Climate Change and Trade Relations Between Australia and Japan

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Abstract International momentum is building for action on to address climate change. In view of the likelihood of binding carbon constraints on developed nations, efficient interaction based on comparative advantage between economies via market mechanisms is considered essential for least-cost greenhouse gas abatement. Recent research has indicated that the major medium-term impacts of global and domestic carbon abatement policies on the Australian economy will be through changes in international trade flows. However, there has been little investigation of structural changes in trade relationships with major trading partners. Trade effects will, to a large extent, depend on the interaction of domestic carbon abatement policies through bilateral and multilateral mechanisms. This paper surveys a number of issues effecting trade relations between Australia and Japan which have implications for forecasting changes in international trade flows.

Keywords: *Climate change policy, emissions trading, Kyoto Protocol, market mechanisms.*

1. INTRODUCTION

Recent research has indicated that the major impact of global and domestic carbon abatement policies on the Australian economy between 2002 and 2010 will be through changes in international trade flows, particularly changes in carbon intensive commodity exports (McKibbin, 2002). Trade effects will, to a large extent, depend on domestic carbon abatement measures, marginal abatement costs, comparative advantage in emission reduction, interaction through bilateral and multilateral mechanisms, and subsequent change in industrial structure. This paper proposes that a key issue to be examined is the potential changes in industrial structure within major trading partners and trade competitors. There has been little formal modelling conducted on the likely changes in trade relationships between Australia and major trading partners. This paper considers some of the economic forces that may effect international trade, particularly the export of goods from Australia to Japan, as a result of international concerns over global warming manifest as domestic climate change policy.

2. THE INTERNATIONAL CONTEXT

Anthropogenic climate change is seen as a major global issue effecting economic, social and environmental systems. International efforts to constrain carbon emissions centre around the United Nations Framework Convention on Climate Change (UNFCCC). One hundred and eighty six nations are now parties to the UNFCCC. The UNFCCC entails an obligation on its parties to take action to reduce their emission of greenhouse gases. The Kyoto Protocol, adopted by the UNFCCC in 1997, sets binding emissions targets for Annex I (developed) countries, relative to their 1990 emission levels, for the first commitment period defined to be 2008 to 2012. Under the Protocol, three market-based flexibility mechanisms are allowed. The Clean Development Mechanism (CDM) provides for emissions mitigation projects in non-Annex I countries yielding tradeable emissions credits. Joint Implementation (JI) allows mitigation projects to be conducted between two Annex I countries. International Emissions Trading (ET) allows national governments and entities such as companies to trade in emissions permits and credits. A fourth mechanism refers to the ability to aggregate nations' emissions targets into a bubble, as has been implemented by the European Union.

For the Protocol to enter into force, it must be ratified by the parliaments of at least 55 nations representing at least 55% of Annex I emissions. Currently 106 Parties (31 Annex I and 75 non-Annex I) have ratified the Protocol, representing 43.9% of Annex I emissions. It is widely expected that the Russian Federation will ratify the Protocol, at which stage the multilateral agreement will enter into force, and become binding on those nations that have ratified the agreement. On 4 June 2002, the Japanese Diet ratified the Kyoto Protocol, following closely behind the European Union. Presuming the Protocol enters into force, Japan has agreed to a 6% reduction on 1990 levels in greenhouse gas emissions within the first commitment period. Japan emits around 8.5% of total developed country emissions.

The governments of two Annex I nations, the United States of America and Australia, have indicated that they are not currently prepared to ratify the protocol. The Australian Government has indicated that it is not prepared to ratify the Protocol "unless and until it can be shown to be in our national interest to do so", nevertheless, the Government has committed to meet

Australia's target under the Protocol of 108% of 1990 emissions over the first commitment period (Kemp and Downer, 2002). The Government's argument that Australia should not ratify the protocol is based on four fundamental points (i) the Protocol will only reduce global emissions by about 1% which is insufficient to mitigate the effects of climate change; (ii) developing countries and the USA are not participating in emissions reductions under the Protocol, and these countries currently account for the majority of the world's greenhouse gas emissions; (iii) any constraint on emissions that is not shared by Australia's trade competitors could result in a competitive advantage to those countries, and the relocation of energy intensive industries offshore with no benefit, and possibly to the detriment of, global greenhouse emissions reductions; and (iv) ratification and acceptance of the Protocol as it currently stands within the first commitment period may obligate Australia to a far more onerous target in the second commitment period (2012 to 2016) with no guarantee of developing country commitments to reducing emissions.

