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PERSPECTIVES

The 2006 Sir Leslie Melville Lecture

From National to International Climate Change Policy

Warwick J McKibbin

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The 2006 Sir Leslie Melville Lecture[1]

From national to international climate change policy

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Introduction

It is a great privilege to give the 2006 Sir Leslie Melville lecture. It is a lecture in the name of a great Australian who was a key architect of the Australia in which we live today. It is also a privilege to be invited to give this lecture because of the distinguished people who have delivered it in previous years.

I am very unfortunate to have never met Sir Leslie Melville, although my career has overlapped his in many ways – as I discovered in researching the substantial contributions made by Sir Leslie. His legacy can be found in many areas in which I currently work. Sir Leslie was a prolific writer as an academic but also served critical roles in the development of universities in Australia, both as an academic at the University of Adelaide and later as Vice Chancellor of the Australian National University. Sir Leslie worked in the Commonwealth Bank as Head of the Economics Department and eventually served on the Board of the Commonwealth Bank and later the Reserve Bank of Australia. I worked for 16 years on the staff of the Reserve Bank before joining the ANU as a Professor in 1993. I have recently begun my second term on the Board of the Reserve Bank and serve on a variety of government advisory Boards. It is important for academics to have this life as teachers and researchers, as well as contributing to public policy. This is certainly a tradition established by people such as Sir Leslie Melville. Whether universities will be capable of sustaining the quality of academics was the subject of Max Corden's Melville lecture in 2005.[2] Suffice to say, it is very difficult being an academic in an Australian University today and to contribute to public policy formulation.

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[1] This Sir Leslie Melville Lecture was presented at ANU on October 12, 2006. The author thanks Peter Wilcoxen and David Pearce for much helpful collaboration on the theme of this lecture.
[2] See Corden (2005).

Many aspects of Sir Leslie's life have been covered in earlier lectures particularly the first lecture by Ian Macfarlane.[3] One aspect that is relevant for the substance of my lecture is the contribution that Sir Leslie made to the design and establishment of new international institutions such as the IMF and World Bank for dealing with global macroeconomic interdependence. This was the subject of the Lecture by Ken Henry in 2004.[4] Sir Leslie was fully aware that well designed institutions are critical for delivering good policy outcomes.

Although there are many issues today very similar to those that Sir Leslie grappled with[5], some new issues that Australia currently faces are somewhat different to those on which Sir Leslie focused. His role in the Tariff Board was critical to the opening up of Australia, but the issue of tariffs and problems in the macro-economy[6] today has been overshadowed by a host of new problems which require new institutions and new policy approaches. One of these issues is how to deal with the problem of environmental degradation and in particular how to respond to the problem of climate change.

I will spend the remainder of this lecture stressing that climate change policy is a problem in policy-making under enormous uncertainty, the important role that price signals and local actions can play as a basis for global system, and conclude with an outline of what I consider to be the way forward on climate policy both in Australia and globally.

Much of this lecture is from joint work with Professor Peter Wilcoxen of the Maxwell School at Syracuse University through collaboration at the Brookings Institution. We have been colleagues since graduate school and have been working together on climate change issues for more than 15 years.

The climate change policy problem

Climate change policy is a classic case where international cooperation is essential. Climate change is partly caused by the concentration of carbon dioxide in the atmosphere from all sources. Thus to address this problem all major emitting countries will need to be involved in a solution. There are two important sources of carbon dioxide emissions – emissions from natural sources and emissions from human sources. The policy debate has had little to say

[3] See Macfarlane (2002).
[4] See the lecture by Ken Henry (2003).
[5] See Henry (2003) on international architecture and global imbalances and Garnaut (2004) on macro economic policy and commodity price booms.
[6] This topic is well covered in Ross Garnaut's Melville Lecture. See Garnaut (2004).

about the role of natural carbon emissions because the focus has been on reducing human emissions. However a comprehensive approach would not rule out reducing emissions from any source since both manmade and natural sources have the same impact on the climate.

Figure 1 shows the emission of carbon dioxide into the atmosphere from burning fossil fuels since 1750.[7] It is clear that there has been a dramatic change in human induced emissions especially since the Second World War. There is cause for concern that this cannot be sustainable and indeed needs serious attention under a wide range of interpretations of climate science.

The importance of natural climate variability can be seem in Figure 2 which shows the temperature record from the Vostok Ice Core samples for the period from four hundred and twenty five thousand years ago to the present expressed as a deviation from the average temperature in the twentieth century. This is what econometricians call a long run of data! This figure shows that historically the average temperature (from this one location) has varied from -9 degrees Celsius relative to today to +3 degrees Celsius. These large swings in temperature had profound impacts on the earth's ecosystems and life on the planet. The sources of the historical variability in climate are well understood and most of this variability is not related to human activity except for the past few thousand years.

It is important to note that it is not the amount of emissions in any year that matters for the climate but the concentrations in the atmosphere – the emissions over a long period of time that cumulate into concentrations. The atmosphere is like a bath with greenhouse emissions flowing from a tap. Reducing the flow of emissions by turning the tap does not empty the bath but only changes the rate at which it fills. The idea that a policy should target emissions in any given year independently of the cost of doing so rather than focusing on carbon concentrations and smoothing the cost of taking action over time is the key mistake that has stalled the process of formulating a robust policy to tackle climate change.

