INTERNALIZING THE EXTERNAL COSTS OF CLIMATE CHANGE:

CAP AND TRADE VS. CARBON TAX

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I. The Costs of Climate Change

The effects of climate change are felt not just by plants, animals, and the environment, but also by humans, and specifically human economies. This not only provides a motivation for people to address climate change, but also a method. Simply put, climate change costs money – a lot of money, some of it calculable, some of it not. For example, President Obama's Climate Action Plan estimates costs for some of the damages due to climate change in 2012: $65 billion for Superstorm Sandy, $30 billion for droughts and heatwaves, and $1 billion for western wildfires.[1] The Environmental Protection Agency doesn't estimate costs but does estimate savings to health care expenses if its Clean Power Plan to lower carbon pollution from power plants 30 percent by 2030 is enacted: up to 6,600 lives and $93 billion per year.[2] The Department of Defense does not estimate costs or savings from acting on climate change, but has made clear that it considers climate change a national security threat. Its 2014 Climate Change Adaptation Roadmap lists several areas in which the military is planning to address new challenges brought on by climate change, including an increased demand for disaster relief and humanitarian aid, greater need for air and sea capabilities in the Arctic, instability within and among other nations, and vulnerability of our own military bases.[3] The costs of these challenges is not calculable at this time, but could take up much of the Defense Department's proposed 2015 budget of almost $500 billion.[4]

Quantifying such enormous costs highlights the urgency of climate change and provides motivation for people to act. But bringing out the costs of climate change does something else equally as important: it points the way to a policy by which people can act. In economic terms, climate change is a classic example of a negative externality. According to the Organization for Economic Cooperation and Development, a negative externality refers to a situation in which the production or consumption of goods or services imposes costs on others which are not reflected

in the prices charged for the goods and services being provided.[5] In the case of climate change, everything on earth – plants, animals, people, and the environment as a whole – is dealing with its costs, and those costs are not included in the price of producing and consuming fossil fuels, which scientists say is the chief cause of carbon emissions that lead to climate change.[6]

II. Policy Options

Economists typically discuss five policy options for addressing a negative economic externality.[7] First, a society can learn to live with it, that is it can adapt – but adaptation alone is not a solution in the case of climate change. Some adaptation will certainly be necessary as the climate has warmed 0.8°C since the Industrial Revolution, with another 0.8°C or so in the pipeline due to the carbon emissions currently in the atmosphere. However, if left unaddressed, climate change will warm the planet 3.2°C to 5.4°C by 2100, altering the environment into something completely different from the one in which human civilization evolved.[8]

