The proposed carbon tax in Australia: impacts on income distribution, employment and competitiveness

Mohammad Mafizur Rahman, PhD
School of Accounting, Economics and Finance
Faculty of Business and Law
University of Southern Queensland
Toowoomba, QLD 4350, AUSTRALIA.
Tel: 61 7 4631 1279
Fax: 61 7 4631 5594
Email: mafiz.rahman@usq.edu.au

Abstract

The proposed carbon tax in Australia, which is scheduled to be implemented from 1 July 2012, has become a controversial issue to the policy makers and people regarding its potential effects on the economy and society. Therefore, this paper analyses the various effects of the carbon tax with particular attention on Australian income distribution, employment and international competitiveness.

The carbon tax will increase the inequality between the poor and the rich, as the poor will be adversely affected because of increased price of almost all essential items even in the presence of the government support program; regional disparity is also likely to increase. Employment will be reduced especially in coal, mining, steel, automotive and other manufacturing industries which will cause the shrinkage of GDP. The international competitiveness of Australian industries will also be reduced, as these industries will suffer because of higher production cost compared to foreign competitors. Some policy options such as reduction of VAT, a tax free allowance for essential use of energy, a lower carbon tax rate, border tax adjustments, permanent financial support to the poor may be considered to reduce the regressive effects.

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1. INTRODUCTION

A carbon tax is an excise tax imposed on polluters for reducing carbon emissions from the earth. In other words, it is a price on pollution. A carbon tax is different from emissions trading scheme. Under the carbon tax arrangements, there is no limit on the amount of emissions. Whereas under an emissions trading scheme, the government would set a cap on the total amount of emissions that can be released. The heavy emitters may purchase emission trading certificates to trade-off emissions above the set limits.

Economists, environmentalists and international organisations have long advocated carbon taxes, because it is believed that the same emissions reductions target can be achieved at lower costs by them compared to conventional command-and-control regulations. It is also argued that carbon taxes can encourage polluters to search for cleaner technologies, but there is no such an incentive for the polluters to go beyond the set standards for command-and-control regulations, unless the standards are constantly revised and set above the best available technologies (Zhang and Baranzini, 2004).

Australian Prime Minister Julia Gillard first announced her government's intensions to implement a carbon tax in February 2011. On Sunday 10 July, 2011 the Prime Minister released a detailed package outlining the carbon tax arrangements as part of its 'Clean Energy Future' plan. She noted that the carbon tax would be implemented from 1 July 2012. The government regards a price on carbon is the most environmentally effective and economically efficient way to reduce pollution. The government believes that implementation of carbon tax will allow the Australian economy to prosper continuously without the continuous growth of pollution.

This proposed tax has raised a widespread debate in the country. The politicians, policy makers and researchers are divided over the impacts of carbon tax for the Australian economy and society. This paper will therefore attempt to investigate the different possible effects of this carbon tax. Especial attention will be paid on the aspects of income distribution, employment and competitiveness.

The reminder of the paper is structured as follows: section 2 describes the details of the proposed carbon tax in Australia; section 3 briefly presents the current income distribution situation in Australia; section 4 provides a literature review on carbon tax; section 5 analyses the different possible effects emphasising the distribution of income, employment and international competiveness. The paper ends with conclusion and policy recommendations in section 6.

2. PROPOSED CARBON TAX IN AUSTRALIA

Given the population size, Australia's carbon pollution levels are very high, and the economy is heavily dependent on emissions-intensive energy sources. In fact, production of carbon pollution per head in Australia is the highest among the developed countries in the world. Thus Australia is one of the top 20 polluting countries in the world, as its carbon pollution represents 1.5 per cent of global emissions of greenhouse gases.

Against this backdrop, Australian government has developed a comprehensive plan for a clean energy future. The government believes that this plan is essential for the better future of

the Australian economy and environment. The world is warming; carbon pollution from human activity creates significant risks. By reducing carbon pollution, these risks can be avoided or minimised.

