HOW TO ENFORCE A CARBON TAX: LESSONS FROM THE MONTREAL PROTOCOL AND THE U.S. EXPERIENCE WITH THE OZONE DEPLETING CHEMICALS TAX

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TABLE OF CONTENTS

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INTRODUCTION

Global climate change is one of the most controversial environmental and political issues of our time. The scientific community has reached a broad consensus that the earth's atmosphere is warming and that anthropogenic greenhouse gas (GHG) emissions contribute to that warming.[1] Yet there is still considerable political debate over the consequences of such warming and what steps, if any, governments should take in response. At one extreme are those that believe voluntary measures to restrict GHG emissions are sufficient and that mandatory measures are unnecessary and would weaken economies. At the other extreme are those who believe that GHG emissions should be reduced without regard to the economic consequences of such reductions. Somewhere in the middle is a growing consensus that a balanced approach to curbing GHG emissions is necessary and feasible. Many economists believe that a carbon tax is the most effective option for reducing GHG emissions. They argue that it is superior to other market-based approaches because it is simpler to implement, transparent, provides price certainty, and is more efficient.[2]

Several countries have agreed with this line of reasoning and implemented carbon taxes. Australia recently passed a carbon tax that

1. Anthropogenic emissions of greenhouse gases are generally understood to include emissions caused by human activity such as a car's exhaust or emissions from a coal-fired electric energy plant. COUNCIL ON ENVTL. QUALITY, ANNUAL REPORT ch. 1 (1993), *available at* http://clinton4.nara.gov/CEQ/reports/1993/chap1.html (last visited Feb. 21, 2013).

2. Roberta F. Mann, *The Case for the Carbon Tax: How to Overcome Politics and Find our Green Destiny*, 39 ENVTL. L. REP. NEWS & ANALYSIS 10118, 10122 (2009); *see also* Michael J. Zimmer, *Carbon Tax: Ready for Prime Time?*, 8 SUSTAINABLE DEV. L. & POL'Y 67, 68 (2008).

began on July 1, 2012.[3] Other countries, such as the Netherlands, Sweden, Norway, Denmark and Costa Rica, have had carbon taxes since the early 1990s. Further, South Africa is looking to introduce a carbon tax, which will be incorporated in its treasury's budget this year.[4] Although the United States does not have a carbon tax, it has support from the majority of Americans.[5]

However, before Congress considers enacting a carbon tax, it should examine a similar tax designed to reduce the use of ozone depleting substances (ODS). While there are differences between a carbon tax and an ODS tax, important lessons can be learned from the United States' experience with the ODS tax. This paper will examine these lessons in the context of a carbon tax. Part I presents an overview of environmental taxes and the advantages of environmental taxes as a government-imposed means of pollution control. Part II presents the international and domestic experience with an ODS phase-out including the United States' imposition of the Ozone Depleting Chemicals Tax. Part III outlines enforcement challenges that arose under the ODS tax and their significant potential for repeat under a carbon tax. Part IV discusses carbon tax limitations and addresses ways to prevent a repeat of ODS tax problems. Throughout this paper, we have highlighted the structural and legal challenges that may arise—and must be considered—in the practical implementation of a carbon tax.

I. ODS AND CARBON TAXES: A MARKET APPROACH TO POLLUTION CONTROL

A carbon tax is a market-based means of reducing environmental pollutants. ODS and excess concentrations of GHGs in the atmosphere are environmental pollutants. When released, ODS migrate to the upper atmosphere and destroy the ozone layer, which protects the earth from the sun's harmful UV-B rays.[6] This destruction is linked to medical problems

3. Rod McGuirk, *Australia's Senate Passes Carbon Tax*, GREENWIRE (Nov. 8, 2011), http://www.eenews.net/Greenwire/2011/11/08/archive/12?terms=australia+carbon+tax.

4. Thompson Reuters Point Carbon News, *Recent Global Carbon Politics*, CARBON MKT. N. AM., 5 (Feb. 24, 2012), http://www.pointcarbon.com/polopoly_fs/1.1767638!CMNA20120224.pdf.

5. A recent study by the Yale Project on Climate Change Communication found that the majority of Americans support a revenue-neutral carbon tax. *Majority in U.S. Support Revenue-Neutral Carbon Tax, Survey Says*, ENVIRONMENT360 (Nov. 22, 2011), http://e360.yale.edu/digest/majority_in_us_support_revenue-neutral_carbon_tax_survey_says/3222.