3. DOMESTIC EMISSIONS POLICIES

Neither Australia nor Japan has implemented substantial or comprehensive national emissions policies using broad-based economic instruments, such as an emissions taxation or emissions trading system, in order to reach their respective Kyoto targets. Although a number of emissions trading pilots have been conducted in Japan, and government has proposed and environment tax based on carbon, there has been no serious attempt to develop economic instruments to control carbon emissions (Fujime 2003).

The Japanese government has indicated its intention to utilise the Kyoto Protocol flexibility mechanisms, and domestic land use, land use change and forestry (LULUCF) provisions under the Protocol. In March 2002, the government of Japan issued the New Climate Change Programme, which sets out specific policies and measures necessary for the achievement of Japan's 6% emissions reduction commitments under the Kyoto Protocol. The programme comprises of more than one hundred policies and measures based on four fundamental principles: (i) a balance between environmental and economic priorities, (ii) a step-by-step approach, (iii) shared responsibility, and (iv) international co-operation in efforts to deal with climate change. A breakdown of greenhouse emission reduction efforts relative to the 6% target was also announced. While the emissions of HFCs, PFCs, and SF6 are expected to increase by 2%, the reduction in other greenhouse gases using domestic measures, the absorption by sinks, and the utilisation of the Kyoto mechanisms is intended to contribute to 2.5%, 3.9%, and 1.6% of the target, respectively. Domestic measures outlined include the promotion of energy efficiency, renewable and nuclear sources of energy, fuel substitution, green purchasing and recycling. A staged or stepwise process will be employed in implementing abatement policies, and a commitment that no new measures will be implemented before 2005 has been made. Modification, albeit small, of the current fuel tax regime towards reflecting carbon content has begun. Fujime (2003) observes that achieving the Kyoto target will be both extremely difficult and costly under the government's "Guidelines for Measures to Prevent Global Warming", which aims to meet the target primarily by domestic measures.

Several limited measures and programs have been introduced by the Australian Government and some state governments to reduce carbon emissions, particularly in the stationary energy sector, the country's largest source of greenhouse gas emissions. On a national level, these include the National Greenhouse Strategy, the Mandatory Renewable Energy Target, industry development programs in renewable energy, and energy efficiency and performance standards. State governments have been proactive in developing strategies to deal with greenhouse. The New South Wales Government has introduced a greenhouse benchmarks scheme which imposes an emissions intensity requirement on electricity retailers, and allows the trade in emissions offset instruments. A target for electricity generation using gas has been introduced in Queensland.

However, no economy-wide policies using economic instruments to facilitate the Government's commitment to the Kyoto target have been developed or implemented. In such a national policy vacuum, the plethora of limited and sectoral schemes that have emerged have been criticised as creating uncertainty, and in some circumstances competing with each other (COAG 2002). The most significant and recent policy development, the COAG Energy Market Review (2002), has recommended the implementation of a broad-based emissions trading system as the most allocatively efficient means by which Australia can constrain carbon emissions. A consequence of the Australian government's position on ratification of the Protocol is that, if the Protocol enters into force, the government will not have access to the Kyoto flexibility mechanisms, and neither can it authorise Australian firms to participate in the flexibility mechanisms. Australian entities are likely to be prevented from trading in Assigned Amount Units (national emissions permits), participating in JI projects. Non-ratification is also a significant, if not complete, barrier to Australian entities engaging in CDM activities. This is a serious impediment to international interaction on climate change under the multilateral framework.

4. TRADE AND EMISSIONS CONSTRAINT

4.1 Trade with Japan

The importance of considering the effects of greenhouse policies on the structure of Japanese

industry is apparent when Australian exports to Japan are considered. Japan has long been Australia's largest single market for exports, comprising around 20% of total exports in 2001-02, almost twice the share of the second largest market. Exports to Japan have been growing at an average of 4% per anum since 1991-92 (see Figure 1). Although exports fell 3% to AUD 22.6 billion in 2001-02, this followed a large increase of 25% in 2000-01. Table 1 shows the principal Australian exports to Japan in 2001-02. The top four export goods are either carbon intensive fuels or products related to energy intensive industries.