Key features of the carbon price

The government wants to reduce carbon pollution by implementing carbon tax with the hope that a price on carbon will create incentives to reduce pollution and invest in clean energy. The government's official carbon target is for a 5% reduction in emissions below 2000 levels by the year 2020. Around 500 of the biggest polluters will be taxed for every tonne of carbon pollution they produce. Carbon tax will cover around 60 percent of Australia's carbon pollution, including pollution from electricity generation, stationary energy, some business transport, waste, industrial processes, and fugitive emissions. The carbon price will be fixed like a tax for the first three years, before moving to an emissions trading scheme in 2015. On 1 July 2012, the price will be A$23 per tonne and will rise at 2.5 per cent per annum in real terms. From 1 July 2015, the carbon price will be determined by the market. Household transport fuels, light vehicle business transport and off-road fuel use by the agriculture, forestry and fishing industries are exempted from the carbon tax.

For the first three years of the flexible price period, price ceiling and price floor will be applied. The price ceiling will be set at A$20 above the expected international price and will rise by 5 percent each year in real terms. The price floor will be A$15, rising by 4 percent per annum in real terms (CEF 2011). An estimated A$71 billion will be collected by the government in the first 6-and-half years of Australian carbon tax.

Household assistance

A carbon price will increase the cost of living. The government has estimated that the increase of the cost for average household will be A$9.90 per week. The overall impact on the Consumer Price Index (CPI), in 2012-13, is expected to be around 0.7 percent because of the carbon tax.

To minimise the effect on cost of living, the government has announced the assistance package for the households. The government has decided to spend over 50 percent of its carbon price revenue on households. According to the government estimates, average household will receive around A$10.10 per week as assistance. Particularly low and middle - income households and pensioners have been targeted for this assistance to offset the expected average price impact. The government is assuring that about nine out of ten households will receive some assistance.

The government has also announced to cut income tax by increasing tax-free threshold from current A$6000 to A$18,200 in 2012-13. The tax free threshold will be further increased to A$19, 400 from 2015. This tax-cut opportunity is possible as the carbon price will raise revenue for the government. An increase of pensions, allowances and benefits is also included in the government plan (CEF 2011).

Supports for job and competitiveness

The government will provide A$9.2 billion over the period to 2014-15 to assist the most emissions-intensive activities in the economy which are exposed to international competition. It is expected that this assistance will support jobs and competiveness in those sectors.

To help improve energy efficiency in manufacturing industries and support research and development in low-pollution technologies, a A$1.2 billion Clean Technology Program will be undertaken. For food processing, metal forging and foundry industry A$200 million of Clean Technology Program will be allocated. To support the small businesses, their instant asset write-off threshold will be increased from $5, 000 to $6, 500 from 2012-13. This will provide businesses with increased cash flow by providing an immediate income tax deduction for depreciable assets costing less than the threshold level. As a result, the government expects that the capacity for small businesses to invest in new assets and energy efficient equipments will be increased (CEF 2011).

3. INCOME DISTRIBUTION IN AUSTRALIA

People's command over economic resources largely determines their economic wellbeing. Individuals must have some income and reserves of wealth to access to many of the goods and services consumed in everyday life. However, the distribution of income always remains an issue in political economy. Should a government redistribute income? If yes, to what extent? These are normative questions, and each person's answer will depend on individual's values. To make a fair judgement in answering these questions people must have a proper understanding about the existing income distribution in the country. The term "income

distribution" is a statistical concept, and it arises from people's decision about work, leisure, saving, and investment as they interact through markets and are affected by the tax system. Through the distribution of income, government takes money from the rich in the form of tax, fees and levies, and supports the poor or less wealthy people with different welfare arrangements.

A perfect equal distribution of income in a country is not possible, and it is not desirable as well, as it provides no incentives for people to work hard and improve their skills. So it hinders growth and progress. On the other hand, extreme inequality is also unacceptable as it implies that majority of population lives in poverty, and people cannot maintain their basic standard with less or no money for caring and educating their children. Without proper education, a country will have unproductive workforce. There is a possibility of increasing social crimes and political turmoils. All these will also negatively affect growth and prosperity in a country. Therefore, a fair distribution of income is always desirable from the social, political and economic points of view.