Dealing with uncertainty and policy design

Designing climate policy is very difficult for a number of reasons. First, there is already committed warming in the system from the long history of previous emissions, mostly by industrialised economies. Thus the response to climate change will require both mitigation to

[7] All figures are at the end of the text.

change future climate change and adaptation to respond to climate change that is not controllable by current policy. Second, climate policy is dominated by geographic reality – there is an enormous range of sources of emissions made by just about every person and corporation on the planet. Third, it is a policy that crosses many jurisdictions – international organisations, national, state and local governments. This makes formulating and coordinating a policy extremely difficult. Fourth, the time scales for climate policy are much longer than most other policy problems. Policies today may not affect the climate for more than five decades into the future. Finally, the uncertainties surrounding climate change are large, numerous and mostly intractable. The uncertainty compounds at each level – there is uncertainty about future emission levels; about how these impact on future carbon concentrations; about the timing and extent of temperature change and climate variability (and distribution across regions); about the impacts of these temperature changes and variability on ecological systems, and the extent of economic damages and economic benefits in different regions at different times. Critically there is the problem of how to formulate a policy to respond to the entire probability distribution of possible outcomes into the future where some events have low and uncertain probability but could be catastrophic.

What should be done given the uncertainty? Uncertainty is not a new concept. Techniques for understanding uncertainty and risk management are well developed. The approach to climate policy should be about managing risk especially taking into account the unusual nature of the risks associated with climate change. For example, some of the science suggests that there is the possibility of catastrophic outcomes from climate change. This fact needs to be taken into account when designing climate policy. It is also necessary to make sure that the cost of action does not exceed the expected benefit of taking action because there are many other problems that need to be urgently addressed in the world, for example poverty reduction and dealing with the large number of people inflicted by preventable diseases. Dealing with these problems also requires scarce resources which otherwise might be devoted to tackling climate change. The tradeoffs involved with addressing climate policy must take into account the opportunity cost of taking action.

The design of a robust and ‘sensible’ climate policy must deal with a range of issues such as: coverage; equity; politics; institutions; economic fundamentals; and flexibility.

a) Coverage

Coverage must be extensive. The policy regime needs to include the major current and future emitting countries but not necessarily all countries. All sectors of the economy need to be included, not just a particular sector. Both the supply side and demand side of energy use and other sources of carbon emissions needs to be addressed.

b) Equity

A climate policy will likely lead to winners and losers. It is important to deal with the distributional issues within countries and between countries in the regime design. However, how individual countries deal with their own issues is up to individual countries.

c) Politics

The regime needs to build constituencies across society that support the climate policy in their own financial self-interest. These constituencies include fossil fuel producers and fossil fuel-intensive industries who potentially face a reduced demand for their products; consumers facing higher energy prices; and politicians who may otherwise have an incentive to reject a policy in support of a narrow constituency.

d) Institutions

It is important to use existing institutions such as legal systems and financial markets rather than attempting to create a new global set of institutions. These global institutions would take decades to design and delay action further.

e) Fundamentals

There needs to be a portfolio of market-based measures and direct policy interventions. For a market-based policy to work there needs to be clear property rights over carbon emissions over a very long period. There need to be incentives to want to reduce emissions because emissions are a valuable asset. There need to be markets that enable individuals and corporations to manage climate risk rather than relying on government to be the sole managers of that risk. There need to be long term price signals consistent with a long term carbon goal that encourage the emergence, adoption and diffusion of existing and new technologies that enable emissions to be reduced wherever possible at low cost.

Both the demand side and the supply side of emissions need to be addressed. Climate policy is not just about technology, although, clearly, technology is a key part of the solution.

f) Flexibility

It is critical that the policy regime is flexible enough to adapt as new information on climate science, climate change and the extent and cost of emission reductions becomes available. Thus flexibility through time is essential. Also, the extent to which emissions are removed at each point in time should depend on relative costs over time and not be based on an absolute target in any given year. Recall that it is the cumulative emissions that matter and not emissions in any given year. The idea of targets with timetables, as embodied in the approach of the Kyoto Protocol, ignores this basic issue.

Flexibility across country participation is also critical. It is not sensible to have a system that collapses if a single country withdraws. The system must also be flexible enough to add

countries over time without debasing the value of carbon and flexible enough that the departure of a country does not undermine the integrity of the policies of the countries that remain in the system.

The role of prices in climate policy

The answer to reducing emissions at low cost and perhaps in very large quantities will involve a portfolio of policies that ultimately need to generate a technological change in the way energy is generated and used.

A core part of this portfolio should be an approach based on markets and incentives. This will be an essential part of the foundation. History provides better evidence than introspection on the role of price change in changing the underlying relationship between economic activity and energy use. Figures 3 and 4 show the paths of energy use, GDP and CO2 emissions from 1965 to 1990 for the United States and Japan expressed as an index of one in 1965.

It is clear that, before the 1970s, energy use and CO2 emissions grew more quickly than GDP in both the US and Japan. After the oil price shocks, the relationship changes dramatically. This demonstrates that a policy under which carbon is priced is likely to encourage a substantial degree of substitution within the demand and supply side of the global economy. The key to a sustainable policy is that the carbon price does not unnecessarily dampen economic activity at the same time as is encourages the degree of substitution necessary to reach the sort of targets pointed to by the scientific community as necessary to stabilise or reduce emissions.

Would Australia leading the world in policy design be costly?

In making the argument that Australia should move first on adopting a sensible climate policy, it is critical to understand what is currently happening globally. Other countries are already adopting policies that effectively put a price on carbon. The European permit trading system is an explicit price but there are other strategies, even in Australia, which are putting a price on carbon. The various schemes such as MRET[8] effectively put a price on carbon by imposing a cost on generators to add renewable energy to the grid, even though they would

[8] The MRET scheme requires the generation of 9,500 Gigawat hours of renewable energy by 2010 (roughly 2% of power).

otherwise choose not to. In this case it is a very imperfect approach because once the target is met there is no incentive for new investment in renewable energy sources.