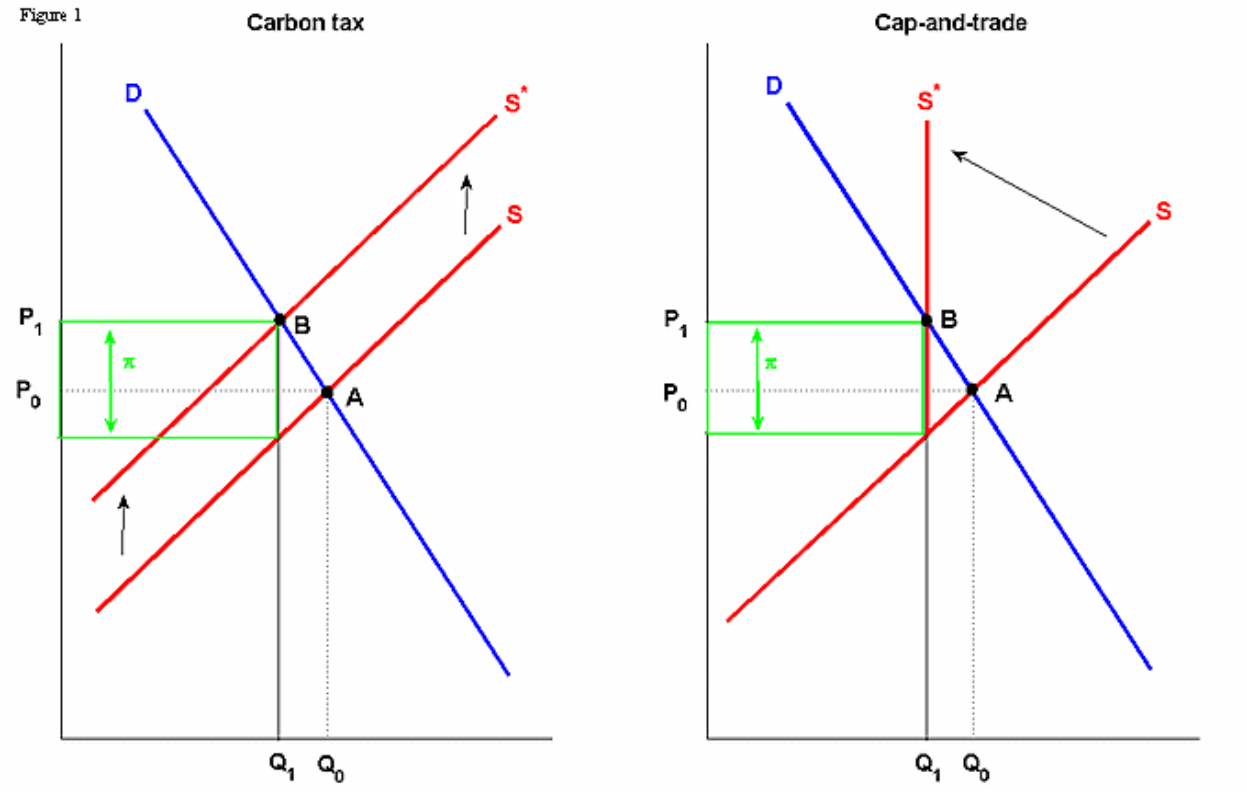
Second, a government can issue regulations, often referred to as the "command and control" approach. In this option, governments generally mandate a limit on the negative externality, which in turn often entails a limit on production of the good or service that is causing the negative externality. The EPA Clean Power Plan requiring power plants to lower emissions 30 percent by 2030 is an example of a regulation designed to mitigate climate change. Free market schools of economics see regulations as coercive because they are issued and enforced by government, which many economists believe should stay out of the workings of the market.[9] Government intervention is seen as causing more problems than it solves because government cannot reproduce the invisible hand of the market, which means regulations will result in undesirable and unintended consequences, leading to the need for yet more regulations.

A third approach governments can take is to subsidize an alternative to the good or service that is causing the negative externality. Government subsidies usually take one of two

forms: price-oriented subsidies or research and development funding.[10] In the context of climate change, price-oriented subsidies are often awarded for existing renewable energy technologies, such as through tax breaks for purchasing home solar panels. Research and development subsidies are provided to firms developing new technologies such as carbon capture and sequestration. Subsidies come under some of the same criticisms as regulations from free market economists, who do not believe the government can use them appropriately to influence the market. But more to the point, fossil fuels currently receive several times the subsidies as renewable forms of energy both in the United States and around the world. From 1950 to 2010, the U.S. government provided $594 billion in energy incentives to fossil fuels ($369 billion to oil, $121 billion to natural gas, and $104 billion to coal), but only $81 billion to renewables ($74 billion to wind and solar; $7 billion to geothermal), according to the Nuclear Energy Institute.[11] Worldwide in 2013, subsidies to fossil fuels totaled $550 billion compared to $120 billion for renewable energy technologies.[12] Clearly renewable energy subsidies have a long way to go to catch up to their fossil fuel counterparts.

III. Market-Based Options

Finally, governments can take one of two market-based options for addressing climate change: cap and trade or a carbon tax. These options are considered market-based because they work with the invisible hand of quantity-price equilibrium to internalize the negative external cost. In economic terms the two policies have the same effect, though they come at it from opposite directions. As seen in Figure 1,[13] a carbon tax manipulates quantity by controlling price, while cap and trade manipulates price by controlling quantity. With a carbon tax, the government adds a tax π to the price of carbon, moving the price from P_0 to P_1 and shifting the supply from S to S*. This shifts the supply-demand equilibrium from point A to point B, and moves the quantity from Q_0 to Q_1. People pay more for carbon-based goods and services, so



they demand less. With cap and trade, the quantity is moved first when the government puts a cap on the overall amount of carbon that can be produced. Typically the government then allocates permits to produce a certain fraction of the total amount to high carbon emitters such as power plants and cement factories, which can then trade those permits on an open market. Trading allows those that emit a lot of carbon to buy permits from those who emit less. In economic terms on Figure 1, quantity is moved from Q_0 to Q_1, and supply from S to a vertical S*. No matter how high the price gets, the supply remains at Q_1, though the higher the price goes, the more incentive the emitter has to become more efficient. This mechanism shifts the supply-demand equilibrium from point A to point B, which settles the price from P_0 to P_1. This market mechanism can be repeated for both the carbon tax and cap and trade if the government raises the tax or lowers the cap, as has been done or proposed in most schemes for both options.