It is argued that income distribution in Australia is, more or less, fair. However, the recent data released by Australian Bureau of Statistics (ABS) confirms the trend that Australia is becoming more unequal with bottom 20 percent losing out to the top 20 percent, though the changes are relatively modest.

Year Book Australia 2009-10 reports that the average equivalised disposable household income of all households in Australia in 2007-08 was A$811 per week; but the median (i.e. the midpoint when all people are ranked in ascending order of income) was lower, just A$692 per week. This difference reflects that the income distribution in Australia is not

symmetric where a small number of people possess relatively high household incomes, and a large number of people possess relatively lower household incomes.

The Table-1 below also indicates the unequal distribution of income in Australia. In 2007-08, 'low income' group (i.e. the 20% of the population in the second and third income deciles) received only 10.1% of total equivalised disposable household income; whereas 'high income' group (represented by the 20% of the population in the highest income quintile) received 40.5% of disposable household income.

Table 1: Selected income distribution indicators, equivalised disposable household income

Indicators	1997-98	1999-00	2000-01	2002-03	2003-04	2005-06	2007-08
% share of total income received by persons with low income (a)	10.80	10.53	10.48	10.57	10.60	10.40	10.10
% share of total income received by persons with middle income (b)	17.65	17.65	17.63	17.62	17.60	17.40	17.00
% share of total income received by persons with high income (c)	37.86	38.36	38.49	38.27	38.40	39.20	40.50
Gini coefficient	0.303	0.310	0.311	0.309	0.306	0.314	0.331

(number)							

(a) Persons in the second and third income deciles.

(b) Persons in the middle income quintile.

(c) Persons in the highest income quintile.

Source: ABS Household Income and Income Distribution, Australia, 2007-08 (6523.0)

Another measure of income inequality is the Gini coefficient which is a single statistic. It lies between 0 and 1. The smaller the Gini coefficient, the more even distribution of income is in a country. That is, if the value is 0, then all household income is equal (perfect equality), and if the value is 1, a single household would have all the income (perfect inequality). Table-1 indicates that Gini coefficient is increasing over the years. It has increased to 0.331 in 2007-08 from 0.303 in 1997-98 indicating that income inequality in Australia is gradually increasing.

The 2009 OECD Fact Book ranks Australia 16 among the 30 OECD countries, using data from 2003-04 with regard to income inequality. The least income inequality was found in Denmark (Gini coefficient 0.232), and the greatest income inequality was found in Mexico (Gini coefficient 0.474).

4. LITERATURE REVIEW: CARBON TAX

A country, where there are no distortions in the energy markets, would have a deadweight loss because of the carbon tax. However, an introduction of carbon tax can yield a net gain to an economy if the revenues generated from the imposition of a carbon tax are properly recycled to the economy for reducing a distortionary tax (Zhang and Baranzini, 2004).

A number of studies have been conducted regarding the impact of carbon/energy taxes on household income distribution. These studies took place mainly in developed countries where green taxation has been used, or at least considered, more extensively. It is found that carbon/energy taxes generally are, or are expected to be, regressive in developed economies but progressive in developing economies (Verde and Tol, 2009).

To measure the distributional effect of gasoline tax in the United States, Poterba (1991) used the data from the US Consumer's Expenditure Survey. Calculating the fractions of household income and expenditure that are devoted to gasoline purchase, he concludes that the tax is slightly regressive. This is especially true when share of expenditure on gasoline is considered. On the other hand, the study conducted by Safirova et al (2004) in and around Washington DC confirms that burden of road congestion disproportionally falls on the rich; hence road pricing or fuel taxation can be considered strongly regressive.

Extending Poterba's approach by including price elasticities Pearson and Smith (1991) estimated the distributional impact of carbon tax on seven European countries. Their findings are that the tax would be significantly regressive in the UK and strongly regressive in Ireland, but weakly regressive in France, Germany, Italy, Netherlands and Spain. Upgrading Pearson and Smith's work, Barker and Köhler (1998) also achieve the similar results. The study of Hamilton and Cameron (1994) on Canadian carbon tax also concludes that the tax would be moderately regressive (cited in Verde and Tol, 2009).