6. *See Ozone Layer Protection Glossary*, U.S. Envtl. Prot. Agency, http://www.epa.gov/ozone/defns.html (last visited Dec. 15, 2011) (providing that various ozone-depleting substances accelerate the destruction of the stratospheric ozone layer).

such as skin cancer and cataracts.[7] Also impacting the atmosphere is an increase in anthropogenic GHG emissions, which causes global temperature rise.[8] The impacts of climate change include rising sea levels, exacerbated droughts, proliferation of disease vectors, and biodiversity loss.[9] Two distinct problems, ODS and GHGs are similar in that both anthropogenic pollutants are released by diverse sources in a multitude of countries, the pollutants stay in the atmosphere for a very long time, and their effects are felt globally, rather than in a limited location near the emission source.[10]

Viewed in economic terms, pollution—such as emissions of ODS and GHGs—results from market failure.[11] Pollution, from the production of goods and services, generates costs to parties outside a market transaction, an effect that is referred to as a negative externality.[12] For example, when our society consumes ODS or fossil fuels, it creates pollution that has a societal cost—everyone suffers the consequences of a depleted ozone layer and climate change.

Because no country controls the earth's atmosphere, some form of international agreement was required to phase-out ODS, and is currently required to reduce GHG emissions.[13] Governments can address pollution through a variety of approaches, most of which can be categorized as voluntary, command-and-control, or market-based approaches.[14] In the near term, a carbon tax can be a fairly optimal market-based solution for incentivizing energy efficiency measures and reducing GHG emissions. With a set price on GHGs, businesses and consumers can plan ahead, making more prudent and efficient decisions. A carbon tax is simple to

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7. *See Health and Environmental Effects of Ozone Layer Depletion*, U.S. Envtl. Prot. Agency, http://www.epa.gov/ozone/science/effects/ (last visited Feb. 27, 2013) (linking UVB radiation to nonmelanoma skin cancer and cataracts).

8. WORKING GROUP II OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY (Martin Parry et al. eds., 2007), *available at* http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html (last visited Feb. 27, 2013) (assessing the impacts of anthropogenic CO_2 increases).

9. *See* THE PEW CENTER ON GLOBAL CLIMATE CHANGE, CLIMATE CHANGE 101: UNDERSTANDING AND RESPONDING TO GLOBAL CLIMATE CHANGE (Jan. 2011), *available at* http://www.c2es.org/docUploads/climate101-fullbook.pdf (summarizing the effects of climate change on the anthropogenic world).

10. *See* Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 HARV. ENVTL. L. REV 1, 2 (2007) (advocating the adoption of an international agreement in order to effectively address global climate change).

11. SCOTT J. CALLAN & JANET M. THOMAS, ENVIRONMENTAL ECONOMICS AND MANAGEMENT: THEORY, POLICY AND APPLICATIONS 29 (2d ed. 2000).

12. *Id.* at 76.

13. *Id.* at 99.

14. Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming Than Cap and Trade*, 28 STAN. ENVTL. L. J. 3, 20–21, 28 (2009).

adjust, and it can have a built-in evaluation period at which the tax level can be reset if market-based changes are too weak or too strong.[15] Yet as the United States' experience with the ODS phase-out demonstrates, a carbon tax has limitations. Those limitations become apparent upon examination of the legal mechanisms used to phase out ODS.

II. OZONE DEPLETING SUBSTANCES PHASE-OUT AND TAX

A. International Command-and-Control Regulation to Phase Out Use of ODS

In 1987, the United States signed the Montreal Protocol on Substances That Deplete the Ozone Layer (Montreal Protocol),[16] an international agreement to phase out ODS.[17] The Montreal Protocol provides ODS phase-out timelines based on the potency of the ODS.[18] In developed countries[19] such as the U.S., the phase-out began in 1989 when command-and-control regulations froze production of the most harmful group of ODS, chlorofluorocarbons (CFCs), at 1986 levels.[20] Production was further reduced by seventy-five percent by 1994, and, with limited exceptions, completely phased out by 1996.[21] The next most harmful group of ODS, mainly hydrochlorofluorocarbons (HCFCs), will be reduced by ninety percent by 2015 and by 100% by 2030.[22]

In developing countries, the phase-out of CFCs began in 1999,[23] when production was frozen at the average of 1995–1997 levels.[24] Production was further reduced by fifty percent in 2005, followed by eighty-five percent in

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15. Zimmer, *supra* note 2, at 69.

16. Protocol on Substances That Deplete the Ozone Layer (Montreal Protocol), Sept. 16, 1987, 26 I.L.M. 1541, 1550.

17. *Id*. at 1541.

18. Internal Revenue Serv., *Ozone Depleting Chemicals (ODC) Excise Tax Audit Techniques Guide*, http://www.irs.gov/Businesses/Small-Businesses-&-Self-Employed/Ozone-Depleting-Chemicals-(ODC)-Excise-Tax-Audit-Techniques-Guide (last updated Apr. 30, 2013).

19. The Montreal Protocol divides countries between Article II (developed countries) and Article V (developing countries) based on historical uses of ODS. This division is generally consistent with the division between developed and developing countries and we use the later terminology because it is more easily understood.

20. *Ozone Depleting Chemicals*, *supra* note 18.