IV. Carbon Pricing Around the World

Since Finland introduced the world's first carbon tax in 1990,[14] many governments around the world have instituted carbon pricing of some sort, whether through a tax or cap and trade, also called emissions trading. Currently more than half the world's population lives in a place where carbon production or consumption is priced in some form.[15] Jurisdictions that tax or will soon carbon include British Columbia (2008), Costa Rica (1997), Denmark (1992), Finland (1990), France (2014), Iceland (2010), Ireland (2010), Japan (2012), Mexico (2012), Norway (1991), South Africa (2016), Sweden (1991), Switzerland (2008), and the United Kingdom (2013). Jurisdictions that have or soon will have an emissions trading scheme include the European Union (2005), New Zealand (2008), Kazakhstan (2013), Switzerland (2013), the Republic of Korea (2015), the Regional Greenhouse Gas Initiative covering nine northeastern U.S. states (2009), the Western Climate Initiative covering California and Quebec (2013), Alberta (2007), seven pilot cities in China (2013), and Tokyo (2013).[16] Australia passed a hybrid carbon tax and emissions trading program in 2012 but repealed it in 2014.[17] Countries exploring options to price carbon include Brazil (possible tax, 2016), Chile (combined tax with cap and trade, 2016), China (expanding cap and trade nationally 2018), Colombia (possible tax, 2016), and Costa Rica (2016).[18] Clearly a carbon tax and cap and trade are not mutually exclusive, as many jurisdictions employ both, often covering different sectors or in different capacities. However, either carbon tax or cap and trade can work very differently in different jurisdictions depending on how the program is designed, as is apparent from examining a few programs of note.

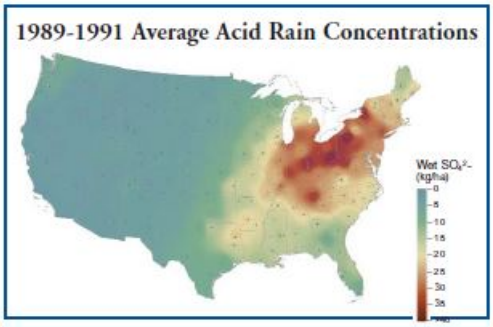
A. Emissions Trading

1. EPA Acid Rain Program

Acid rain occurs when emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x), chiefly from coal-fired electric power plants, react with water and oxygen in the atmosphere to form

acids such as sulfuric acid (H_2SO_4) and nitric acid (NHO_3). These acids fall to the earth in both wet form as rain, snow or fog that enters water and ground, and in dry form, sticking to buildings, homes, cars and trees.[19] Acid rain particles can acidify lakes and streams, killing fish populations; damage tree leaves, harming forests; damage buildings and cars; and enter the lungs, affecting human health.[20] In order to mitigate these effects, the U.S. Environmental Protection Agency established the world's first cap and trade program for acid emissions through Title IV of the 1990 Clean Air Act. The goal was to reduce annual SO_2 emissions by 10 million tons below 1980 levels, a 50 percent reduction, and NO_x emissions by 2 million tons below 1990 levels, a 27 percent reduction, all by the year 2000. [21]

The program was implemented in two phases, the first in 1995 affecting 445 units, mostly coal-fired electric power plants, and the second in 2000 expanding to more than 2,000 units with an output capacity of more than 25 megawatts. By all accounts it has been a great success. The program reduced SO_2 emissions faster and at a far lower cost than anticipated, with wide-ranging environmental and health improvements. By 2002, SO_2 levels were 41 percent lower than in 1980, and NO_x levels were 33 percent lower than in 1990. Wet sulfate deposits were 20 to 50 percent lower than 1990 levels in most of the Northeast and Midwest, allowing lake and stream ecosystems to recover from decades of damage, and reducing human exposure to pollutants that cause asthma, heart disease and premature death. Compliance with the program was more than 99 percent at a cost of $1 billion to $2 billion per year, just one-fourth of original estimates. A 2003 study by the Office of



Acid Rain Program Results. Source: U.S. Environmental Protection Agency.