Using the input-output analysis Labanderia and Labeaga (1999) conducted a study to explore the effect of a carbon tax on Spanish household income. The Spanish Household Expenditure Survey data were used. They find contrasting results compared to others that a carbon tax in

Spain would not be regressive. Similar results were also found by Tiezzi (2001) for the Italian carbon tax. It is not to be regressive mainly because it affects more motor fuel and less domestic fuel.

A study on the Danish carbon tax conducted by Wier et al (2005) also found that it would be regressive particularly to the disadvantage of rural households. The study of Kerkhof et al (2008) also confirms that multiple taxations, compared to a carbon tax, improves the cost effectiveness of reducing emissions and distributes the tax burden more equally.

It is argued, however, that a carbon tax would be progressive by the change of the structure of the economy, higher transfer payment to the less income households and other tax cut. The study of an Indonesian carbon tax by Yusuf and Resosudamo (2007) find that it would be progressive, and uniform cut in commodity tax rate would minimise the adverse effect on GDP. The study of Van Heerden et al (2006) on South Africa notes that a combination of increased energy taxes and reduced food taxes reduces emissions, increases output and decreases income inequality between rich and poor (cited in Verde and Tol, 2009).

Some studies mention that a carbon tax has a double dividend: it can reduce CO_2 emissions, and it can finance the reduction of distortionary taxes such as income tax. A study on Ireland by Fitz Gerald and McCoy (1992) found that if revenue earned from carbon tax were used to reduce social insurance contributions, competitiveness of the economy would increase which in turn would increase the country's GDP. In contrast, the study of Verde and Tol (2009) finds that the carbon tax in Ireland is remarkably regressive: the average burden is an estimated 2.1 percent of disposable income for the first decile, 1.2 percent for the second decile and 0.3 percent for the tenth decile.

5. EFFECTS OF THE CARBON TAX

It is argued that introduction of a carbon tax reduces the overall economic cost of raising government revenues (Feldstein, 1999, Zhang and Baranzini, 2004). A carbon tax provides the scope of reducing distortionary taxes, and a reduction in distortionary taxes is always better than a reduction of lump-sum taxes. That is, rather than returning the tax revenue in a lump sum way, a country may achieve cost saving by using carbon taxes revenues to reduce distortionary taxes. Each country's particular economic circumstances are determining factors for the magnitude of the potential cost saving.

Effects on income distribution

The effect of a carbon tax on income distribution is a main concern regarding its acceptability. It is expected that the tax has a regressive effect on the income distribution, as lower-income households spend a larger share of their income compared to higher-income households. In a study of UK carbon and energy tax, Smith (1992) calculates the distributional effects on different income groups. The estimated results show that the poorest 20% and the richest 20% of the population would have to pay an increased tax of 2.4% and 0.8% of total spending, respectively, and the average household would have to pay an additional tax of 1.4% of total spending. Hence it is clear that the more burden of a carbon tax falls on the poorest section of population, and the richest bear the lower burden (Zhang and Baranzini, 2004). Poterba (1991) and Safirova et al (2004) also find the similar regressive results of a carbon tax for the USA as mentioned above.

However, as mentioned in the literature review section, some studies found that regressiveness of a carbon tax is not so strong. In fact, its effect on the low-income households may be relatively moderate if tax is carefully imposed on the type of fuel (heating, cooking, lighting, transport, etc.) and the tax revenue and benefits from improved environment quality is properly distributed among the population.

