Age growth in general and there was concern about the short-term adequacy of supply capacity. Some analysts have suggested that there was also a speculative element in the large increases in resource prices over this period (Shiller 2008), although market behaviour may not require this additional strand of causation. The markets would have caught up, even without a Great Crash. After a lag, supplies would have expanded more rapidly and prices eased, although prices would need to remain at levels that were on average substantially higher than in the late 20th century.

The resources boom that grew from the Platinum Age raised Australia's terms of trade to exceptional levels. It added about 12 per cent to average Australian incomes in the 4 or 5 years to the peak of export prices in the middle of 2008. By 2008, the investment in new capacity was making a large additional contribution to Australian incomes, beyond the lift from the terms of trade. High levels of investment were set to expand global production and to bring resources prices back to historically high but more moderate levels—before the Global Financial Crisis precipitated the Great Crash in global economic activity from the third quarter of 2008.

The Climate Change Review discusses how the resources boom was the other side of the coin to an acceleration of growth in global greenhouse gas emissions in the early 21st century (Garnaut 2008, Chapter 3). Sustained rapid growth in the Asian developing countries—especially but not only China—meant that global growth, the energy intensity of that growth, and the emissions intensity of energy growth were all much higher than in the most widely used scenarios applied by the IPCC (IPCC 2000, 2007) and the Stern Review (Stern 2007). This at once made mitigation more urgent and important, and more difficult and expensive.

I presented the Final Report of the Garnaut Climate Change Review to the Prime Minister of Australia on 30 September 2008. This was the morning after the American day of the largest 1-day points fall on the New York Stock Exchange in history.

The Global Financial Crisis has provided the context for all of the discussion of the Final Report, and of the Government's White Paper on a Carbon Pollution Reduction Scheme (Commonwealth of Australia 2008). The crisis and associated global recession has affected perceptions of what is possible in relation to mitigation in the near term. It has for a time stopped the rapid growth in emissions of the early 21st century. Since mid-2008, emissions from the developed economies as a whole, and from China, have been falling.

It is a matter of great importance for climate change policy whether the Global Financial Crisis represents a temporary pause in the Platinum Age, or brings it to an end. My address to the CSIRO Conference, *Greenhouse 2009:*

Climate Change and Resources, in Perth in March 2009 focused on the implications of the Global Financial Crisis for the global mitigation task, and for the political economy of mitigation in Australia and abroad. For this study, I will simply assert a conclusion: that the current crisis may shift the trajectories of 'business as usual' emissions growth by perhaps 2 or 3 years, but is unlikely to affect the slope of the curve significantly in subsequent years. For the climate change cognoscenti, it may bring down 'business-as-usual' emissions in 2030 and later years to a bit below the levels that the Review thought to be most likely (Garnaut 2008, Chapter 3 and Garnaut *et al*. 2008). It may bring them close to the highest of the wide range of scenarios generated by the IPCC: the 'extreme' A1FI scenario. It happens that the A1FI scenario and its implications for climate and for human activity was the basis for the Review's modelling of the costs of climate change and the benefits of mitigation.

It is an implication of this view of the future of the Platinum Age, that Australia can look forward to long-term average export prices for minerals, energy and metals considerably above the levels of the late 20th century, although below the levels at the heights of the recent boom. The Global Financial Crisis gives us a little breathing space, but mitigation of climate change remains urgent and of central importance. We will need the breathing space, and we will need to use it well, if there is to be a mitigation outcome that future generations of Australians and others judge to have been satisfactory.

2. Australia's interest in strong global mitigation

The Climate Change Review sought to assess whether it was worthwhile for Australia to participate in a global mitigation effort, within which it would be required to play its full proportionate part. It also examined the extent of global mitigation, with Australia playing its proportionate part that was best for Australia. The questions are different from, and as it turns out much more complex than, the question underlying other large quantitative studies: whether the benefits of mitigation would exceed the costs for the world as a whole (Cline 1992, 2007; Nordhaus 1994, 2007; Stern 2007).

All systematic studies of the costs and benefits of climate change mitigation must come to grips with some difficult conceptual issues. First, all of the costs of climate change mitigation, but only some of the benefits (through reduced costs of climate change), are amenable to quantification using standard economic methodologies. Second, the costs of mitigation come early and the benefits of reduced climate change late, so that an appropriate social discount rate must be used to convert values at widely different points of time into present values.