Monitors show significant decreases in wet sulfate deposition in the Eastern U. S. Source: NADP

Management and Budget found the EPA Acid Rain Program "accounted for the largest quantified human health benefits – over $70 billion annually – of any major federal regulatory program implemented in the last 10 years, with benefits exceeding costs by more than 40:1."[22]

2. European Union Emissions Trading Scheme

The success of the U.S. Acid Rain Program helped set the stage for the first and largest international greenhouse gas emissions trading system in the world, the European Union Emissions Trading Scheme. Launched in 2005, the EU ETS now limits emissions from more than 11,000 power plants, manufacturing facilities, and aviation operators in 31 countries. It covers 45 percent of the EU's greenhouse gas emissions from carbon dioxide, nitrous oxide, and perfluorocarbons, with the goal of lowering them 21 percent by 2010 and 43 percent by 2030 from 2005 levels.[23] Overseen by the European Commission, the ETS is the European Union's flagship climate policy and the cornerstone of the EU's overall environmental policy. But its history and development has not been without setbacks, criticism, and controversy.

Paradoxically, the origins of the EU ETS lie in two failures: the failure of the European Commission to enact a carbon tax in 1992, and the failure of European negotiators to keep emissions trading out of the Kyoto Protocol.[24] The carbon tax proposal failed due to lobbying from the Union of Industrial and Employers' Confederations of Europe, now BusinessEurope, a Brussels-based association of industries and employers, as well as popular resistance to the idea of an international tax being imposed on sovereign nations. Then during the third Conference of Parties negotiations leading to the 1997 Kyoto Protocol, U.S. Vice President Al Gore got emissions trading included with Joint Implementation and the Clean Development Mechanism as flexible mechanisms for achieving binding pledges for emissions reduction. Initially European negotiators resisted including emissions trading in the Kyoto Protocol because they thought it would not lead to lowering emissions. But a few months later when the U.S. Senate passed the

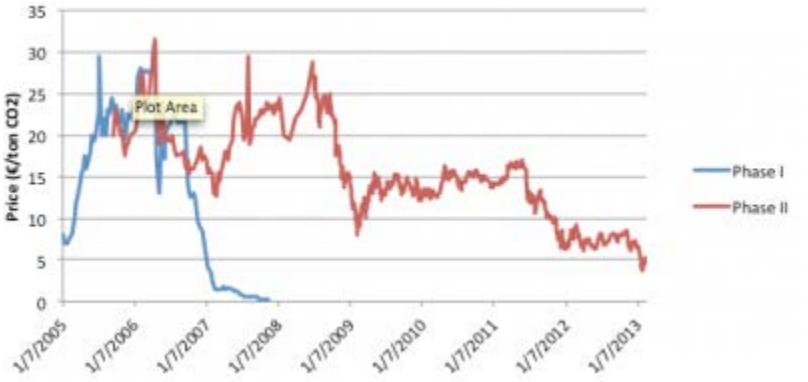
Byrd-Hagel Resolution making it clear they would not ratify the Kyoto Protocol, EU policymakers did an about face, embracing emissions trading as the centerpiece for their new climate policy. Europe went "from follower to leader" in using market-based instruments as the basis for environmental policy.[25]

The European Union Emissions Trading Scheme was planned in three trading periods: Phase I, a "learning by doing" trial period from 2005 through 2007; Phase II, coinciding with the first Kyoto Protocol commitment period from 2008 to 2012; and Phase III, a period of significant change and reform from 2013 to 2020.[26] Phase I included all 15 then-members of the EU; Phase II included all 27 then-members of the EU, along with Iceland, Norway, and Liechtenstein, which joined in 2007; in Phase III, Croatia joined the EU and negotiations got underway with Switzerland.[27] Australia was set to link its nascent emissions trading system with the EU ETS in 2015, but those plans were scuttled when Australia repealed its carbon tax in 2014.[28]

During the first two trading periods, the scheme covered only carbon dioxide emissions, with each allowance giving the holder the right to emit one ton of CO_2. Each country requested its own cap through a National Allocation Plan submitted to the European Commission, which could approve or modify the plan. Controversially, almost all allowances were given away – 95 percent in the first period, 90 percent in the second period – with the remaining auctioned. The first phase had no goal for CO_2 reduction, while the goal for the second period was the same as the European Union binding pledge under the Kyoto Protocol of an 8 percent reduction of CO_2 from 1990 levels by 2012.[29] The EU did meet this pledge,[30] partly through emissions offset projects that EU countries financed in developing nations through the Kyoto Protocol's flexible mechanisms.[31]

During its first two phases, the EU Emissions Trading Scheme was the subject of several controversies, many stemming from giving away rather than auctioning allowances. During