In Australia, to minimise the impact of the carbon tax on income distribution, the government has taken a number of measures as noted above. The government announcement is targeted to support the low-income earners, pensioners and unemployed persons as these people will face worst effect of the carbon tax. Yet it is argued that indirectly the low income earners will be affected more as the price of the most of the essential commodities will be increased because of this tax. The poor will be affected more as their marginal propensity to consume is always much higher than that of the rich, and they spend a greater share of their income for the basic necessities like food, shelter and clothing. Moreover, the impact of these increased prices would also vary regionally and within the city. For example, states like Tasmania that use hydro-electric power to generate electricity would be less affected than the states which use coal by a carbon tax. Electricity prices already differ among the Australian regions/states (DCC, 2008); this difference would be significant because of the carbon tax. So a regional disparity would increase. The people in remote/rural areas already pay higher prices for food, fuel, energy, medicine and other essential items. Further increase of prices may make these people more vulnerable. Regional communities and industries are also likely to be adversely affected due to their reliance on agriculture and other natural resource-based industries, and low levels of infrastructure stock.

Furthermore, carbon tax would increase energy costs that may encourage/compel people to use less energy by buying more energy efficient appliances such as fridges, cars and light-globes. However, the people who can least afford to replace such goods would face the hardest impact.

Also the people who are renting, for private and public/community housing, have limited or no incentive to pay for the capital cost of low-emissions technologies: costs of energy-saving insulation, space heating, hot water systems and cooking appliances (Garnaut, 2008). Ultimately they will have to bear the higher prices of energy. According to ABS (2007), around 29 percent of Australian households rent their homes; a disproportionate number of these are low-income households.

HIA (Housing Industry Association Limited), Australia anticipates that the carbon tax will increase the cost of building material, products, assemblies and other inputs into a new home by 1.2% -1.4% . This additional cost means higher housing prices, a larger mortgage, higher repayments over the life of a home loan, a higher deposit for prospective homebuyers and less housing affordability especially for low or limited income earners.

Effects on employment and GDP

There is an ambiguity with regard to effect of a carbon tax on employment. Some empirical studies (see Ekins, 1998; EC, 1997; Barker, 1995) show that carbon tax improves the environmental quality which can be accompanied by a simultaneous increase in employment. On the other hand, other studies (e.g. Bovenberg and Goulder, 1996) reject this idea

especially when the initial tax system is relatively efficient. This argument is raised considering the interaction of a carbon tax with the prevailing tax system in a country. A carbon tax may further reduce overall employment and investment since it adds to the existing distortionary taxes on labour and capital (Zhang and Baranzini, 2004).

The proposed carbon tax in Australia will also have a negative effect on employment although there is a controversy among the economists and policy makers about its magnitude. The loss of jobs will be in coal, mining, steel, automotive and other industries. Referring the ACIL Tasman modelling, *The Australian* of 14 June, 2011 reports that in the first three years (by 2014-15), the carbon tax could force eight black coalmines to close, and coal production could have declined by 18.7 percent. This would result in an annual decline in coal sales revenue from existing mines of A$2bn, and employment reduction of 4085 jobs, including 2939 in regional New South Wales and 1146 in Queensland. The impact on the overall economy will be 12, 255 jobs. ACIL Tasman also notes that these estimates include only losses from premature mine closures; there will be more employment losses from operating economies made within surviving mines.

However, Professor Bruce Chapman, the president of the Economic Society of Australia, notes that the impact of carbon tax on mining job will be only tiny, and most of the workers leaving mining will be employed in other sectors. The government has also promised to support jobs by adopting a number of assistance measures.

The negative impact on jobs because of carbon tax would result in shrinkage of GDP. During the period when green energy was subsidised, Spain's economy actually contracted (Cox and Stockwell, 2011). However, the economists predict that the impact of carbon tax on

Australian GDP is likely to be small. According to the treasury model and Reserve Bank of Australia (RBA) estimate, the total impact would be to reduce GDP by less than 0.5 percent points, and to boost inflation by around 1 percent in 2012/13. GDP growth is expected to be reduced by 0.1 percent over 40 years under the carbon scheme. Australian per capita income will grow slightly slowly, and it would be about half a percentage point below where it would have otherwise been in 2020 (Yillang 2011).

Beder (1996) argues that the carbon tax would lead to a reallocation of resources away from carbon producing and using industries to other industries. This would have an overall effect on Australian GDP.

Effects on competitiveness

A domestically imposed carbon tax may have potential important effects on international competitiveness of an economy in relative terms. At least in the short run, certain industries may face serious adverse effects of a unilateral carbon tax with regard to competitiveness. Therefore, it has been an issue of concern to policymakers and politicians.