21. *Id.*

22. Protection of Stratospheric Ozone: Allowance System for Controlling HCFC Production, Import and Export, 40 C.F.R. § 82 (2003).

23. Elizabeth R. DeSombre, *The Experience of the Montreal Protocol: Particularly Remarkable, and Remarkably Particular*, 19 UCLA J. ENVTL. L. & POL'Y 49, 73–74 (2001).

24. *Id.*

2007, and 100% (i.e., the complete phase-out) in 2010.[25] For developing countries, HCFCs will be frozen in 2016 at 2015 levels and reduced to a 100% phase-out by 2040.[26]

Notably, the Montreal Protocol's phase-out schedule does not include a restriction on consumption. ODS that has been lawfully produced or imported in a country can continue to be used by consumers until stockpiles are depleted. In addition, the Protocol allows for the continued consumption and trade of recycled or "used" ODS that is reclaimed to proper standards for re-use. As will be discussed later in this paper, the continued use of lawfully stockpiled and recycled ODS made tracking ODS difficult, and provided avenues for black market smuggling of newly manufacturing ODS in developing countries. A similar problem could arise with trade in carbon-intensive goods and fossil fuels. In spite of these enforcement issues and the incomplete nature of the phase-out, the Montreal Protocol has already been successful at decreasing ODS. Groups such as NASA, NOAA, and EPA all applaud the success of the Montreal Protocol, which has been referred to as the most successful multilateral environmental agreement to date.[27] As a result of the Protocol, ODS has decreased in the atmosphere, and the ozone hole is on a path to recovery.[28]

B. Regulation of ODS in the United States

1. Clean Air Act Regulations

In the U.S., Congress incorporated much of the Montreal Protocol's phase-out requirements in Title VI of the Clean Air Act (CAA), 42 U.S.C. § 7671 et seq., and the accompanying Stratospheric Ozone Protection Regulations, 40 C.F.R. Part 82. The "phase-out" codified therein is a near-complete ban on the production and import of ODS under the time frames

25. THE TRANE COMPANY, CFC FREE: THE CHALLENGE OF CHANGE (1998), *available at* http://www.usgbc.org/Docs/LEED_tsac/Energy/TRANE-CFC%20Free.pdf.

26. *New Stronger Montreal Protocol Controls Reduce Developing Country HCFC Emissions about 58 Percent*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/ozone/intpol/pograph.html (last updated Aug. 19, 2010).

27. Press Release, Nat'l Aeronautics & Space Admin., Tabataha Thompson, NASA Keeps Eye on Ozone Layer Amid Montreal Protocol's Success,, (Sept., 13, 2007), *available at* http://www.nasa.gov/home/hqnews/2007/sep/HQ_07192_montreal_protocol.html; *Study: Ozone Layer's Future Linked Strongly to Changes in Climate*, NAT'L OCEANIC AND ATMOSPHERIC ADMIN. (Feb. 16, 2011), *available at* http://www.noaanews.noaa.gov/stories2011/20110216_ozone.html; *The Montreal Protocol on Substances that Deplete the Ozone Layer*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/ozone/intpol/index.html (last visited Feb. 27, 2013).

28. *Montreal Protocol: Frequently Asked Questions and Answers*, U.S. ENVTL. PROT. AGENCY, *available at* http://www.epa.gov/ozone/downloads/MP20_QandA.pdf (last visited Feb. 27, 2013).

specified in the Montreal Protocol.[29] The most harmful group of ODS (mostly CFCs) are identified as Class I controlled substances and the remainder (mostly HCFCs) are identified as Class II controlled substances. The U.S. agreed to accelerate its phase-out of the most harmful Class II substances, requiring significant reductions in 2004 and 2010.[30] As with the Montreal Protocol, use of lawfully stockpiled or recycled ODS is legal under the CAA.[31] Lawful production or importation that takes place until the phase-outs are complete is regulated through a consumption allowance scheme.[32] Companies that had produced ODS prior to the phase-out were awarded consumption allowances that permitted them to continue to import or produce ODS at proscribed levels consistent with the ODS phase-out schedule. As will be discussed further, the allowance scheme also created a challenge for law enforcement that initially did not fully appreciate which companies did and did not have these allowances.

2. The United States' ODS Domestic Tax

To accelerate the removal of ODS from the market and encourage the creation and use of non-ozone depleting alternatives, Congress also established an excise tax on ODS.[33] This tax, known as the Ozone Depleting Chemicals Tax, is designed to complement the command-and-control-based phase-out in the CAA.[34] The tax is designed to decrease lawful use of stockpiled or recycled ODS after the phase-out dates. This tax is imposed on the sale or use[35] of ODS by an importer or manufacturer.[36]

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29. UNITED NATIONS ENV'T PROGRAMME, HANDBOOK ON THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER (7th ed. 2006), *available at* http://ozone.unep.org/Publications/MP_Handbook/Section_1.1_The_Montreal_Protocol.