Phase I, the European Commission had no reliable data on industry-wide and company-specific emissions, so it allowed member countries to allocate allowances based on emissions estimates. Many countries overestimated their own emissions, some basing estimates on optimistic forecasts for growth. By 2006 it became clear that the number of allowances greatly outpaced actual emissions, leading to a steep drop in prices. The price for Phase I allowances then fell to zero when the European Commission announced they could not be used during Phase II of the scheme.[32] During Phase II, a new round of allowances was issued, this time based on actual emissions data from the pilot phase. However, prices dropped dramatically again from €30 to less than €10 as production fell in the wake of the global economic downturn of 2008, and fell again as a new round of allowances was auctioned leading up to the start of Phase III.[33] When the price of carbon allowances hit a record low of less than €5 in 2013, the European Commission determined that there was a surplus of more than 2.1 billion allowances and instituted a plan of "backloading," or taking 900 million allowances off the market for up to five years.[34]



Price of European Union Allowances to emit carbon. Source: Libecap, Gary. 2013. The Cap-and-Trade Bust. Hoover Institute. Accessed at http://www.hoover.org/research/cap-and-trade-bust

Another major controversy during the early phases of the EU Emissions Trading Scheme was windfall profits to some of the continent's biggest polluters. Simply put, although power plants got almost all of their carbon allowances for free, some raised prices to customers as if they had paid for the allowances. German power company RWE, the biggest carbon dioxide emitter in Europe, received a windfall of €5 billion during Phase I, more than any other company

in Europe. Confidential documents obtained by the International Herald Tribune found that the German cartel office had accused the company of "abusive pricing" and called for price cuts of 75 percent. RWE settled the case without acknowledging any wrongdoing.[35]

Due to controversies during the first two phases of the European Union ETS, a number of significant changes were made in Phase III.[36] First, a single EU-wide cap replaced the National Allocation Plans, which were complex and subject to a great deal of wrangling between the European Commission and member countries. Second, more allowances are now being auctioned rather than given away, starting with 40 percent of allowances auctioned in 2013 and increasing annually. Third, the scheme expanded to cover additional greenhouse gases, adding nitrous oxide and perfluorocarbons, and additional sectors, adding aviation. The addition of the airline industry in particular proved controversial with EU trading partners such as the United States, India and China. In 2011 the United States passed the European Union Emissions Trading Scheme Prohibition Act, forbidding U.S. airlines from participating in the program.[37]

3. American Clean Energy and Security Act of 2009

Just as Europe was finishing up Phase I of its Emissions Trading Scheme, the United States began debating a cap and trade scheme of its own, the American Clean Energy and Security Act, or ACES, also known as the Waxman-Markey Clean Energy Bill. This 1400-page bill contained five titles that set up programs in clean energy, energy efficiency, reducing global warming pollution, transitioning to a clean energy economy, and agriculture and forestry offsets.[38] The most important provision would have instituted an emissions trading program covering seven greenhouse gases – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3) – from plants emitting more than 25,000 tons per year, producers and importers of petroleum fuels, and local distributors of natural gas. The bill would create caps to reduce

aggregate emissions 3 percent below 2005 levels by 2012, 17 percent by 2020, 42 percent by 2030, and 83 percent by 2050. Twenty percent of allowances would be auctioned at the program's start, increasing to 70 percent by 2030, overseen by the Federal Energy Regulatory Commission. Proceeds would be used to offset energy costs for consumers, help businesses transition to clean energy, fund research and development, and build resilient communities.[39]