It is often argued, especially by the proponents of R&D expenditure by government on new clean coal technologies, that there is no point in a market signal before technology is ready to bring to market. Such arguments are made by Montgomery and Smith (2006) for example. This argument is popular amongst groups who benefit either directly or indirectly from government subsidies. However, there are a number of arguments as to why subsidising R&D would only be partially necessary but not sufficient condition for the technological solution to emerge[9]. First I will deal with the arguments for a price signal and then with the arguments as to why it is not necessarily costly to move first in a sensible framework.

The earlier literature on early action to which we contributed using the G-Cubed model was in the context of the Kyoto Protocol. We found, in a study for the Australian Government in 2002[10], that the Kyoto Protocol was a costly approach for the Australian economy and moving first in that context meant the costs came more quickly, although even in that research there were some gains to early action, depending on the scenario being modeled. This argument has been variously re-interpreted incorrectly by various advocates of a Kyoto-style approach.

It has been unfortunate that the debate on whether Australia should take early action has been in the context of Kyoto-style policies. It is quite logical to reject Kyoto as a sensible way forward (which I do), but to advocate early action in the context of a completely different approach in which, if short term costs do rise too quickly relative to expected benefits, they are bounded directly within the policy design.

There are a number of reasons why Australia might gain from undertaking early action policies. The most important is the argument made above that the uncertainties on climate change and the uncertainties about climate policies mean that important investments, particularly in energy infrastructure, are not being undertaken. By creating markets for risk management of long term climate uncertainty there is a real wealth gain for the economy and an incentive for large-scale energy projects to move forward with substantial benefits.

Second, in a forthcoming paper, David Pearce and I show, using the G-Cubed model, that the anticipated changes in carbon prices give a clear signal for investment rates to change, which in the short run can lead to a macroeconomic stimulus to the economy. This effect was also

[9] This is also addressed in Pezzy Jotzo and Quiggin (2006).
[10] See McKibbin (2002).

present in some of the results of the 2002 study on Kyoto. Models such as G-Cubed, that incorporate investment decisions based on expected future returns to capital, can lead to a beneficial anticipatory effect of credible policy announcements. Most models do not have this important channel.

Third, David Pearce and I show that in a world without discounting, if the marginal abatement costs are equal in all periods then it is optimal to undertake equal abatement in each period. Postponing abatement in this world means that costs in the future will rise and the present value of costs for the same amount of abatement will be higher. What might change this argument? With discounting, it will pay to push abatement relatively into the future, but that does not imply that no abatement today will be optimal. If there is declining marginal cost of abatement over time because of new technologies (a common argument of the technology option advocates), this tilts the abatement into higher future abatement but not necessarily no current abatement. It is also not clear that future abatement will be cheaper than current abatement – indeed you could argue that marginal costs of abatement will rise over time for a variety of reasons.

It is not necessarily the case that new technologies – particularly if they are developed independently of a carbon price signal – will lower the *marginal* cost of abatement. New technologies are designed to solve technical problems of various kinds, only some of which are related to carbon. New cost-saving technologies may be adopted regardless of their carbon characteristics in response to pricing signals that already exist.

Also, new technologies – particularly energy cost-saving technologies – have two distinct effects: a substitution effect and an expansion effect. The *substitution* effect leads to a substitution away from energy inputs. This generates an increase in real income, which may result in an *expansion* effect involving the increased total use of energy, depending on how marginal increases in wealth are spent. Despite the technical change, the baseline emissions path may increase which – depending on the industries involved – may lead to an increase in the marginal cost of abatement. This effect is avoided however, where the expansion effect is modified by a clear price of carbon.

In the absence of an appropriate price signal, new capital that is carbon-intensive may be put in place in sectors not targeted by government policy on R&D. This capital is put in place according to normal capital turnover dynamics in a variety of industries. With no carbon price signal, there is no particular incentive for this new capital to be less carbon-intensive than the original capital stock. Given, however, that there are costs of adjustment in installing and

replacing new capital, the new capital spending will tend to increase the marginal cost of abatement.

A final case for early action is the argument that reducing uncertainty by establishing clear long term carbon markets, both to provide a long term carbon price signal and to enable the risk of long term energy investments to be managed, is capable of reducing the cost of capital. As long as any short term carbon price is kept low, it is possible that the gain from lower capital costs can more than offset the cost for fossil fuel-intensive industries of higher short term carbon prices. Thus a well designed set of long term and short term carbon markets can indeed strengthen the case for early action in Australia.

The McKibbin Wilcoxen Blueprint – a hybrid approach

In a number of papers, McKibbin and Wilcoxen (1997, 2002) argue that the approach which best addresses the many facets of the climate change policy problem outlined above is an approach that combines the best features of a tax (i.e. to guarantee short run cost certainty) with the best features of permit trading (i.e. to set a long term emission target and find the least costly way of achieving it). This is called a hybrid approach and in McKibbin and Wilcoxen (2002) it is also called The Blueprint for climate policy.

The approach in principle is quite straightforward. Rather than set a relatively short term target for emissions with a timetable of when these emissions will be met (such as in conventional permit trading approaches), The McKibbin-Wilcoxen Blueprint sets a long term target for emissions over the next hundred years. This target profile is used to create long term carbon emission permits that give rise to an emission permit (or a fraction of a permit if the profile is one of declining emissions over time) each year. These long term permits are fixed in quantity and tradeable in a market which determines a long term carbon price as well as the expected price of carbon at each year into the distant future. The second component of the policy is to allow the federal government to issue as many annual permits in the current year to prevent the annual carbon price from rising above a trigger price. This short term cap on the price of permits is set for a decade at a time.