The Review handles the first issue by separating out four types of costs of climate change (Garnaut 2008, Chapter 1). Type 1 (fairly precisely) and Type 2 (approximately) are amenable to economic analysis using standard computable general equilibrium analysis. These effects relate to

economic impacts experienced through market processes. The application of computable general equilibrium modelling many decades into the future stretches the technical limits of the models, and no attempt is made to provide precise quantitative estimates of the costs and benefits of mitigation beyond the end of the 21st century. By the end of the century, the annual net benefits of mitigation are strongly positive, so that the temporal truncation of the analysis leads to underestimation of Types 1 and 2 net benefits of mitigation.

The mainstream science recognises a high degree of uncertainty about the impacts of climate change. The modelling of Type 1 and Type 2 effects focuses on the mid-points of the probability distributions of possible outcomes. Type 3 impacts recognise the additional costs associated with human risk aversion related to bad outcomes, with outcomes being uncertain, and with possible outcomes including some that are much more unfavourable than the median.

Type 4 recognises that some important impacts of climate change, and therefore benefits of its avoidance, are not felt by humans through market processes. The Review seeks to assess Type 3 and Type 4 effects, as well as Type 1 and Type 2 effects beyond the 21st century, and to bring them to account fully but qualitatively.

The Review found that the range of appropriate social discount rates for converting future into present values covered the appropriate market discount rates for sovereign debt in a developed country (Garnaut 2008, Chapter 1). The conclusions about whether mitigation advanced Australian interests, and about the degree of mitigation that advanced Australia's interests most, were robust across the range of appropriate discount rates.

The analysis revealed that Australia was the most vulnerable of the developed countries to unmitigated climate change. Of all the developed countries, Australia would seem to have the greatest interest in early and strong mitigation. It follows by implication that the best level of global mitigation for Australia is the highest level to which the international community can agree.

For any given extent of Australian mitigation, the costs are much lower if mitigation is undertaken within a global regime than through unilateral action. There is negligible climate change benefit from Australia acting alone, so any unilateral action should be transitional, temporary, and directed at developing an effective global agreement.

The formal modelling of quantifiable impacts suggests that through the first half of this century, strong global action directed at greenhouse gas concentrations of 550 ppm, with Australia playing its full proportionate part, would reduce growth in the value of Australian incomes by a bit above one-tenth of a percentage point per annum. This loss could be expected to be restored in present value terms through the second half of the century. The additional benefits of mitigation—the possibilities away from the median of the income distribution, and the non-market effects, together with conventional market effects beyond the modelling horizons to the end of the century—tip the balance strongly in favour of mitigation. The same lines of

analysis indicate that Australia's national interest would be served by the strongest feasible global mitigation—for example, a global mitigation effort directed at holding concentrations of greenhouse gases in the atmosphere to 450 ppm rather than 550 ppm. For 450 ppm, the costs of mitigation are higher than for 550 ppm, but these higher costs are amply justified by larger benefits of reduced climate change.

3. Mitigation and the Australian resource industries

A considerable part of Australia's vulnerability to climate change is concentrated in the resource and agricultural industries.

The vulnerability of agriculture derives mainly from supply side effects. Much of Australian agriculture operates close to the upper margins of the temperature ranges at which agriculture is undertaken successfully, and close to the lower margins of the ranges of access to water. Higher temperature threatens output directly in many areas and for many crops. Higher temperature also increases evaporation and reduces run-off, and so reduces access to moisture. In the conditions of southern Australia, run-off declines by around 15 per cent for each percentage point rise in temperature. In addition, climate change is expected to be associated with major changes in rainfall patterns, which are likely to be unfavourable to Australian agricultural production. The rainfall changes could be devastatingly unfavourable.

The vulnerability of the resource industries to climate change derives mainly from different considerations. Higher temperatures and intensification of extreme weather events raise the cost of capital items. However, the largest effects operate through global demand and prices for resource-based products. Unmitigated climate change would slow growth in countries, notably the large Asian economies, which account for a large and growing proportion of global minerals and energy demand. Lower growth in these countries and in the world as a whole would reduce Australian export prices. Incidentally, the largest single loser through these terms of trade effects of unmitigated climate change is the coal industry.