Figure 1. Australian Exports to Japan 1991-92 to 2001-02

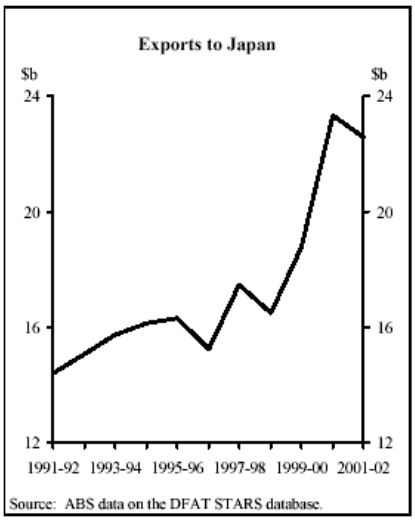

Table 1: Principal Australian Exports to Japan 2000-01 and 2001-02

Good	00-01 AUD million	01-02 AUD million	Percent Change
Non-coking coal	2,437	3,034	3%
Iron ore and concentrates	2,125	2,177	2%
Coking coal	1,453	1,518	4%
Aluminium	1884	1,448	-23%
Total Exports	23,495	22,827	-3%

Department of Foreign Affairs and Trade, 2002.

Traditionally, the trade relationship between Australia and Japan has been based on comparative advantage in producing raw materials in Australia's case, and manufacturing in Japan's case. However, de Brouwer and Warren (2001) note that with the emergence of the "knowledge economy", a set of new complementarities have arisen based on human capital, information and communication technologies. Little research has been conducted on the impact of the knowledge economy on the level of greenhouse gas emissions in Australia or Japan. Hawkes (2003) examines trends in emissions intensity in the manufacturing and construction industries in order to identify influences of the emerging knowledge economy.

4.2 Overview of Trade and Kyoto Impacts

Several macroeconomic and microeconomic modelling studies by practitioners and academics have analysed impacts on the Australian economy due to the introduction of greenhouse gas abatement policies. These are generally linked to the potential ratification of the Kyoto Protocol by Australia. A number of studies are framed in terms of ratification of the Protocol against complete non-participation in a carbon constraint regime. Business-as-usual policy scenarios are compared against participation and non-participation in the Kyoto protocol, with and without the flexibility mechanisms. Many analyses were conducted prior to important international developments in climate change that occurred at COP 8 (see for example Brown et al. (1999), Tupule et al. (1999), and McKibbin et al. (1999)). ACIL Tasman (2003) conducts a meta-analysis of eight recent studies. In general, these studies suggest substantial economic costs would be associated with meeting Australia's GHG emissions target under the Protocol, particularly in regional areas. The models imply that emissions intensive sectors of the economy would suffer the greatest costs. Trade effect are important in determining the impacts on the Australian economy given the emissions and energy intensive nature of exports (ACIL Tasman, 2003). Consequently high among the concerns of industry are issues related to international competitiveness and carbon leakage. Global models predict that domestic and international carbon abatement policies will lead to a decline in highly carbon intensive fossil fuel production and exports, most importantly coal. Exports of low carbon intensity fossil fuels such as Liquefied Natural Gas (LNG) may increase.

Impacts on the Australian economy are typically evaluated using various computable general equilibrium (CGE) model specifications. CGE models provide a number of useful insights into the inter-sector and inter-industry effects of carbon emissions abatement policies. The models involve a vast number of important assumptions regarding the structure of the macroeconomy, the adjustment process to carbon constraints, technical change, the nature of domestic abatement policy and international trade linkages. Typically, this class of models does not reflect substantial structural change or the emergence of new industries well. CGE models may be argued to be un-suited to analysing the profound structural change that might result from carbon abatement policies. The dynamics of carbon-intensive industry response to carbon constraints are not well understood, and there is little data available with which to analyse this issue. Frequently within CGE modelling scenarios, carbon constraints impact as purely an increase in the costs of production for most industries. Assumptions on change in the trade exposed sectors of foreign economies are often

historical, static and simplistic. Representation of technological change can also be problematic. The G-Cubed multi-country model used in McKibbin (2002) assumes the pattern of technical change at the sector level is similar to that of the historical record of the United States. In regions other than the United States, the sector level rates of technical change are scaled up or down in order to match the region's observed average rate of aggregate productivity growth over the past two decades. In an attempt to model the effects of industrial structural change, Islam (2003) employs an adaptive model of endogenous technological progress. An important issue raised is the possibility of changes in industrial structure that result in low carbon development paths, particularly for less developed nations.

CGE modelling is frequently controversial in regard to the assumptions on which policy scenarios are based. For example, the choice of market-based tradeable permit instruments requires assumption on numerous market parameters including permit allocation methods. Alternatively, optimal levels of carbon taxation or other supplementary abatement policies must be included. Furthermore, marginal abatement costs in many industries are difficult to estimate. Even with careful attention to such issues, the response of the trade exposed energy and emissions intensive sectors of industry, within both the domestic and international economies, is difficult to forecast. A recent study of modelling in the United States is illustrative. Krause et al. (2002) review five major assessments of the impacts of the Kyoto Protocol for the USA. They find that each modelling exercise omits at least one of four cost-reducing policy options. These policy options are identified as a national cap and permit trading system, productivity enhancing market reforms and technology programs, recycling of permit auction revenues into economically advantageous tax reductions, and international emissions trading. Krause et al. (2002) show that including each of the four policy options in an optimal manner leads to productivity, output and welfare gains. However, the authors acknowledge that the impact of greenhouse abatement policies on output and employment in energy intensive industries, that is those where the most profound structural change is expected, remains unanswered.