Over time, as information is revealed on all aspects of climate change and the costs and benefits of abatement, the annual economic cost, which is under complete control of the government, can be varied to approximate expected benefits. The long term permit price guides research and investment decisions on ways of reducing carbon emissions, whether

through alternative energy generation technologies or carbon capture and storage technologies. Any annual permits which the government sells to cap the short run price can be used either to support R&D in carbon abatement or in adaptation technologies. This money could also be put aside in order to buy long term permits in the future if it was deemed that the policy profile needed to be tightened. A loosening of the emissions reduction profile is not necessary because the cap price enables the government to do this if required over time.

This approach gives flexibility in the sense that no international permit trading is required to create an efficient outcome, because the annual carbon price is set by government and would ideally be the same across countries (i.e. efficiency is achieved without trading). National institutions are at the core of the policy. The defection of any one country from the policy does not affect the carbon price in other countries. In addition, countries can enter the international agreement by adopting this policy. This accession has no effect on the carbon prices in other countries. The approach is one of domestic actions and institutions but coordinated globally to build up a global system.

The approach is very similar in many ways to the way that modern monetary policy is implemented in advanced economies. The long term bond rate (long term permit) is the outcome of demand running up against a fixed supply of long term government bonds. The short term interest rate (carbon price) is set by the government by supplying as much liquidity as demanded in the short term money market to generate a fixed interest rate. The long term bond rate is the expected future value of future short term interest rates. So it is with the long term permit price.

A critical aspect of the policy is how the initial allocation of the long term permits is implemented. This should be done to trade off the need to compensate losers from the policy with the need to have constituencies with a strong financial interest in the policy surviving over many decades. It should be done in such a way that future decisions are independent of past output decisions – that is, a once off allocation independent of future emissions decisions. The initial allocation would ideally go to all households as well as all corporations. Industries that are likely to be most affected should receive the largest allocation. This grandfathering of previous decision means that all new decisions involving carbon will be treated equally by existing and new emitters.

The ability of such a system to change the behaviour of all emitters, either through price incentives or the motive of making profits from freeing up previously allocated permits that can be done at low cost, deals directly with the issue of geography .

Countries are not giving up national sovereignty because they each implement the system within their own borders using domestic institutions. For major developing economies, institutional development will be needed but this is needed to enhance the overall development agenda anyway.

This approach deals with each one of the major features that I have argued above needs to be taken into account in designing a global system of coordinated national schemes.

Figures 5 and 6 show an illustrative example of a short term permit market and a long term permit market for the same system in Australia and China. The scenario depicted is one in which prices are expected to rise over time. In figure 5 the annual permit price in Australia is determined at the cap each year, whereas in China a much larger initial allocation of long term permits means that the annual permit price in China takes time before it rises to the price in Australia. This is an economically inefficient outcome in the short term but represents a tradeoff with equity and the need for China to commit over the medium to long term. The long term permit market prices the commitment to the policy in both countries. Thus we have effectively separated the resistance to paying substantial short term economic costs from the need to provide clear long term incentives to innovate in carbon abatement especially in China.

In summary, Australia could adopt this approach before any other countries, with the knowledge that a low short term permit price can be imposed until other countries are also taking effective action but with the long term permit market guiding long term investment decisions. In particular, industry would be able to use the long term market to hedge investment decisions and thus help minimise the riskiness of long term capital investments related to energy generation and energy use. If chosen thoughtfully, the balancing of these two opposing costs and benefits could bring an aggregate macroeconomic benefit to Australia.

Conclusion

Just as the design of the international monetary system and the development of institutions to deal with economic independence were critical in Sir Leslie's world of the 1950s, the current state of deliberations over an international architecture for dealing with global environmental problems needs attention. At the global level, the world has stalled on effective climate policy with a well intentioned, but ultimately faulty Kyoto Protocol, designed by political

compromise rather than as a real plan. Greenhouse gas emissions continue to rise globally, and now desperate governments and concerned citizens are advocating and creating inefficient and counterproductive systems to try and tackle a problem that ultimately needs a large dose of international and national cooperation which overrides jurisdictional rivalries.

There is a way forward based on existing domestic legal, accounting and economic institutions that, combined with international cooperation, could move the world forward from the current stalemate with global climate change policy. The Australian government needs to take leadership of this effort, just as it did in the formation of the international monetary system under the intellectual leadership of people like Sir Leslie Melville. The problems may have changed since Sir Leslie's day but the focus on well designed systems with strong institutions has not changed. It is not just the need for Australia to take action but the need for Australia to demonstrate to the world how to take action on climate change policy that balances effective action with a realisation that costs must be contained in the short run. This is currently the biggest contribution Australia can make to what could be the major policy issue of our generation.