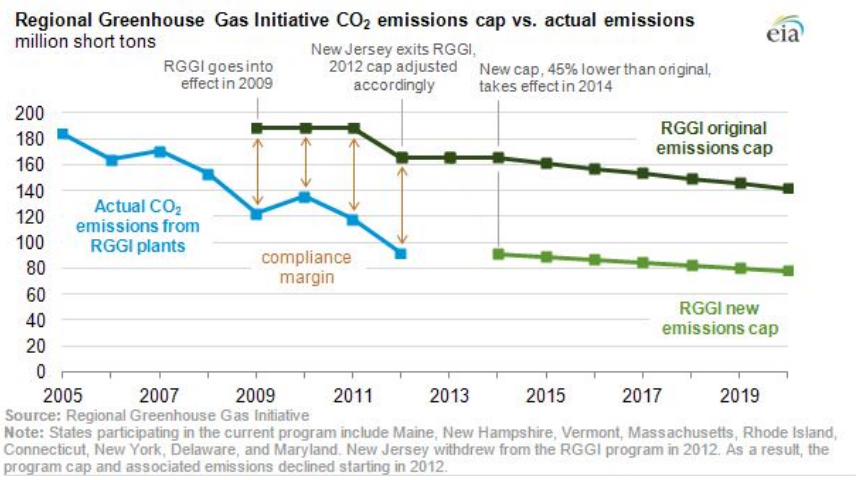
Waxman-Markey was supported by a broad array of environmental, community, and health organizations, labor unions, electric utilities, and manufacturing, industry and energy corporations.[40] It was opposed by a few environmental groups such as Friends of the Earth, which didn't think it went far enough, and some industry groups such as the U.S. Chamber of Commerce and National Association of Manufacturers. It squeaked by in the House, 219-212, with Secretary of State Hillary Clinton and former Vice President Al Gore, who had just won the Nobel Peace Prize for his work on climate, personally lobbying Democratic fence-sitters from coal states.[41] Despite a bipartisan call for support by John Kerry (R-Mass.) and Lindsay Graham (R-SC),[42] the bill died in committee because it did not have enough votes to pass the Senate.

Why did a bill that seemed to hold so much promise in comprehensively addressing climate change meet such a disappointing fate? Several causes have been pointed out. First, it was being debated just on the heels of a major international recession that had particularly affected the housing market, leaving many people homeless due to foreclosures and others underwater on their mortgages. Worries about climate change paled in comparison to immediate concerns about jobs, homes, and retirement, giving an opening for Republicans to highlight the bill's costs and paint the legislation as "cap and tax."[43] Second, opponents could point to troubles with the EU's Emissions Trading Scheme, which were becoming painfully apparent just as Waxman-Markey was being debated. Although ACES would have auctioned off a higher percentage of allowances and mandated that utilities use free allowances to benefit consumers,

critics brought up the surplus in allowances and windfall profits that plagued the European system.[44] Finally, the climate change denial countermovement, headlined by organizations such as the Heartland Institute and Americans for Prosperity, significantly stepped up efforts to discredit the science behind climate change, specifically targeting senators in advance of Senate consideration of cap and trade.[45] Once funded openly by fossil fuel interests such as ExxonMobil and the Koch Brothers, this industry is now bankrolled at almost $1 billion a year in mostly dark untraceable money funneled through a series of conservative foundations.[46]

4. Regional Emissions Trading Programs

Although cap and trade failed on the national level, at least two regional programs are in place in the United States: the Regional Greenhouse Gas Initiative covering nine states in the Northeast, and the Western Climate Initiative, currently covering California and Quebec. Launched in 2009, the RGGI was the first cap and trade program in the United States to reduce carbon dioxide emissions from power plants with a generating capacity above 25 megawatts.[47] Its first goal was to reduce CO_2 emissions 10 percent below 1990 levels by 2018, setting the cap at 188 million tons of CO_2 from 2008 to 2011, then 165 million tons from 2012 to 2013.[48] However, driven by the recession, actual CO_2 emissions from power plants in the nine states had fallen to 91 million tons in 2012, far below the cap.[49] This led to an updated cap of 91 million tons beginning in 2014, or 45 percent below 2005 levels, with subsequent reductions of 2.5 percent



Source: U.S. Energy Information Administration. Accessed at http://www.eia.gov/todayinenergy/detail.cfm?id=14851

per year from 2015 to 2020.[50] Although so far CO_2 emissions from power plants covered by the RGGI have not approached the cap, the program has generated $912 million since 2009 for participating states.[51] Nearly all carbon allowances were sold by auction, with prices ranging from $2.06 to $3.51 to ton of CO_2, all without increasing the cost of electricity.[52] Most states have used the proceeds to improve energy efficiency or develop renewable energy, while a few used some of the money to balance their budgets.[53]

The Western Climate Initiative is a collaboration of seven U.S. states and four Canadian provinces to identify, evaluate, and implement measures to reduce greenhouse gas emissions in participating jurisdictions.[54] Currently only two jurisdictions participate: California, starting in 2013, [55] and linking to Quebec in 2014.[56] California's goal is to return to 1990 levels of greenhouse gas emissions by 2020, while Quebec's is to reduce emissions 20 percent below 1990 levels by 2020.[57] Second in size only to the European Union Emissions Trading Scheme, California and Quebec's cap and trade system tracks seven greenhouse gases -- carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluocarbons (PFCs), nitrogen trifluoride (NF_3), and other fluorinated greenhouse gases – from and industry starting in 2013, plus ground transportation and heating fuels starting in 2015, for emitters of at least 25,000 metric tons of CO_2 equivalent per year. Allowances are distributed by a mix of free allocation and quarterly auctions, with the portion of free allowances declining over time. A price floor of $10 was set for auctioned allowances in 2012, rising 5 percent annually over inflation. Proceeds are to be used for local projects that improve air quality, especially for disadvantaged communities. Utilities must consign their free allowances to auction and use the proceeds to benefit ratepayers.[58]