5. ISSUES AND IMPLICATIONS

A number of issues arising from climate change policy and their implications for trade relations between Australia and Japan are considered below.

5.1 International Flexibility Mechanisms

Emissions reductions efforts are expected to have a particularly acute effect on the Japanese economy given its high level of energy efficiency. Greenhouse emissions in 2000 as reported to the UNFCCC were 1.386 billions tonnes of carbon dioxide equivalent, representing a 7.9% increase over 1990 levels (Kudo, 2003). Energy sector emissions alone are approximately 10% above 1990 levels, and realistically can be expected to be in excess of 20% by 2010. Efforts to revitalise the domestic economy are likely to exacerbate the problem. Industrial emissions have not risen markedly since 1990 under the Keidanren's Voluntary Action Plan. However, it is clear that this is due to the prolonged recession leading to depressed levels of industrial output. As marginal abatement costs are high within the domestic economy, the Kyoto flexibility mechanisms are essential for internationally competitive abatement. International emissions permit trade and investment in CDM and JI projects will result in large capital outflows. Furthermore, government is moving to subsidise feasibility studies for CDM projects. Mitigation project investment will focus on low emissions or energy efficient technologies, and thus influence the nature of technology exports and transfers, primarily to non-Annex I countries. Given the expected focus on the Kyoto mechanisms, Japan's climate change policy will have a substantial effect on the profile of its foreign direct investment flows. This phenomenon may influence trade flows.

5.2 Translocation of Japanese Industry

There is a substantial literature examining the relationship between trade and environmental regulation (see for example Antweiler et al. 2001, Cole and Elliott 2003). The pollution haven hypothesis refers to the phenomenon of dirty industries relocating to areas with relatively less stringent or costly regulation. Frequently this is simply industries the developed world becoming displaced from the world market by similar industries in the developing countries. Carbon constraints, or expectations of potential carbon liability and associated risks and costs may lead to translocation of manufacturing industry. Alternatively, upstream and energy or emissions intensive sectors of Japanese industry may shift to lower cost emissions jurisdictions, or countries without commitments under the Protocol. This is particularly relevant for energy intensive industries in Japan compete with producers in South East Asia. Industry participants in Japan cite translocation as occurring due to expected greenhouse liabilities combined with other factors such as energy and labour prices. Industries considered as being most susceptible to the effects of carbon constraint policy, both directly and through increased energy costs, include aluminium smelting, steel production, cement making, and chemicals.

Industrial translocation implies potential change in export markets for Australian firms. Export flows may change in destination, quantity or value. Translocation may alternatively involve an international shift in just part of production, typically an upstream energy or emissions intensive process. As a result, additional upstream processing of raw materials and mineral commodities may be sited in Australia, conditional upon a comparative advantage

in carbon abatement. Clearly, this will increase emissions within the Australian National Greenhouse Gas Inventory, and possibly drive up domestic abatement costs. Thus, there are likely to be equilibrium effects where Australian abatement levels approach those of the international market based on Kyoto mechanism instruments, albeit possibly without Australian Kyoto participation.

5.3 Energy Markets and Deregulation

Relying completely on imported fuels, energy security and diversity concerns have driven Japanese energy policy since the first oil crisis of 1973. Policy has been effective in the substitution of fuels away from oil to other fossil fuels such as coal and gas, and to nuclear energy. The efficiency of energy use has also be an important focus of policy. Legislation pertaining to "the reasonable use of energy" has forced increased energy efficiency in numerous sectors. There is now little leeway for low cost domestic energy efficiency abatement actions. This is in stark contrast with the economies of other developed nations such as the USA and Australia, that are, on average, far less energy efficient.

Commitments to carbon constraint form a secondary, albeit important and new, influence on Japanese energy policy. Climate change motivated changes in energy policy must, however, be interpreted in the context of a number of other changes in Japanese energy markets, principally the deregulation of electricity and gas markets. Such liberalisation, contestability in retail, and competition across electricity and gas sectors is expected to significantly change the structure of domestic energy markets. Substantial electricity price reductions have already occurred, however, as is common experience internationally, greenhouse emissions from electricity generation have increased. Furthermore, electricity demand is forecast to continue rising over the Kyoto commitment period. As an important market for Australian thermal coal and LNG, change in the structure of Japan's domestic electricity and gas markets is likely to have important implications for trade in these energy commodities.