Coal exports are also highly vulnerable to distorted mitigation policies in coal-using countries. The resource industries in general, and none more than coal, have a powerful interest in effective global mitigation, through processes that are built around comprehensive and similar emissions pricing across industries and countries.

The agricultural and forestry industries, viewed broadly to encompass land use in general, have large potential for relatively low cost sequestration of carbon emissions. They thus have considerable scope for generation of credits from any comprehensive regime of carbon accounting, which systematically rewards all sequestration and penalises all emissions. The Review notes that the utilisation of this potential is potentially transformative for the mitigation task, especially for Australia and its developing country neighbours, but also for the world as a whole (Garnaut 2008, Chapter 22). If agriculture, land use

change and forestry are subject to similar incentives to economise on emissions as other major sectors of the economy, the generation of carbon credits is likely to be a major source of income in rural Australia. The Review suggested that Australia should favour comprehensive carbon accounting and the bringing to account of all emissions and sequestration within this sector in the global emissions regime. There are technical barriers to the development of comprehensive carbon accounting for use in domestic and global mitigation regimes. These issues should be the subject of a major research effort, in which Australia has both strong interests and comparative advantage in research capacity.

4. Limits to adaptation

The costs of unmitigated or weakly mitigated climate change would be affected significantly by the efficiency with which production systems adapt to higher temperatures and changed patterns of precipitation. The efficiency of adaptive responses will, in turn, be affected *inter alia* by the economy's and industry's capacity for innovation, the availability and dissemination of knowledge of possible changes in climate, the effectiveness of markets for productive inputs (notably water) and products, and the effectiveness of government in correcting market failures in adjustment to large and far-reaching change (Garnaut 2008, Chapter 15).

The Australian agricultural and resource industries are renowned for their innovative capacity in response to changes in opportunity. This will be important to the survival of agriculture in many areas. In Australia, many changes from weakly mitigated climate change would require innovation beyond the normal capacity of human systems if anything like current production levels were to be maintained. Unmitigated climate change is likely to render unproductive large parts of established agricultural land in southern Australia, and more generally through the Murray-Darling Basin. Adaptation would allow us to make the most of unfavourably changed circumstances. In many circumstances, the appropriate adaptive response is likely to be the contraction of agriculture, and depopulation.

5. 'Compensating' affected industries

The agricultural and resource industries are currently highly emissions-intensive. Once the two broad sectors are included in an emissions trading scheme, entities within them will be the locus of legal compliance for a high proportion of emissions.

The Review draws a distinction between the point of legal incidence of the emissions trading scheme—the entity that is responsible for surrendering a permit with emissions—and the point of economic incidence. The point of economic incidence will lie with the entity within the economy that actually bears the cost of the permit. The two points are different to the extent that the

entity required to surrender the permit is able to pass on the costs to purchasers of its goods and services.

When output is not internationally tradeable, as with electricity generation, or supplies of fresh food into domestic markets, there will be considerable opportunity to pass on the costs of emissions permits to final users. In these circumstances, the emissions-reducing effects of emissions pricing occur mainly through reductions in demand for the more expensive final products. As competitively priced low-emissions substitutes emerge over time—more likely for electricity than for fresh foods—there will be progressively less opportunity for firms using emissions-intensive processes to pass on costs, and substitution in supply provides more scope for abatement.

Most of the output of the Australian agricultural and resource industries is sold onto international markets. There is limited scope for passing on increases on the costs of emissions permits to final users, until such time as most competing production is subject to similar emissions constraints. If and when there is comparable carbon pricing in countries which are the location for competing production, the main constraint on the pass-through of costs will be the availability of substitutes produced through less emissions-intensive processes.

There has been much discussion of whether and in what circumstances it is appropriate to 'compensate' firms for the requirement to acquit emissions permits. There is no economic case for 'compensation' where competitors are subject to comparable constraints on emissions: sales into the domestic non-traded sector, and into an international market after the general adoption of comparable emissions pricing. Where competitors are subject to comparable carbon constraints, the presence of carbon pricing will raise the capital value of some enterprises, applying low-emissions means of meeting consumer requirements, and lower the capital value of others, applying high-emissions means of meeting consumer requirements.