At the firm level, the term competitiveness refers to the firm's ability to maintain or even increase the domestic and international market shares and profitability. Both the micro factors (e.g. cost structure, product quality, trademark, service and logistic network) and macro factors (e.g. exchange rate, trade rules and political stability) can affect a firm's competitiveness. A carbon tax changes the relative production costs, and thus affects a firm's competitiveness. To illustrate, let us take two firms: A and B. Firm-A makes intensive use of

energy and firm-B makes less intensive use of energy. Imposing a carbon tax, ceteris paribus, will increase the relative production cost of firm-A compared to firm-B in the short term, and thus firm A's competiveness would decline. At the same time, the cost advantage, competitiveness, of firm-B (and other less energy-intensive firms) would increase in the short term (Zhang and Baranzini, 2004).

If the effects of carbon tax on energy-intensive national and multi-national firms are severe, there is some evidence that these firms sometimes re-locate. They shift their investment and production to other countries, especially to developing countries where environmental standards are relatively low. The firms that are in sectors suffering competitive difficulties due to high environmental costs and overall poor economic conditions are more likely to invest abroad or shut down (OECD 1993).

However, following the Kyoto Protocol if all industrial countries implement carbon tax/energy tax to reduce emissions simultaneously, industries in different countries will experience the simultaneous cost increase. If this is the case and the fiscal revenues are properly recycled, a carbon tax implementing country can increase the competitiveness of its industries compared to other countries that adopt less cost-effective instruments (Zhang and Baranzini, 2004).

Australian industries, particularly heavy manufacturing industries, will suffer because of the carbon tax, and hence their international competitiveness will reduce. Referring ACIL Tasman modelling, Australian Coal Association executive director Ralph Hillman notes that Australian coalmines could close if the government implement a carbon tax. He also opines that jobs in coal industry are supporting real families in regional Australia, and expressed a

great concern that the carbon tax will put thousands of jobs at risk and push billion of investment dollars in new mining developments offshore to Australia's competitors. In the first nine years of the carbon price, he said, 18 mines were projected to close and the carbon price would cost Australian mines about A$18bn over the same period. This cost will not be faced by any of Australia's competitor (The Australian, 2011), and thus the competitiveness of Australia's trade exposed industries, including coal, will be adversely affected.

However, as mentioned earlier, with the carbon tax announcement the Gillard government has made a commitment to support jobs and competitiveness through the assistance program to the most emissions-intensive activities that are exposed to international competition. The government hopes that this program will support local jobs, prevent carbon leakage offshore and encourage industries to invest in cleaner technologies.

6. CONCLUSION AND POLICY OPTIONS

As a signatory of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, Australian government is committed to reduce greenhouse gas emissions along with other industrialized countries and the European community. The recently announced carbon tax is a policy initiative to this end. While a carbon tax is considered a cost effective measure to reduce pollution from the atmosphere, it has raised a debate among the policy makers about its various adverse effects on the economy and society, as the tax is generally regressive.

In this paper, we have attempted to analyse the possible effects of the carbon tax in Australia. We have specifically highlighted the effects on income distribution, employment and GDP,

and international competiveness. In doing so, the key features of the proposed carbon tax have been discussed in section 2, and the picture of current income distribution in Australia has been presented in section 3 above.

From 1 July 2012, around 500 of the biggest polluters will be taxed for every tonne of carbon pollution they produce. The tax will be $23 per tonne and will rise at 2.5 per cent per annum in real terms till June 30, 2015. The carbon price will be determined by the market from 1 July 2015. As the carbon tax will increase the cost of living, Australian government has announced household assistance program, in the form of lump sum payment and tax benefit, targeting the low-income earners and pensioners.

It is argued that the distribution of income in Australia is relatively fair and equitable; however, ABS data confirms that Australia is recently becoming more unequal with bottom 20 percent losing out to the top 20 percent. The Gini coefficient, measurement of income inequality, has increased to 0.331 in 2007-08 from 0.303 in 1997-98 indicating that income inequality in Australia is gradually increasing.