The energy taxation base is being transformed from an energy content to a carbon content based system. This will both provide a disincentive against relatively carbon intensive fuels, and a source of revenue linked to carbon emissions. Recently, a tax of JPY700 per tonne was imposed on thermal coal, previously untaxed. The Ministry of Economy Trade and Industry plans to increase the rate of this tax over time. However, it is not clear that such a tax will provide a sufficient incentive for electricity generators to substitute away from coal. Relative costs of coal and LNG fired electricity generation, and relative levels of taxation will effect the choice of new generation plant. Low price elasticities and substantial lags to adjustment in the electricity generation industry suggest carbon taxation my not be an effective disincentive. Numerous generators expect coal fired generation to remain competitive even under carbon constraints.

The share of nuclear energy in electricity generation is unlikely to substantially increase in the future, although the nuclear option for emissions abatement is an important component of the Japanese Government's emissions reduction strategy. Almost 40% of nuclear generation capacity is due for decommissioning over the next 15 years, and there is little public support for new nuclear facilities due to several recent, but admittedly minor, safety breaches. Further, in a deregulated electricity market, the volume of investment required for new nuclear power stations is unlikely to be forthcoming from the electricity utilities without substantial subsidy. This is due to increased risks related to demand and prices in a competitive electricity market, and the high cost of nuclear generation. Domestic emissions policy regime simulations by Hamasaki (2002) have indicated a decrease in coal imports by up to 30%, and an overall decrease in all fossil fuel imports, including a decrease in LNG consumption of around 15%. However, the competing factors behind domestic energy market emissions including concerns over security, deregulation of markets, and nuclear policy indicate that the adjustment to a carbon constrained economy is likely to be complex and involve significant change in the energy sector.

5.4 Commodity Trade

Interest from within industry has been expressed in the concept of trade in commodities with (Kyoto compliant) emissions credits or permits embodied, such that the downstream use of these commodities is less carbon intensive, or emissions neutral. This is of particular relevance to energy commodities, where the emissions permit may be used to offset the emissions involved in the combustion of the commodity, for example the combustion of coal or LNG in electricity generation to produce carbon neutral electricity. Australian resources exporters are already considering how they might compete within international markets for emissions neutral energy commodities. Emissions permits must be sourced from within the Protocol system, implying that if Australia does not ratify, a market barrier to trade in Kyoto permits might exist for Australian commodity exporters. If access to Kyoto compliant emissions offsets, and the ability to trade in Kyoto instruments is limited, commodity trade flows may be effected where emissions neutral commodities are demanded. Further, market power in emissions permits could effect commodity trade flows where emissions permits may become an essential co-input with commodities to production. This highlights the potential importance of international emissions permit market structure. To the extent that markets for emissions permits are liquid, relatively informationally efficient, involve low transactions costs, and are competitive, access to market mechanisms will allow international trade in permits independent of commodity flows.

5.5 Bilateral Cooperation

The Japanese and Australian governments have a history of cooperation on climate change policy as part of the Umbrella Group involving joint negotiating positions to the UNFCCC. This coalition is somewhat diminished given the exit of USA, and the diverging positions of Japan, Russia and Australia. Furthermore, non-ratification may diminish the scope for, and effectiveness of, such cooperation in the future.

Under the Australia-Japan Creative Partnership, the nations have agreed to address climate change, taking into account its economic and environmental effects. The agreement has lead to three areas of government to government cooperation, namely (i) energy technologies; (ii) carbon accounting for sinks and sequestration; and (iii) encouraging all nations to become part of one effective global climate change regime. While a first step in direct bilateral cooperation on climate change, the agreement will not impact on trade. However, there is potential for bilateral trade-based cooperation involving climate change considerations. Bilateral trade agreements based on incentive approaches have been suggested as both augmenting and replacing the Kyoto Protocol.

6. CONCLUSION

An understanding of the impact of structural change in response to greenhouse constraints is essential for assessing the impact of domestic and foreign climate change policies on the Australian economy. General equilibrium modelling can only elaborate on this topic to the extent that its assumptions might approximate anticipated changes in the structure of the economy. A central proposition of this paper is that an exhaustive analysis of the impact of carbon constraints on the Australian economy requires a sound understanding of the likely effects of carbon constraints on trade relations via changes in the industrial structure of major trade partners' and competitors' economies.

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