Such changes in asset values are part of the normal rise and fall of elements of a market economy. The changes in relative prices provide incentives for new patterns of production and consumption, and drive the process of adjustment to lower carbon intensity. The case for compensating losers is no stronger than for compensating for any other change in policy—from taxation to interest rates to reductions in tariffs or subsidies or removal of protective quotas. Perhaps of closer relevance to the subject of this paper, the fall in asset values in some enterprises following the taxation of the emissions externality generates no stronger case for 'compensation' than any other instance of government introducing measures to reduce the external costs of some economic activity—from discouraging tobacco smoking or the consumption of alcohol or unhealthy foods, to controls on the use of asbestos. There are winners and losers from taxation of or controls on negative externalities, and the gains and losses are recognised as being part of the risk of business.

6. The dreadful problem of shielding trade-exposed industries

Different issues arise when an emissions-intensive product is sold into a competitive international market. There is an economic case for making payments to firms that cannot pass on increased costs associated with carbon pricing because competitors are not subject to comparable carbon constraints. It is, however, a more limited case than is supposed in most of the Australian public policy discussion.

The valid case is closely analogous to the case for measures to restrict 'dumping' of subsidised foreign production onto the local market.

The economically valid concern arising out of firms operating in Australia facing more stringent carbon constraints than overseas competitors is not that some Australian firms may reduce their levels of production or investment. Some reduction in output of some products would occur in a world in which there was comprehensive carbon pricing on a comparable basis. Such adjustments would be economically and environmentally efficient.

The economically valid concern is that some Australian firms may reduce their levels of production and investment more than would have been the case if all competitors in other countries faced similar carbon constraints.

The aluminium industry can illustrate the distinction between concern for contraction of production or investment, and concern for excessive contraction.

The smelting of aluminium uses electricity intensively. Electricity can be produced through high-emissions processes (at an extreme, through the use of brown coal, but more generally through the use of coal), or low-emissions processes (for example, geo-thermal or hydro-electricity). Natural gas can be used to generate electricity with intermediate emissions intensity. Comprehensive global carbon pricing would provide incentives for contraction of production of aluminium based on coal to contract, and for expansion based on low-emissions electricity generation. The pressures for reducing the share of an emissions-intensive producer—say, Australia—in global production does not depend on the absence of carbon pricing in competing countries. Carbon pricing would make emissions-intensive processing less competitive even if it were adopted everywhere in a similar way.

With comprehensive carbon pricing, with similar constraints being applied in all countries with potential for economic production of aluminium, there will be strong upward pressure on costs of high-emissions production, but not on costs of low-emissions production. If, at the relevant margins, there is sufficient potential capacity at competitive prices to produce enough to supply the growth in world demand for aluminium from low-emissions sources of electricity, there may be little upward pressure on global aluminium prices as a result of the introduction of a price on emissions. On the other hand, if the potential for additional low-emissions production of electricity for aluminium smelting falls well short of the world's requirements, the increase in the aluminium price may reflect most or all of the effects of the emissions price on the cost of coal-based smelting.

If, with comprehensive carbon constraints, the global aluminium price would have risen more or less in line with the costs of emissions permits in Australia, comprehensive carbon pricing would generate little or no contraction of Australian production or investment. However, if it were the case that comprehensive global carbon constraints would have little effect on global aluminium prices, there would be considerable pressure for reduction in production and pricing.

How metal prices would be affected by comprehensive carbon constraints is an empirical matter, which can be the subject of analysis using standard techniques.

For aluminium, my guess is that analysis would show some tendency for upward pressure on prices as a result of comprehensive carbon constraints. These would weaken over time, as production patterns adjusted to the possibility of greater use of renewable sources of power in isolated locations. The effect on high-emissions, coal-based Australian production would probably be slight in the early years, but greater over time, as established capacity reached the end of its economic life. Whether Australia remained a major aluminium smelter and exporter in the long-term would depend on whether it was able to become a competitive source of relatively low-emissions energy. Australia's low-cost potential for geo-sequestration and bio-sequestration of carbon dioxide, and utilisation of a wide range of renewable energy sources, introduces the possibility that this country would remain a competitive producer of energy-intensive products.