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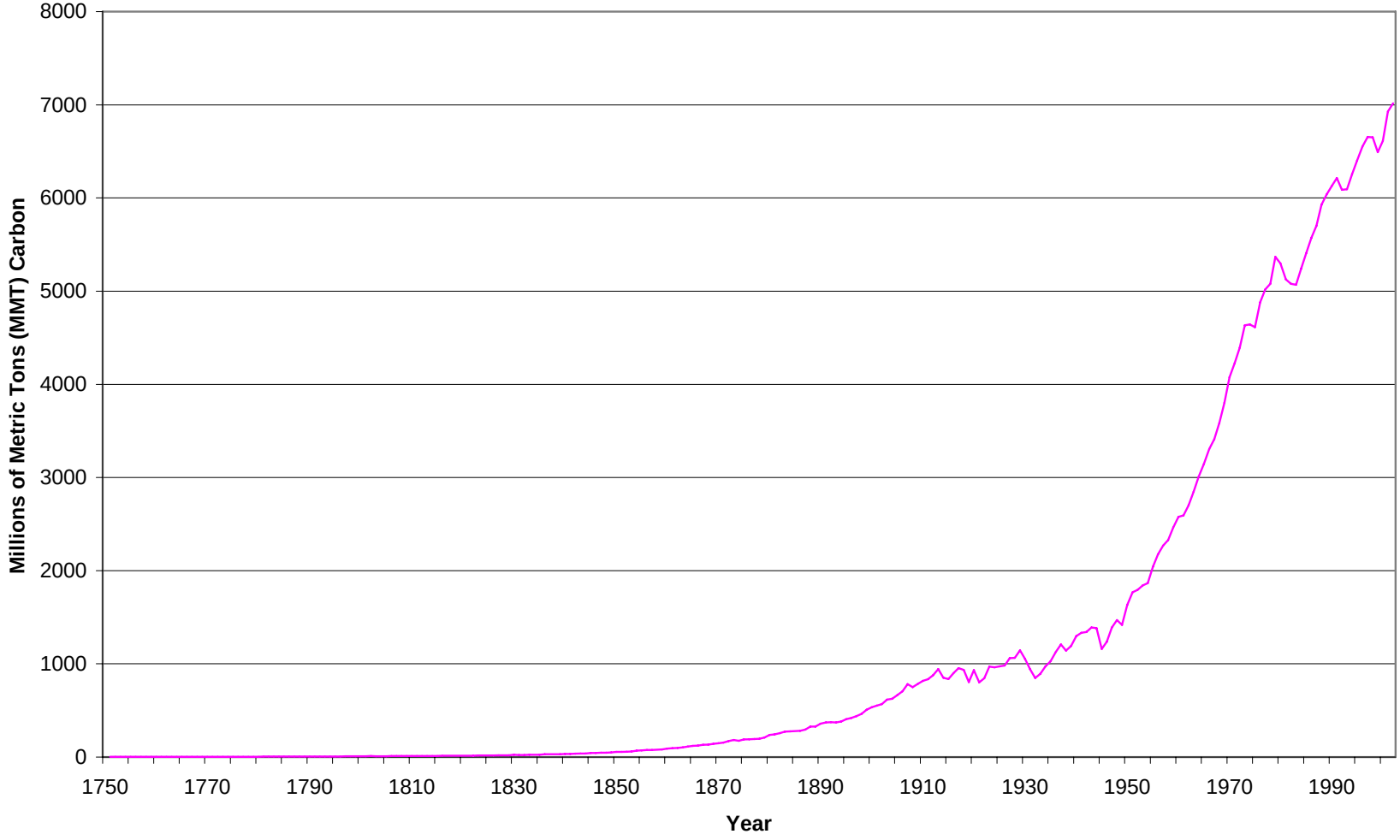
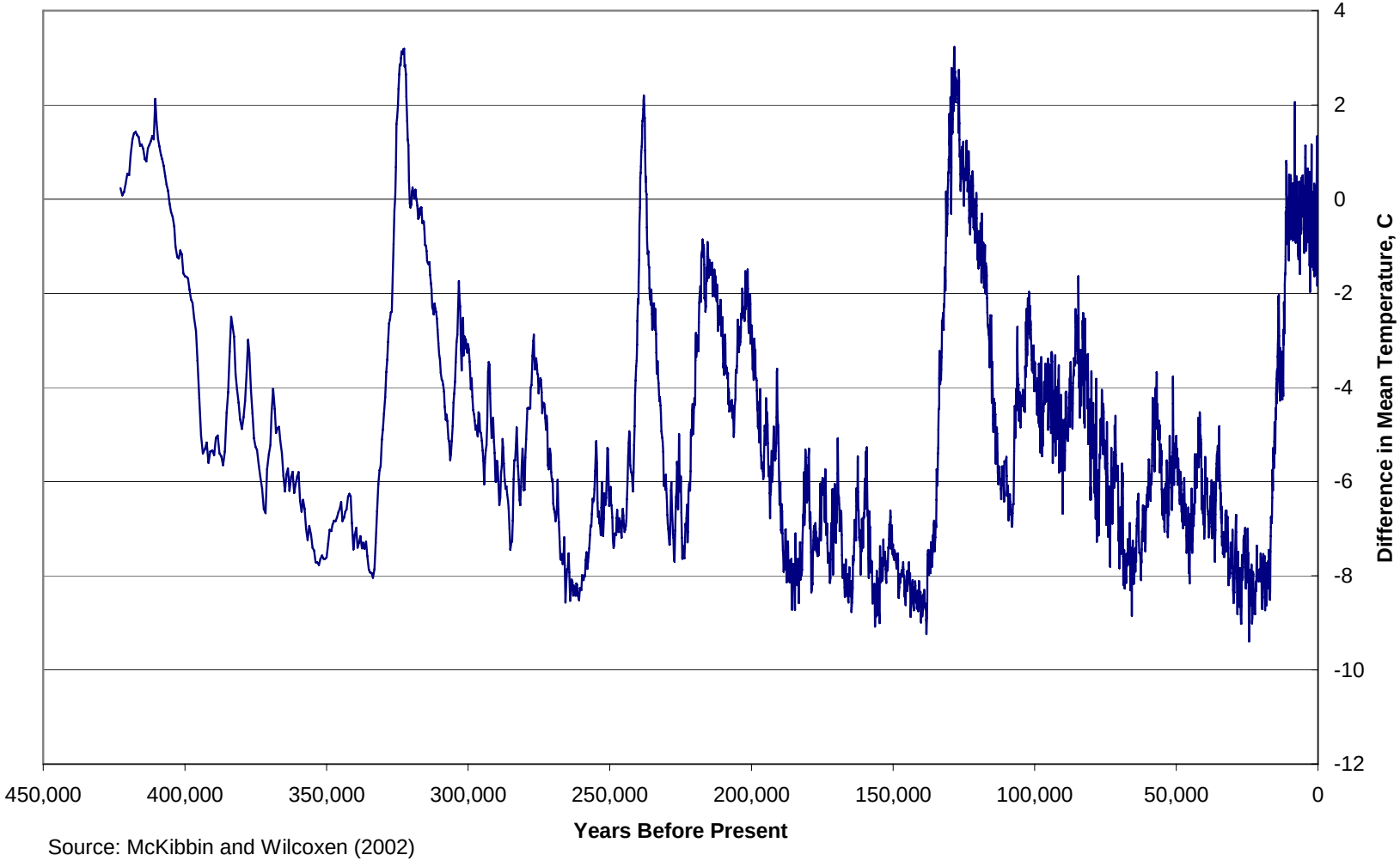
Figure 1: Global Carbon Dioxide Emissions from Fossil Fuels, 1751-2002