30. *HCFC Phaseout Schedule*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/ozone/title6/phaseout/hcfc.html (last visited Feb. 27, 2013).

31. *See* 40 C.F.R. § 82.154(g),) (establishing exceptions for reclaimed or recycled Class I and II substances under the CAA).

32. 42 U.S.C. § 7671c (2012).

33. The tax was included in the Omnibus Budget Reconciliation Act of 1989, Pub. L. No. 101-239, 103 Stat. 2364. *See generally* Protection of Stratospheric Ozone, 40 C.F.R. pt. 82 (implementing the Montreal Protocol in the U.S.). It went into effect on January 1, 1990.

34. 26 C.F.R. §§ 52.4681, 52.4682 (2012).

35. ODS are considered to be used in the manufacture of a product if it is "[i]ncorporated into the product . . . [r]eleased in to the atmosphere in the process of manufacturing the product . . . or [is] [o]therwise used in the manufacture of the product." 26 C.F.R. § 52.4682-3(d)(2) (2012). Therefore, substances used in the production process that are not physically incorporated in the final product are taxed. The predominant production method approach is used if there is no information about the amount of ODS used in the production process.

36. I.R.C. § 4681(a)(1) (2006).

The excise tax rate is calculated by multiplying three factors: (1) the base tax rate; (2) the ozone depletion factor of the ODS;[37] and (3) the pounds of ODS.[38] The base tax rate was first set at $1.37 per pound[39] and then increased to $5.35 per pound in 1995, with an annual forty-five cents increase.[40] Currently, the base tax rate is $12.55 per pound.[41]

Additionally, a floor stock tax is imposed on "any person (other than the manufacturer or importer of the [ODS]) that holds [ODS] for sale or for use in manufacturing on January 1 of each year."[42] The excise tax and floor tax level the playing field for ODS sales. Manufacturers, who might stockpile ODS that was manufactured prior to the phase-out, must still pay the excise tax at the rate in place when the ODS is eventually sold. Likewise, a person who holds ODS for longer than a year has to pay a yearly floor stock tax on any unsold ODS. In this manner, both ODS manufacturers and wholesalers pay an equivalent tax on the ODS they hold or sell.[43]

3. Excise Tax on Imports into the United States

The tax code addresses the concern of imported ODS by subjecting all lawful imports of ODS, or of products containing ODS, to the same excise tax. The import tax is imposed on "the date the [ODS] is first sold or used by its manufacturer or importer" and is subjected to the same tax rates as imposed on U.S.-manufactured ODS.[44]

III. ENFORCEMENT CHALLENGES WITH THE ODS PHASE-OUT AND TAX

A. ODS Phase-Out Schedule and Border Tax Incentivized Smuggling

Prior to the Montreal Protocol phase-out period, lower ODS production costs in developing countries created an incentive to manufacture ODS in developing countries for eventual lawful import to the United States and

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37. The ozone depletion factor reflects the potency of each individual ODS with values ranging from 0.1 to 10.0. *Ozone Depleting Chemicals*, *supra* note 18.

38. *Id.*

39. CALLAN & THOMAS, *supra* note 11, at 243.

40. *Ozone Depleting Chemicals*, *supra* note 18.

41. *Ozone-Depleting Chemicals Excise Tax*, KPMG, http://www.kpmg.com/us/en/industry/japanese-practice/pages/2010-issue2-article1.aspx (last visited Feb. 27, 2013).

42. *Ozone Depleting Chemicals*, *supra* note 18.

43. There are a few tax exemptions. One notable exemption is for use in further manufacture, i.e., use as a feedstock. *Id.*

44. *Id.*

other developed countries. Once the phase-out period began, this disparity in production costs created an immediate financial incentive for smuggling. Added to that incentive was the additional ten years that the Montreal Protocol provided developing countries to continue production of the most harmful group of ODS before requiring their phase-out.[45] Thus, as the phase-out commenced, supply of ODS in developed countries tightened and the economic incentive to illegally import ODS manufactured in developing countries increased. In the U.S., the profit for illegal ODS imports from developing countries was further heightened by the ODS tax. As a point of reference, illegally smuggled ODS through the port of Miami was second only to cocaine during the early stage of the phase-out in the mid-1990s.[46]

B. United States Initially Unprepared to Uncover Entities Gaming the ODS Phase-Out and Tax

When the phase-out commenced, the U.S. was ill-equipped to respond to ODS smuggling. On the one hand, the U.S. Environmental Protection Agency (EPA) was well aware of the companies that had consumption allowances and was careful to check these companies' reported use of the allowances to make sure that they were not importing more than their share of ODS; however, EPA was largely unaware that companies with no consumption allowances were importing ODS completely outside the regulatory scheme. U.S. Customs Service (Customs)[47] on the other hand had excellent information on the companies that were importing CFCs, but did not know about the Montreal Protocol or the CAA phase-out schedule. Smugglers were able to exploit this communication failure between EPA and Customs and illegally imported hundreds of thousands of pounds of ODS, largely without detection.[48] This enforcement gap created immense uncertainty in the marketplace, and threatened to undermine the Protocol.[49] However, when law enforcement was alerted to the problem, its forceful

45. *See* UNITED NATIONS ENV'T PROGRAMME, *supra* note 29 (Article 5, section 1 entitles developing countries to a ten-year delay for complying with the control measures set out in Articles 2A to 2E.).