The anticipation of comprehensive carbon pricing has led to the search for sites for aluminium smelting with large potential for generating electricity with low emissions. Examples include the establishment and then the progressive expansion of BHP Billiton's aluminium smelter in Mozambique and its studies of the hydro-electric potential of the Congo; Rio Tinto's purchase of the Alcan aluminium smelting capacity based on Quebec hydro-electricity resources; the emergence of Iceland as a major locus of aluminium smelting based on geo-thermal and hydro-electric power; and the interest that several global aluminium producers are taking in the hydro-electric potential of Papua New Guinea.

Any tendency for comprehensive global carbon pricing to inhibit investment in Australian aluminium smelting may turn out to be temporary. Australia has a number of advantages in aluminium smelting independently of the availability of electricity that has low costs if and only if no price is placed on environmental externalities. It is an advantage to be the locus of mining of the bulky raw material. Australia has ready availability of a wide range of skills in the resources industries. The potential for new production of low-emissions electricity in developing countries is finite, and will be exhausted sooner rather than later. Australia's exceptional opportunities for producing low-emissions electricity is likely again to be a source of comparative advantage in energy intensive industries once the 'stranded' opportunities for

low-emissions power resources in developing countries have been exhausted (Garnaut 2008, Chapter 23).

A valid case for payments to trade-exposed industries arising out of differences in carbon constraints from those applying in our trade competitors is not established by evidence that the application of carbon pricing in Australia will lead to lower levels of production.

Rather, the concern is that the world is on its way towards comprehensive carbon pricing, and the absence for the time being of carbon pricing in some countries may cause some firms to reduce their production too far—that is, beyond the level that would eventuate if and when competitor countries were subject to commensurate carbon constraints (see Attachment). The associated loss in productive capacity may not be reversible at a later stage when a carbon-inclusive world price emerges in the relevant commodity and goods markets. In addition, new investment in trade-exposed, emissions-intensive industries may be stalled even though it may have been viable had all competitors adopted policies consistent with those of Australia.

If the more favourable treatment of one industry within a competitor's than in the home emissions regime were expected to be permanent, the Australian economy as a whole would do best if the overseas distortion were ignored, and Australian trade specialisation adjusted to the set of international prices that emerged from the permanent set of distorted interventions. But it is not expected to be permanent, and that is part of the justification for transitional support for Australian production.

Here we have a close parallel to the economically rational response to other countries' subsidisation of traded goods industries. First, each country should seek the agreement of others on all countries removing all subsidies, to support efficient resource allocation on a global basis. To the extent that it turns out to be impossible to get other countries to remove subsidies, each country will maximise the value of its own output if it accepts world prices as it finds them, and specialises in production of those products that are most profitable in the world in which prices have been distorted by subsidies.

That is not, however, the world in which emissions-reducing policies are being developed. The whole purpose of introducing constraints on emissions in Australia is to be part of a global mitigation effort. We are working towards a comprehensive international carbon pricing regime. There will be no effective global mitigation without it. We cannot give up on removal of pricing distortions across countries without giving up on effective mitigation itself. It is reasonable to treat differentials in carbon pricing as temporary, and to avoid changes in the structure of the Australian economy that are dependent on temporary price distortion.

Therefore, under certain circumstances, there are environmental and economic reasons for establishing special arrangements for emissions-intensive industries that are trade-exposed.

So far, this paper has mainly used examples from the minerals and metals industries. In the livestock industries, unlike aluminium smelting, it is likely

that Australian production is less emissions-intensive than competing production entering international markets. Production of beef, sheep meats and diary products in the developed countries of the northern hemisphere is particularly emissions-intensive as a result of the need to house animals indoors and to feed them intensively in the cold parts of the year. It is likely that the competitiveness of Australian production would be enhanced in comparison with production in North America, Europe, Japan and Korea by comprehensive emissions pricing. It is therefore also likely that transitional assistance to avoid excessive contraction of Australian production would be warranted prior to the establishment of comprehensive global emissions pricing.

For analytic completeness, I should note that the case for assistance to industries facing excessive pressure to contract in the transitional period prior to comprehensive carbon pricing must clear one other hurdle before it is made completely on economic grounds. It needs to be demonstrated that the economic costs of adjustment are higher than the forgone gains from improved resource allocation.