B. Carbon Tax

Besides emissions trading, the other market-based way to price carbon is through a carbon tax. But as with emissions trading, the success of a carbon tax depends on how it is implemented. In other words, the devil is in the details. Two major places where a carbon tax has been tried are British Columbia, where it has been extremely successful, and Australia, where it was repealed.

1. British Columbia

In 2008, British Columbia instituted a tax of $10 per ton of carbon dioxide equivalent (CO_2e), set to increase by $5 a ton for five years, ending in 2012 at $30 a ton.[59] The tax applied to the purchase or use of any carbon-based fuels in the province, including gasoline, diesel, jet fuel, natural gas, propane, and coal. To minimize administrative costs, the tax is collected in the same way as motor fuels except on natural gas, which is collected at the retail level. At 2012 levels, the tax worked out to 6.67¢ per liter for gasoline, 5.70¢ per cubic meter for natural gas, and 62.31¢ per ton for high heat value coal.[60] The tax is revenue neutral, meaning that all funds are returned to taxpayers through reductions in other taxes, not used for government programs. Each year the Ministry of Finance much present a plan to the legislative assembly for returning carbon tax revenues through tax reductions for individuals and businesses. A major component of tax program is the Low Income Climate Action Tax Credit, designed to provide extra tax relief to low-income individuals and families who spend a higher proportion of their income on fossil fuels.[61] Although British Columbia's carbon tax was set to expire in 2012, the province conducted a review and decided to maintain the tax at 2012 levels, continuing to recycle revenue to taxpayers. In 2013-14, reduction in provincial taxes exceeded the $1.212 million in carbon tax revenue by $20 million.[62]

How successful has British Columbia's carbon tax been? A 2013 analysis by Sustainable Prosperity, a research and policy network based at the University of Ottawa, compared changes in fuel consumption, greenhouse gas emissions, and gross domestic product between British Columbia and the rest of Canada. It found that per capita consumption of petroleum fuels from 2008 to 2012 fell 17.4 percent in British Columbia while rising 1.5 percent in the rest of Canada, that greenhouse gas emissions from 2008 to 2011 fell 10 percent in British Columbia but only 1.1 percent in the rest of Canada, and that GDP from 2008 to 2011 fell 0.15 percent in British Columbia and 0.23 percent in the rest of Canada. In other words, during the time the carbon tax was in place, fuel use and greenhouse gas emissions fell much more sharply in British Columbia than the rest of the country while making virtually no difference to GDP.[63] By 2020, British Columbia's carbon tax is expected to reduce emissions in the province by up to 3 million tons annually, the equivalent of taking almost 800,000 cars off the road each year.[64] Meanwhile, British Columbia has the lowest personal income tax rate in Canada and one of the lowest corporate tax rates in North America. Since the program began, the province has returned $760 million more in tax cuts than it collected in carbon tax revenue.[65] A 2012 poll found that two-thirds of British Columbians strongly (25 percent) or somewhat (39 percent) supported the tax, and that almost six in 10 Canadians outside British Columbia say they would strongly (19 percent) or somewhat (40 percent) support a BC-style carbon tax in their own province.[66]

2. Australia

Australia instituted a carbon tax on July 1, 2012, and repealed it two years later. Whereas British Columbia's carbon tax was simple and transparent in design and implementation, Australia's was anything but. First, the term "carbon tax" was a misnomer for the carbon pricing scheme, which was actually a hybrid between a tax and cap and trade. Although the program involved a fixed price for carbon emissions during its first two years -- $23 per ton in 2012-13

and $24.15 per ton in 2013-14[67] -- Australia was set to link with the European Union Emissions Trading Scheme in 2015, bringing the Australian carbon price in line with the EU price of about $6 per ton. From then on Australian carbon shares would have been traded at market value;[68] however, the entire scheme was repealed before the link to the EU market could take place.