46. STEPHEN O ANDRESON & K MADHAVA SARMA, PROTECTING THE OZONE LAYER: THE UNITED NATIONS HISTORY 184 (Lani Sinclair ed., 2002).

47. U.S. Customs Service is now U.S. Customs and Border Protection. *About CBP,* CBP.GOV, http://www.cbp.gov/xp/cgov/about (last visited Feb. 27, 2013).

48. Steven P. Solow, *The Big Chill: How Federal Agencies Are Working Together to Stop CFC Smuggling*, 12 NAT'L. ENVTL. ENFORCEMENT J. 9, 11 (1997).

49. It was not until a border agent in the Miami area had her car air-conditioning replaced (a repair involving ODS) that the U.S. Customs started to become generally aware of the Montreal Protocol and the phase-out of ODS. When the inspector returned to her duty post, she was alarmed at the quantity of ODS that was being imported into South Florida without restriction. She contacted EPA and discovered that many of the noted importers were illegal. *Id.* at 11.

response ultimately curtailed the black market and helped level the playing field for those businesses that were abiding by the new laws.[50]

C. Smuggling and Consumer Preferences Prevented Intended Shift to ODS Alternatives

The ODS smuggling described above and consumer preferences combined to prevent the ODS tax from having its intended salutary effect. The ODS tax was designed to incentivize a switch to ODS alternatives under the belief that the ODS tax along with decreased supply would increase ODS prices and make ODS alternatives more attractive. In some consumer markets, however, this switch to alternatives never occurred, in part because the price point for the alternatives was never reached. For example, automobile owners were not willing to pay $250 to retrofit their cars to run their air-conditioning on ozone friendly alternatives when they could simple fill up with CFC-12 or Freon™[51] for a lower price. The price stayed lower in part because of a ready supply of black market-smuggled ODS, but also in part because of consumer preferences not to seek retrofits. By the time the prices did rise, most consumers had already bought new cars that ran on ozone friendly HFC. Thus, the retrofit solution that Congress hoped to achieve from the tax never came to full fruition. As the ODS tax demonstrates, if environmental taxes are poorly designed or enforced, they may not have the intended effect of reducing pollution and fostering use of more environmentally friendly products. Further, even if properly designed, an environmental tax is better suited to reduce consumption than it is to bolster the market for alternatives. Consumers are slow to make major changes in buying patterns and, as the case with car air conditioning shows, they may forego air conditioning or even pay more to run their cars on ODS than to retrofit and switch to alternatives.

IV. APPLICATION OF ODS DEFICIENCIES TO A CARBON TAX

If a carbon tax is implemented, Congress should anticipate that many of the same problems with ODS could be repeated. Focusing first on the potential for illegal imports and exports, our review below suggests that black market smuggling may occur in certain markets, and will require training and additional government resources. The carbon-related import

50. *Id.* at 9.

51. Freon™ is the DuPont brand name for CFCs, HCFCs, and similar compounds. *Chlorofluorocarbons (CFCs)*, NOAA, http://www.esrl.noaa.gov/gmd/hats/publictn/elkins/cfcs.html (last visited Feb. 27, 2013).

with the profit margin most comparable to ODS is carbon-intensive goods, followed by fossil fuels.

A. Smuggling of Carbon Intensive Goods

Carbon-intensive goods—a category of imports likely included under a carbon tax—may be relatively easy to smuggle in ways consistent with ODS smuggling. Carbon intensive goods include iron, steel, steel mill products, aluminum, cement, glass, pulp, paper, chemicals, industrial ceramics, and could include other products manufactured by processes emitting significant quantities of GHGs.[52]

In the context of ODS smuggling, the failure to train law enforcement on the new regulatory scheme allowed smugglers to import ODS without any significant subterfuge. It was not until law enforcement became aware of both the regulatory scheme and the smuggling that smugglers needed more creative ways to illegally import ODS. One of the more common schemes was to import virgin ODS misrepresented as recycled ODS (which were legal).[53] This tactic could be used for carbon-intensive goods. Under the CAA, "used" ODS were exempt from import restrictions and unlimited quantities could be imported into the U.S. for reclamation and eventual reuse.[54] Carbon-intensive goods, such as steel, aluminum, glass, and oil, are commonly recycled, and shipping manifests could be falsified based on claims of recycled goods. Document falsification is neither labor- nor resource-intensive, and importers may be inclined to falsify their documents for only a small profit margin. As was the case with ODS, customs officials without in-depth training will have no way of determining whether a good is virgin or reclaimed and knowledge of such facts would require investigation in the exporting country,[55] an intensive step infrequently undertaken.