7. The misconception and the solution

The Australian public policy discussion has proceeded on the basis that compensation is warranted because Australia is introducing an emissions trading scheme. This leads to a quite different focus and outcome to that which emerges from an economically rigorous approach. It leads to focus on removing part or all of the costs of emissions permits to trade-exposed industries if it can be demonstrated that some competing producers do not face comparable constraints.

No government is comfortable about subjecting its traded sector to an additional impost when its trade competitors are not willing to take comparable policy measures. However, to give way to the superficially attractive approach of compensating for the domestic imposts means either one of two things. It may mean heavily compromising a national commitment to reduce emissions. Or it means increasing the burden on non-traded sectors of the economy—most notably, and ultimately, domestic households. To compensate trade-exposed firms fully for Australia imposing costs on emissions would place large additional burdens on the economy as a whole and on other interests. This approach allows no logical limits to 'compensation'. The inevitable consequence of such an approach is the encouragement of pleading for special treatment.

These are dreadful problems for every country's emissions trading scheme or emissions tax in the absence of a comprehensive global agreement. The issue has the potential to corrupt public policy processes with implications beyond the emissions trading scheme, and to destabilise public support for mitigation policies. Internationally, it can have the effect of systematically excluding many of the most emissions-intensive industries from the emissions constraints that are required throughout the economy if the risks of danger-

ous climate change are to be held to acceptable levels. The progressive exclusion of trade-exposed industries by arrangements that differ across countries makes the details of emissions trading schemes rather than underlying comparative advantage the determinant of competitive advantage in the resources industries.

Australia has more to lose than any other developed country from an internationally fractured, unprincipled and partial approach to dealing with trade-exposed industries. We are one of the world's largest exporters of many emissions-intensive tradeable products, and proportionately to the size of the economy easily the largest amongst developed countries. Clear rules based on sound principles are a necessary protection for countries that would do well on a level playing field. Behind the fog of differentiated arrangements for trade-exposed industries a range of protectionist interventions will emerge that will be especially damaging to Australia. The growth of protection behind the fog of differentiated arrangements for shielding trade-exposed industries will be especially tempting and costly, albeit deeply counterproductive, as many countries seek to find their ways out of deep recession in the period ahead.

How can Australia provide support for trade-exposed industries where it is warranted, while avoided the risks of unprincipled arrangements?

The immediacy of the problem requires a three-pronged approach. This is not a matter of choosing one or other of three prongs. Two of the options rely on international agreements. The third is a domestic arrangement that could pave the way for an international approach. The three options are:

1) A comprehensive global agreement on mitigation under which all major emitters have national emissions limits. Trade in emissions entitlements will then establish similar carbon pricing in all economies, even if the limits are set much more stringently for some than for others (Garnaut 2008, Chapters 9 and 10).
2) Sectoral climate change agreements for our most exposed industries that establish similar carbon constraints amongst major competitors for particular industries.
3) Domestic assistance measures for our most trade-exposed industries that remove the effects of major competitors having failed for the time being to establish comparable carbon constraints.

I will focus on the transitional domestic assistance arrangements.

The correct approach to provision of assistance is based on the following principle:

> For every unit of production, eligible firms receive a credit against their permit obligations equivalent to the uplift in world price for their product that would eventuate if our trading competitors had policies similar to our own.

This formula is conceptually sound. Because it is based on a clear principle, it has defined limits, and so does not lend itself to unbounded negotiations and unbounded calls on the public finances.

The clear limits to calls on the public finances that are associated with the principled approach to shielding trade-exposed industries holds open the prospects of funding high levels of public support for research, development and commercialisation out of revenue from sale of permits. Substantial public support for innovation in the new technologies is an essential component of successful domestic mitigation policies as well as of an effective international agreement. The open-ended nature of fiscal commitments under the arrangements for assisting trade-exposed industries that have been implemented in Europe (with increasing awareness of the costs and increasing determination to reduce the costs), and which have been the focus of most of the Australian discussion and as reflected in the Commonwealth's White Paper (Commonwealth of Australia 2008) make public expenditure to support innovation dependent on appropriations of funds from outside the mitigation policy system.

The proposed principle is simple. It can be applied using standard approaches to modelling global markets that are familiar to economists, including to many working within the world's large resources companies.

The proposed principle ensures that firms are encouraged to invest and to produce to levels that are sustainable in the context of a global agreement, but they are not required to bear the full cost of doing so until there is an agreement.