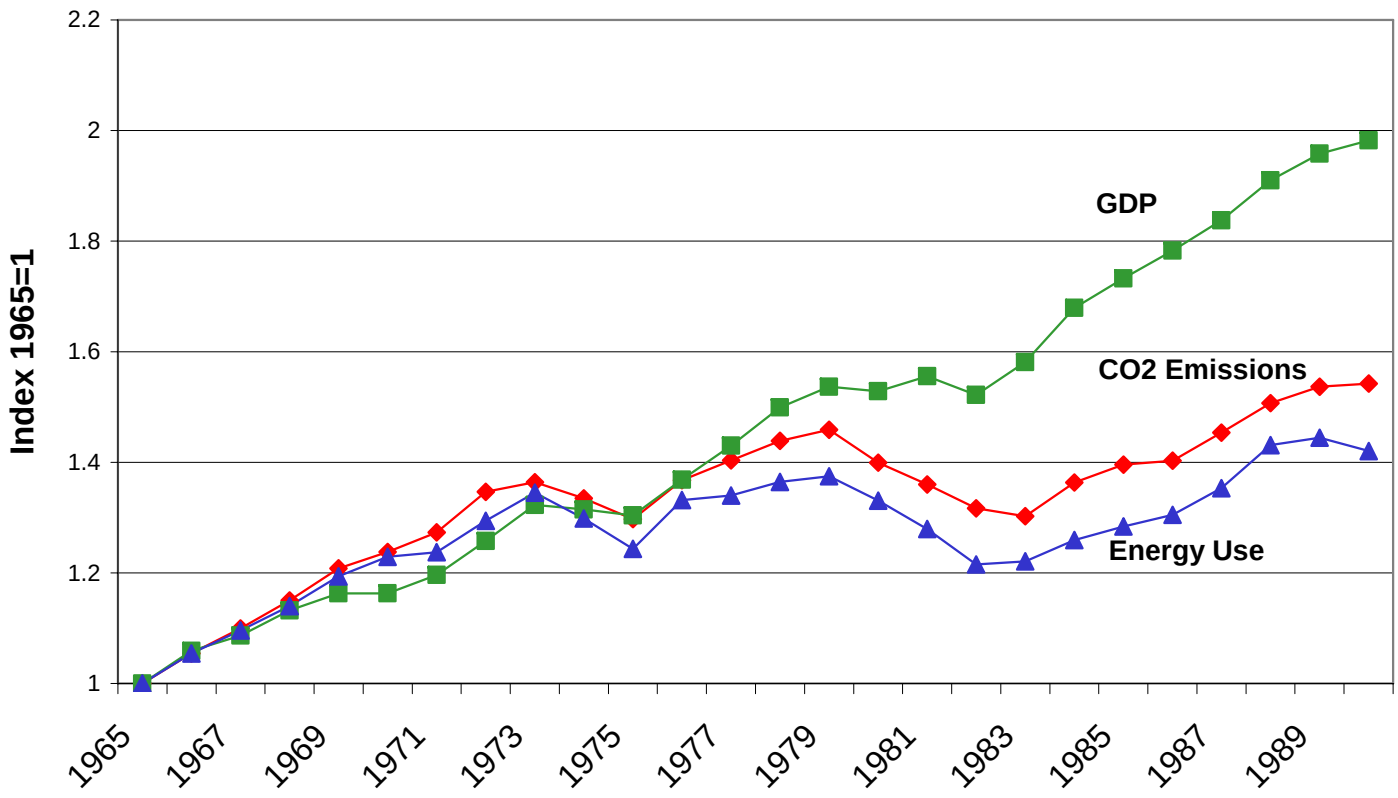
Source: McKibbin and Wilcoxen (2002)