One of the largest cases of ODS fraud occurred with the smuggling of a fire-fighting chemical known as Halon 1301. In 1997, China was the largest country of origin for U.S. imports of Halon 1301.[56] Virtually all the imports

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52. America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong. § 4694(a)(5)(A), (6) (2009).

53. Lary Cook Larson, *The Art of Smuggling: What Customs Officers Need to Know*, *in* U.N. ENV'T PROGRAMME, ILLEGAL TRADE IN OZONE DEPLETING SUBSTANCES: IS THERE A HOLE IN THE MONTREAL PROTOCOL 16 (2001).

54. *See* 40 C.F.R. § 82.154(g), (creating exceptions for reclaimed or recycled Class I and II substances under the CAA).

55. *Id*.

56. *Environment—China: Calls to Block 'Illegal' Chinese Trade in CFCs,* Inter Press Service, (Nov. 12, 1998), http://www.ipsnews.net/1998/11/environment-china-calls-to-block-illegal-chinese-trade-in-cfcs.

of Halon 1301 originating in China during 1997 were labeled as recycled.[57] However, suspicions quickly arose—China had only one Halon 1301 reclamation plant, which was not capable of producing the imported quantity of halons.[58] As the real story surfaced, it became clear that virgin halons were labeled as recycled and mixed with shipments of recycled halons. Numerous export companies were used to divide up shipments and avoid attention, a plan which succeeded for roughly a year.[59]

Shipments of carbon intensive goods could also be mislabeled with a false country of origin. Under such a scenario, the falsely listed country of origin would be a country with an equivalent carbon export duty, but the real country of origin would be one without any tax or equivalent restriction on carbon intensive goods. This is comparable to ODS smuggling, where importers used a false country of origin to import large quantities of ODS. For example, also in the case of Halon 1301, seventy tons were allegedly imported in the U.S. from Italy, despite Italy's prohibition against halon exports to developed countries.[60]

In addition to mislabeling, other smuggling methods could be utilized for carbon intensive goods. ODS were smuggled through transshipment and triangulation,[61] two types of misrepresentation. Transshipment occurs when a ship stops in an intermediate country—while in transit to a named country—and ODS are switched out and sold on the black market.[62] The empty containers continue on to the named country and the ODS stay in the transit country for sale on the black market. For example, CFCs from Northern Europe were exported to South America on ships that stopped in Spain.[63] The ODS never made it to South America, and the importing company in South America did not exist.[64] In triangulation, ODS are shipped to another country, disguised, and sent to a developed country where they are illegally imported.[65] In the case of ODS, European countries would send the ODS to a European outpost under colonial rule—in the Caribbean, Canary Islands, or French Pacific—where the ODS would be disguised and returned to Europe.[66] Other known methods of ODS

57. *Id.*
58. *Id.*
59. Julian Newman, *Illegal Trade in Ozone-Depleting Substances*, *in* STEPHEN O. ANDERSEN & K. MADHAVA SARMA, U.N. ENV'T PROGRAMME, PROTECTING THE OZONE LAYER: THE UNITED NATIONS HISTORY 184 (Lani Sinclair ed., 2002).
60. *Id.*
61. Larson, *supra* note 53, at 17.
62. *Id.*
63. Newman, *supra* note 59.
64. *Id.*
65. Larson, *supra* note 53, at 51.
66. Newman, *supra* note 59.

smuggling included shipping ODS cylinders as "returned merchandise,"[67] and falsely labeling full cylinders as empty containers. All of these methods were used to smuggle ODS into the U.S. and could be repeated again with carbon intensive goods.

B. Smuggling of Fossil Fuels

In addition to the smuggling of carbon intensive goods, a carbon tax may also lead to the smuggling of fossil fuels. The chart below shows the price increase for gasoline, coal and natural gas that would result for a domestic carbon tax comparable to Australia's.

Short Term Energy Price Impacts of $23.81 / tonne CO_2 tax				
	Unit	Price per Unit (in dollars)	Tax per Unit (in dollars)	Price Increase (%)
Gasoline	Gal	3.92	0.21	5.72
Coal	MMBtu	4.87	2.47	102.87
Natural Gas	MMBtu	4.91	1.19	32.00

We examine the market for each of these fuels and the potential for smuggling in more detail below.