It rewards firms that might be described as early movers but does not penalise other producers. It encourages firms that invest successfully in applying low-emissions processes, and does not reward investment in lobbying.

Whereas the European Union and Australian White Paper approach invites competitive protectionist responses amongst countries that are likely to escalate over time, the principled approach lends itself to stable international arrangements. It is easily and usefully reproduced in other countries. Indeed, it is a reasonable hope that one country's adoption of the approach would encourage its emulation by others. Two or more economies applying the approach and connected by trade in emissions permits, and therefore subject to a common carbon price, could share the analysis of prices and appropriate assistance payments.

Unlike the input-based compensation approaches that have dominated the policy debate and are embodied in the White Paper on the emissions trading system, this approach fully accounts for the policies of competitors, now and as they evolve over time. In this sense it is self-correcting. Payments at appropriate levels continue in full so long as other countries do not apply comparable carbon constraints. They are phased out automatically as constraints are imposed elsewhere, whether unilaterally, through sectoral agreements, or through comprehensive agreements.

This formulation for calculating payments ensures undistorted price signals for Australian business from the commencement of the scheme. Firms face incentives that accurately reflect those that will emerge from sectoral and then global agreements. Australian businesses will only reduce domestic production if that is consistent with long-term comparative advantage in a world of full costing of carbon externalities.

The Attachment illustrates the economic analysis underlying the proposed approach.

8. Administering a principled approach to supporting trade-exposed industries

The approach to assistance for trade-exposed industries proposed in the Review and explained in this paper would improve the prospects of effective mitigation. It would diminish the prospects of large-scale distortions in domestic resource allocation and political economy, as well as in the international trading system.

The approach is new in public discussion and in administration, and so will raise a number of issues related to its administration.

As with the administration of customs and taxation, the size of potential payments suggests the merits of delegating administrative judgements to an independent entity—initially national, and as soon as possible international by agreement amongst two or more economies.

The independent authority would need to be established with the necessary skills to develop carbon-inclusive world price models for relevant markets.

The calculation of expected price uplift factors, the frequency and timing of allocation of credits to eligible firms, and the relevant accounting rules should all operate to ensure minimum disruption and maximum certainty. Expected price uplift factors would be produced by the independent authority at regular intervals (at a minimum, annually), through a transparent and consultative process. The process applied by the Australian Productivity Commission in inquiries on protection matters would be a suitable model.

In an open economy like Australia, there are few completely "non-traded" goods. It would be excessively demanding of administrative resources for payments to be made to every firm that is affected to a small degree by the absence of comparable emissions pricing in other economies, irrespective of materiality. There would need to be a materiality threshold.

An eligibility threshold is defined most appropriately in terms of the expected uplift in the unit sales in percentage terms, in the given compliance period, such that:

- Only products that are expected to increase in price by a percentage in excess of a low threshold would attract credits under the scheme
- Eligible producers would receive credits for that part of the expected price uplift that is in excess of the threshold.

9. The prospects for the Australian agriculture and resources industries

Like the Australian economy as a whole, but especially so, the agricultural and resources industries would be big losers from unmitigated climate change. Like the economy as a whole, but more so, they would each face significant costs that were not balanced by benefits in the early stages of an Australian mitigation regime. They would each fare much better within a comprehensive, global regime of emissions constraints, and have a powerful interest in rapid advancement towards such a world.

Amongst much else, agreement on a comprehensive system of carbon pricing would remove the risk of *ad hoc* arrangements, differing from country to country, leading to the proliferation of protectionist devices in the guise of compensation for the fact that competitors not having comparable carbon pricing.

In the meantime, the integrity of Australian policy processes, of Australian and international mitigation and of the multilateral trading system all require the adoption of transitional assistance that compensates domestic producers for other countries not having comparable carbon pricing, rather than for the home country placing a price on emissions. Such an approach has large advantages for Australia acting alone. It has much larger advantages for Australia and for the world if it is adopted in many countries.

Box 14.5 The economics of trade-exposed, emissions-intensive industries and proposed assistance arrangements

Firms will seek to produce the level of goods or services that maximises their profits, although in the short term they might deviate from this objective in order to gain or maintain market share. Some factors of production will be relatively fixed in the short term—namely, the firm's fixed capital stock such as plant and machinery. Where these firms compete in global product markets they are assumed to be 'price-takers'. Each firm's level of production has no bearing on the world price of the relevant product.