Figure 2: Global Temperature Record, Vostok Ice Core Data



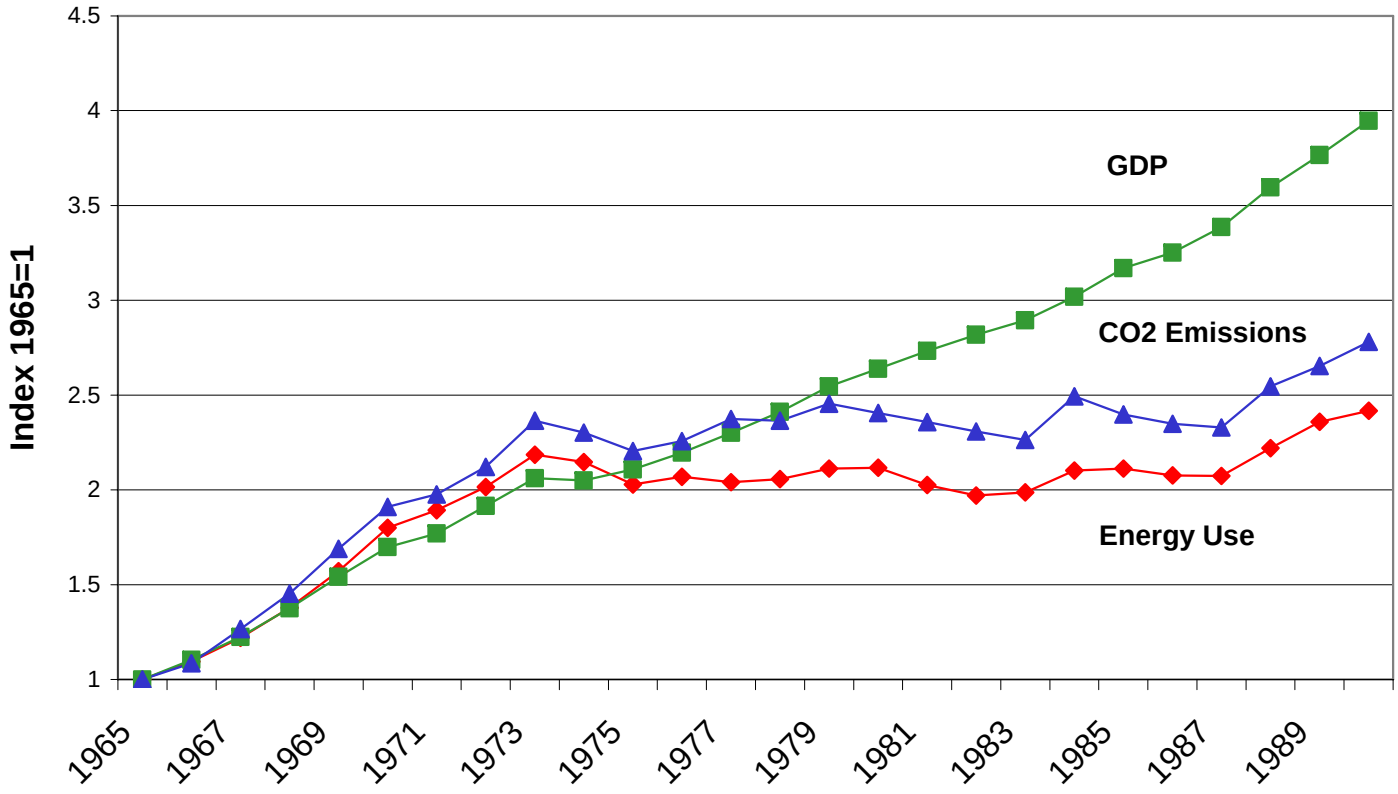
Source: McKibbin and Wilcoxen (2002)

Figure 3: GDP, Energy Use, CO2 Emissions
USA



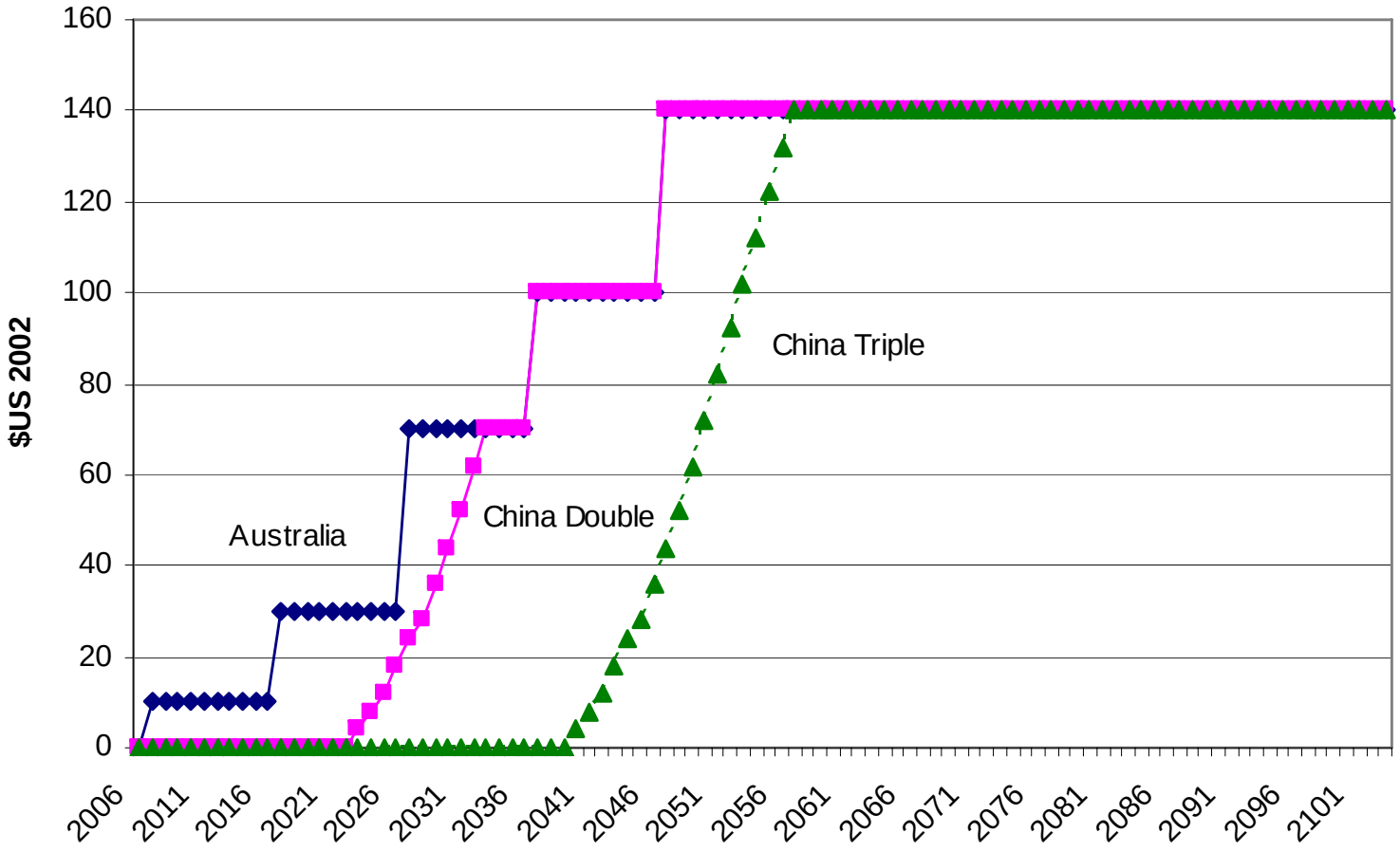
Source: Bagnoli, McKibbin and Wilcoxen (1996)