1. Petroleum

A look at the quantity of fossil fuel imports shows that refined petroleum is the fossil fuel most likely to be smuggled. The United States currently imports about 3.5 million barrels per day of refined petroleum.[68] Such a quantity creates numerous smuggling opportunities,[69] including bunker fuels in shipping. A price increase will drive ships to fuel or refuel in countries without a carbon tax.[70] Fuel use is harder to track on ships, making a surcharge more difficult to impose.[71]

Fuel smuggling is already an issue on a small scale. Chartered ships are buying more fuel than needed and doctoring consumption records to show

67. Larson, *supra* note 53, at 17.
68. Gilbert Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENVTL. L. REV. 499, 527 (2009).
69. *Id.* at 529.
70. *Id.*
71. *Id.*

that all the fuel is used when it is not.[72] Currently, shipping companies use this illegal fuel themselves, but if the fuel price rise from a carbon tax is large enough, they will have the incentive to sell it on the black market instead.

A large smuggling potential for fossil fuels also lies with aviation fuels, particularly in regard to international flights. Fuel for domestic flights is charged at the refinery, but it is impossible to know if the fuel will be used domestically or internationally.[73] The International Civil Aviation Organization (ICAO) prohibits taxing fuel for international flights.[74] If the United States violates this treaty or renegotiates it to allow the carbon tax, a smuggling and leakage problem will arise. Whenever possible, airplanes will simply fuel or refuel in countries without a carbon tax. Fuel left over from international flights could be used for domestic flights.

A similar smuggling problem could arise on an individual level. Individuals could drive across the border to Canada or Mexico and fill their tanks with gas to avoid paying a carbon tax. This is comparable to Canadians driving to the U.S. to purchase cigarettes to avoid Canada's steep cigarette tax. Although this smuggling is at a very small scale, and will have a minimal impact on CO_2 emissions, it must still be considered. The scale of this smuggling problem may never be large enough to cause the carbon tax to fail; however, it will prevent a level playing field for domestic supply.

2. Coal Smuggling

Although coal will have over a ninety percent price increase from a carbon tax, this profit margin may not be enough of an incentive to engage in a more labor and resource-intensive means of smuggling. For example, it would be difficult to hide enough coal in the hull of a ship or the back of a truck to make a profit. Smuggling of enough coal to make a profit would require the use of other techniques, such as smuggling by means of misrepresentation and falsified documents. For example, if a shipment of coal could be misrepresented as another product, the incentive to smuggle may be strong enough. Additionally, the total U.S. recoverable coal

72. *See, e.g.*, Joint Factual Statement at 3, United States. v. Mislang, 2:11-cr-00262-HGB-ALC (E.D. La. 2011), EFC No. 15 (providing an example of an instance in which a commercial cargo ship master admitted to altering reports on weather conditions in order to claim maximum fuel consumption regardless of whether the fuel was actually used).

73. Metcalf & Weisbach, *supra* note 68, at 529.

74. *Id.* at 528–29 (citing Int'l Civil Aviation Org. [ICAO], Convention on International Civil Aviation, art. 24, Dec. 7, 1944, T.I.A.S. No. 1591, 15 U.N.T.S. 295 (9th ed., ICAO Doc. 7300/9, 2006)).

reserves are 17,937 million short tons,[75] and thus the supply shortage that was observed with ODS will not be present to increase prices above and beyond the increase from the tax.

3. Emissions Increases from U.S. Coal Exports

The vast supply of U.S. coal could give rise to increased GHG emissions as coal is exported to and combusted in countries without a carbon tax or equivalent carbon emission reduction program. This problem is more than theoretical as there is already a coal export terminal planned for Washington's Port of Longview.[76] If approved, this terminal is expected to export over five million tons of coal annually.[77] Coal companies are also looking at two Oregon ports—the Port of Morrow and the Port of St. Helens—for additional coal exports.[78] Development of such coal export terminals will increase the quantity of coal exported, and given the geography of these ports, it is likely to be exported to China and other Asian countries without a tax or otherwise imposed price on carbon.

Further, reverse smuggling could occur through these ports. Exporters may falsify export documents showing that the coal was exported and then could turn around and sell the coal domestically, at a hefty profit.

4. Natural Gas

Even though most domestically used natural gas is produced in the U.S., there are forty-nine pipeline locations and eight liquefied natural gas facilities where natural gas is imported or exported.[79] This number could increase substantially as production increases due to hydraulic fracturing. However, given the nature of these facilities and their tight regulatory oversight, smuggling seems unlikely in comparison to other fossil fuels. Nonetheless, as natural gas exports increase, so does the potential to divert

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75. U.S. ENERGY INFO. ADMIN., RECOVERABLE COAL RESERVES AND AVERAGE RECOVERY PERCENTAGE AT PRODUCING MINES BY STATE (2011), *available at* http://www.eia.gov/coal/annual/pdf/table14.pdf.

76. Progressive Railroading, *Millennium Bulk Terminals to Build Export Coal Facility at Washington Port* (Feb. 27, 2012), http://www.progressiverailroading.com/class_is/article/Millennium-Bulk-Terminals-to-build-export-coal-facility-at-Washington-port--30059#.