The introduction of the carbon tax will have important implications for this income inequality in the Australian society. The fact is that the carbon tax is regressive though its magnitude may be reduced through progressive policy options. Despite the different support programs of the government for the low income households, the poor section of the society will be adversely affected as the carbon tax will increase the price of almost all essential items, and the poor spend the larger share of their income on these items. So inequality between the poor and the rich is likely to further increase. The carbon tax will increase regional disparity as the current energy price is not the same for all states and territories; rural/regional Australians

will be affected adversely as these people are already paying higher prices for their many essential items than their urban counterparts. The poor cannot avoid paying higher energy price as they will not be able to install the energy saving devices and buy more energy efficient appliances. The carbon tax will further reduce housing affordability of the poor.

Though the economists are divided with regard to the effect of the carbon tax on employment, it is likely that the tax will impact Australian employment negatively. The job loss will occur especially in coal, mining, steel, automotive and other manufacturing industries. The job loss will also cause the shrinkage of Australian GDP.

A domestically imposed carbon tax will reduce the competiveness of firms or industries at least in the short-run. If the impact is severe, these firms and industries may locate overseas especially in developing countries. Some experts believe that international competitiveness of Australian industries will be reduced because these industries, particularly heavy manufacturing industries, will suffer because of the carbon tax. Unless Australian's competitors are taking the similar measures with regard to emission reduction, the competitiveness of Australia's trade exposed industries will be adversely affected.

Some high income households are not covered under the government support scheme, but they will be worse of because of the carbon tax. About 700,000 middle to high income households will get nothing back from the government. A dual income family with two children aged 5 to 12, earning $120,000 a year, will be almost A$400 a year worse off (The Sunday Telegraph, July 10, 2011).

Therefore, to mitigate the negative effects of the carbon tax the following policy options may be considered:

i. To minimise the inflation effect, revenues raised through the carbon tax (indirect tax) could be offset by a reduction of another indirect tax, e.g. value added tax (VAT) in Australia rather than reducing direct tax like income tax. The studies of DRI (1991), Standaert (1992), Barker et al (1993) confirm that a reduction of VAT offsets the carbon tax's inflation impact more than the reduction of other taxes. A reduction of income tax is likely to increase inflation. A lump-sum redistribution of carbon tax revenues to population may mitigate regressive distributional impacts, as the poor will proportionally receive a higher amount than the rich, but this scheme may have negative effects on inflation and employment.

ii. To mitigate the regressive distributional impacts, a tax-free allowance for essential use of energy may also be considered. For example, metered domestic energy of each household could be taxed (by charging higher a price) only above a certain floor so that essential energy use is tax free to satisfy basic needs. Energy could be progressively taxed above the floor to discourage excessive energy consumption.

iii. Some experts (e.g. Innes Willox, a senior official of the Australian Industry Group) have expressed their concern that Australia will have the highest carbon tax in the world which would hurt its trade competitiveness. The price of 24.5 US dollars a tonne in the starting year is too high compared with the global price which will be around 16 to 18 US dollars a tonne. To maintain international

competiveness the lower carbon tax rate is warranted, and united carbon tax policy with its trading partners, rather than unilateral policy, should be adopted.

iv. To mitigate the competitiveness effects, border tax adjustments may also be considered. After implementation of the carbon tax, if a product is exported, it could be tax rebated; on the other hand, if imported products have not been subjected to a similar level of taxes abroad, Australia could impose the taxes. These adjustments will help Australia to remain competitive internationally as well as to tax domestic energy consuming industries. As long as there is no discrimination against foreign energy products, these adjustments are permissible under the GATT/WTO rules (Zhang and Baranzini, 2004).

v. Financial support through the taxation and social security systems would need to be permanent.

Finally, carbon taxes would be largely ineffective if imposed unilaterally or even regionally (Pezzey, 1992; Felder and Rutherford, 1993). Therefore, effective global mitigation agreement must be reached to reduce the desired level of emission and to make the world economically, environmentally and socially a better place for us and future generation.

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