Figure 4: GDP, Energy Use, CO2 Emissions
Japan



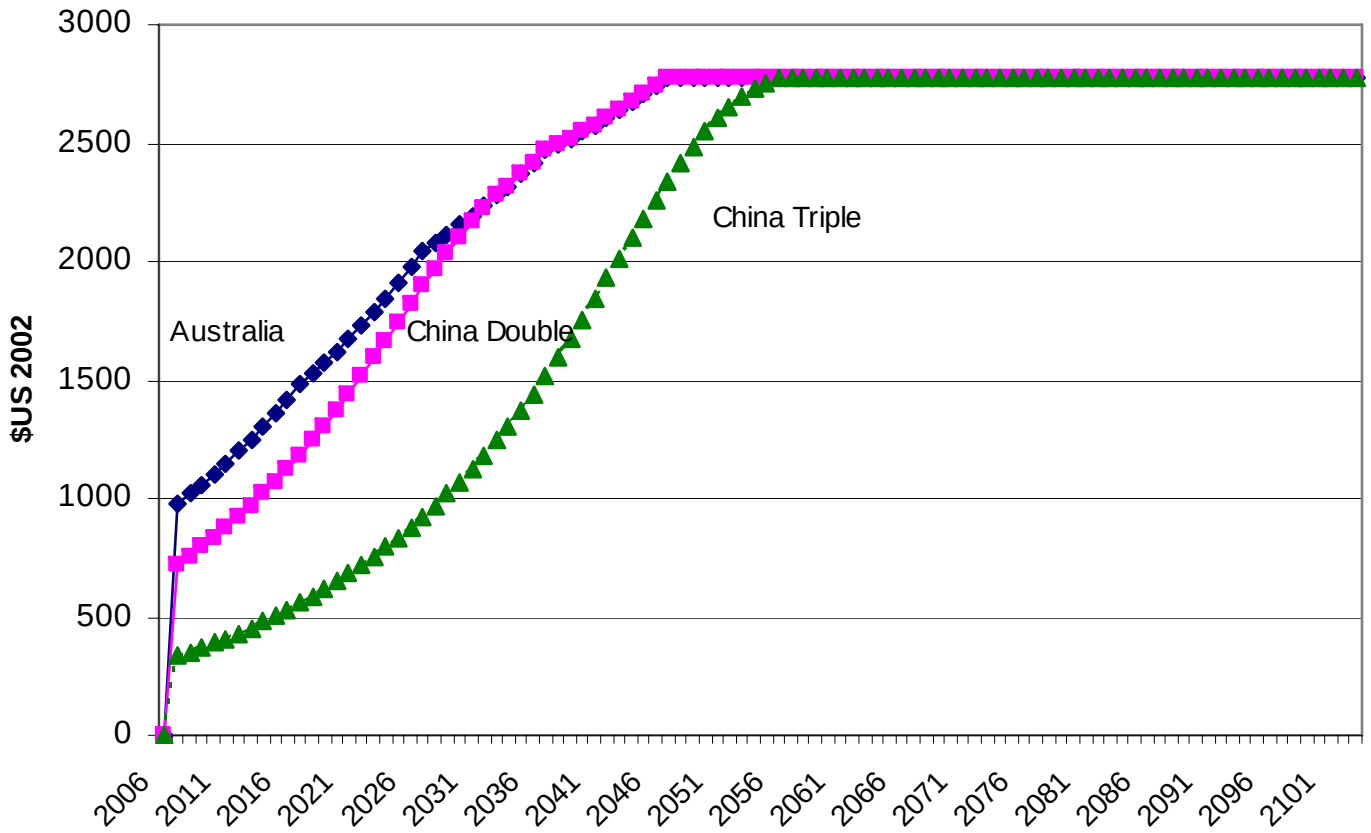
Source: Bagnoli, McKibbin and Wilcoxen (1996)

Figure 5: Annual Permit Price



Source: Author's Calculations

Figure 6: Value of Long Term Permits (r=5%)



Source: Author's Calculations

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