Before it was repealed, the carbon tax was part of Australia's Clean Energy Plan to reduce greenhouse gas emissions 5 percent from 2000 levels by 2020 and 80 percent by 2050.[69] It worked by requiring the country's largest direct emitters, those emitting 25,000 tons of CO_2 equivalent or more, to buy or obtain carbon units, basically permits to pollute, from the government.[70] In 2013 this worked out to about 260 liable entities.[71] Transportation and agriculture were exempt.[72] As in many cap and trade systems, some of the permits were sold while some were given away. Companies in emissions-intensive trade-exposed industries, or industries such as aluminum and cement that emit a lot of CO_2 but are vulnerable to non-taxed imports, received most of the free carbon units, while coal-based power plants and steel producers received the rest.[73] Revenue from the first two years of carbon pricing was to go toward a range of programs including two rounds of tax cuts and increases in pensions, allowances and benefits for households; investments in renewable energy and energy efficient technologies; and support for farmers to pursue climate-friendly methods and enhance biodiversity.[74]

Was the price on carbon in Australia working before it was repealed? A study by Australian National University says yes, finding that emissions during the first two years of the carbon price fell by 29 million tons or 8.2 percent across the National Electricity Market.[75] So why was the Australian carbon tax repealed? Prime Minister Tony Abbot claimed the tax cost Australian households $550 a year in increased energy costs. Advocacy groups countered that

while electricity costs did go up, the increase was due to power companies investing in infrastructure, and that utilities would not lower prices after the tax was repealed.[76]

The real answer to the repeal of the carbon tax lies in Australian politics. The carbon pricing plan was a political stepchild, opposed by both of the country's major political parties, and enacted only as a concession by the left-leaning Labor Party to the Greens in order to form a parliamentary majority during a period of government stalemate in 2011-12. [77] Before enacting the carbon pricing scheme, then Labor Prime Minister Julia Gillard had promised, "There will be no carbon tax under the government I lead." She then erred by allowing the fixed price portion of the scheme to be called a "tax," opening herself up to charges of broken promises and branding as "Ju-Liar" by the opposition. Australia is one of the world's largest producers of coal, and mining companies joined with conservatives and Rupert Murdoch's newspapers – whose articles about the carbon tax were 82 percent negative[78] -- to sweep Gillard out of office and elect Abbot on the promise of repealing the carbon tax. [79] It is no wonder that one evaluation of Australian carbon policy found that it "was poorly thought through, badly implemented, and lacked majority public support before it began. Australia's carbon tax experience is an interesting case study in how not to go about implementing climate change policy."[80]

V. Lessons Learned

What lessons do the experiences of countries around the world with cap and trade and a carbon tax hold for policymakers hoping to address climate change? First, either cap and trade or a carbon tax can be used effectively to lower greenhouse gas emissions at little cost or even boosting the economy – but the policy has to be crafted correctly, implemented transparently, and presented competently. For both policies, accurate data is crucial. With cap and trade, caps should be set at achievable levels that lower emissions incrementally. Allowances need to be

allocated on the basis of actual emissions data, and free allowances must be limited with legal mandates to pass on savings to consumers. With a carbon tax, the tax should be set at a level that influences purchasing behavior without bankrupting households or industry, and levied as broadly as possible rather than focused on one set of emitters. How the proceeds from sale of allowances or taxation are used is also critical. The more direct the benefits are, the more public support they will get, with revenue recycling in the form of dividend checks or tax cuts being most transparent. Programs to offset emissions through clean energy projects may be used, but they should be as straightforward as possible. Border tax adjustments for carbon-based imports may be preferable to special exemptions for exposed industries.

The other important lesson, especially from the experience of cap and trade in the United States and carbon tax in Australia, is that politics matter. Policies as large as a nationwide price on carbon need strong political championship and support, with groundwork laid in a solid communication of climate science, direct connections to the everyday concerns of citizens, and anticipation of counterpoints from the opposition. One crucial point to make is that acting on behalf of the environment does not have to hurt the economy, but in fact can help. Proceeds from pricing carbon through either cap and trade or a tax can be used to boost families, cut taxes, and spur innovation, creating jobs in clean energy economy. Developed countries that have historically emitted most of the carbon pollution now causing climate change face a choice. We can continue the policies of the past, inflicting further harm on the environment and bringing ever greater costs from extreme weather, human health, and national security -- or we can enact new policies to move our economies off of dependence on fossil fuels and into a low-carbon future in which taking care of the environment goes hand in hand with creating prosperity for people. When framed not as a cost but an investment, pricing carbon becomes a small amount to pay to ensure a future for the planet and all the people and other species that live on it.

ENDNOTES

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