These descriptions of a trade-exposed, emissions-intensive firm can be usefully represented graphically with an upward sloping (marginal) cost curve (C_0) and a flat price curve set at the world price (P_0) (Figure 14.5a). The firm's resultant profit maximising level of production is given by q_0.

The imposition of a carbon price increases production costs for all levels of production to the extent that firms employ emissions-intensive (direct and indirect) production processes. This shifts the cost curve to the left (C_1) but has no bearing on the world product price (which remains at P_0). In response, profit maximising firms will reduce their level of production to q_1.

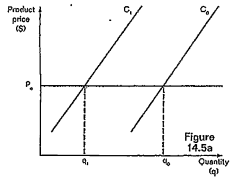

Figure 14.5a

Eventually, as more and more countries adopt a carbon pricing regime, the world price of the relevant commodity, good or service will increase to P_n and domestic firms would produce at a level q_n (Figure 14.5b). The overshooting problem is demonstrated graphically by the difference in production levels between q_n and q_1. That is, a domestic carbon price in the absence of similar schemes elsewhere will see production drop to q_1 only to increase eventually to q_n in the longer term.

Note: q_n may be greater, equal or less than q_1 depending on relative movements in domestic production costs (from C_0 to C_1) and the carbon-inclusive world product price (P_0 to P_n).

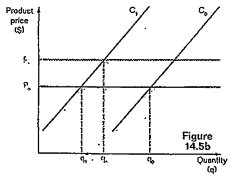

Figure 14.5b

Assistance for trade-exposed, emissions-intensive industries would most efficiently support the level of production that would be sustainable in the long run (q_n) rather than allowing production to overshoot (q_1) or trying to maintain an unsustainable status quo (q_0) (Figure 14.5c). Such assistance entails payments (or credits) to firms equal to the long-run price uplift ($P_n - P_0$) for each unit of production. This assistance has the effect of increasing production to Q_n. The total payment to the firm is shaded in orange in Figure 14.5c.

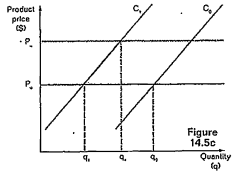

Figure 14.5c

If payments (or free permits) were to be made to compensate for higher input costs imposed by the emissions trading scheme due to a firm's direct and indirect emissions, the result would be an excess payment to the firm shown by the excess of the blue shaded area over the orange shaded area (Figure 14.5d). These excess payments would be supporting unsustainable levels of production at the expense of investment in R&D in new technologies or support for low-income households.

Moreover, input-based compensatory payments will typically reward inefficiency rather than promoting investment in new low-emissions production processes (Figure 14.5e), in which the effect of an emissions trading scheme on two firms in the same industry is shown. One firm has low emissions intensity and the other has high emissions intensity, represented by carbon inclusive cost curves C_L and C_H, respectively.

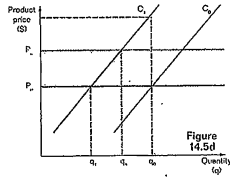

Figure 14.5d

Under an input-based compensatory payment, the high-emissions firm would be rewarded with greater payments (the area defined by AENV) than the low-emissions firm (AEMK). This is not the case under the mechanism outlined in section 14.5, which penalises high-emissions firms with lower payments (DEFG rather than BEFJ).

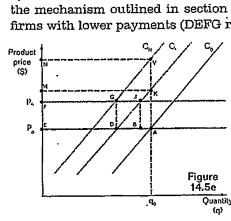

Figure 14.5e

This analysis also demonstrates that the mechanism proposed by the Review rewards investment in new low-emissions production processes, whereas an input-based approach penalises such investment. That is, a high-emissions firm investing in new capital to reduce its emissions intensity (moving from C_H to C_L) receives an additional payment under the proposed mechanism (represented by the area BDGJ). Under an input-based compensation scheme, the firm would be penalised with a loss of payments (KMNV) following the investment.

10. Attachment

Refer to Box 14.5, Chapter 14, *The Garnaut Climate Change Review*, Cambridge University Press, Melbourne, pp. 246–247. Online at http://www.garnautreview.org.au

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