77. Felicity Barringer, *Another Setback for a West Coast Coal Port*, N.Y. TIMES (Dec. 30, 2010), http://green.blogs.nytimes.com/2010/12/30/another-setback-for-a-west-coast-coal-port.

78. *Companies Sizing Up Oregon Ports for Coal Exports*, LONGSHORE & SHIPPING NEWS (June 20, 2011), http://www.longshoreshippingnews.com/2011/06/companies-sizing-up-oregon-ports-for-coal-exports.

79. U.S. Energy Info. Admin., *About U.S. Natural Gas Pipelines*, EIA.GOV, http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/index.html (last visited Feb. 17, 2013).

natural gas—intended for export—back into the domestic market to capture a higher price. Smuggling is a possibility even though the natural gas market is narrow and tightly regulated.[80]

V. APPLYING LESSONS LEARNED TO A CARBON TAX

A. Training and Resources for Administering a Carbon Tax and Corresponding Border Tax

In the U.S., one of the major problems with the ODS tax was enforcement. To help reduce smuggling, effective enforcement systems must be in place. Customs and EPA staff, as well as other relevant agencies, should be well educated about the means of smuggling and the types of fossil fuels and carbon intensive commodities that might be smuggled. Particularly, they should be trained to recognize fraudulent documents and to distinguish between virgin and recycled fuels and goods. Money for additional investigators and training should be included in any carbon tax legislation. Without adequate enforcement, smuggling will rise alongside the increasing carbon tax and could threaten the effectiveness of the tax.

B. Imposing a Border Tax on Imports

Border adjustments are critical for a carbon tax to be effective. A border tax ensures that imports from countries without a comparable emissions price are not given a comparative advantage.[81] It also prevents leakage. Specifically, leakage can occur when there is a shift of energy production to countries without a price on emissions, where fossil fuels and energy intensive goods can thereby be extracted and/or manufactured at a lower cost and then imported back into the countries such as the U.S. that have imposed a price on emissions.[82] The draw of industry to countries with

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80. *See, e.g.*, Laurel Brubaker Calkins & Carlos Manuel Rodriguez, *Pemex Lawsuit Targets U.S. Firms in Gas Smuggling Ring*, Bloomberg.com (June 7, 2010), http://www.bloomberg.com/news/2010-06-07/pemex-lawsuit-targets-basf-murphy-energy-over-natural-gas-smuggling-ring.html (reporting a lawsuit against U.S. companies for allegedly smuggling natural gas into the country).

81. According to a recent study by the MIT Joint Program on the Science and Policy of Global Change, a carbon price (which could be imposed as a border tax) is a better means of controlling leakage and reducing GHG emissions abroad compared to a border adjustment requiring importers to purchase emissions allowances. A carbon price of only one-tenth of a cent would achieve GHG reductions comparable to this border adjustment. NIVEN WINCHESTER, SERGEY PALTSEV & JOHN REILLY, WILL BORDER CARBON ADJUSTMENTS WORK? 15 (2010).

82. Bernd G. Janzen, *International Trade Law and the "Carbon Leakage" Problem: Are Unilateral U.S. Import Restrictions the Solution?*, 8 SUSTAINABLE DEV. L. & POL'Y 22, 22 (2008).

lower manufacturing costs is an issue of serious concern to U.S. manufacturers and can only be addressed through an imposition of a border tax.[83]

C. Tax on Exports

In addition, serious consideration must be given to a tax on exports. If no such tax is imposed, nothing would prevent fossil fuels such as coal from being extracted in the U.S. and then exported and combusted in a country without carbon regulation, and carbon intensive goods could also be exported to these countries for consumption. As mentioned, this is an issue of concern for the Washington State terminal, as it may significantly open this market in Asia. Taxing such exports could disadvantage U.S. businesses in the global marketplace, but the failure to do so might undermine the tax's intended purpose of reducing carbon emissions.

D. Compliance with the WTO Border Adjustments

The imposition of a border tax raises the question of how to design a tax that is: (1) harmonized with other countries' efforts to regulate GHG emissions[84]—regardless of whether other countries use a tax or other mechanism to reduce carbon emissions; and (2) takes into account imports from countries that do not regulate such emissions. In order to be enforceable, border adjustments must comply with global trade law under the World Trade Organization (WTO).[85] Border adjustments implicate two notions central to the WTO:

> (1) the "national treatment" principle of Article III of the General Agreement on Tariffs and Trade ("GATT"), which, in essence, obligates WTO Members to ensure that imported goods are subjected to regulatory and tax treatment no more burdensome than the treatment to which the same goods, produced domestically, are subjected; and
>
> (2) the GATT Article XX defense, which allows WTO Members to take discriminatory action against imports where "necessary to

83. Metcalf & Weisbach, *supra* note 68, at 540.

84. Although this paper focuses on other economic hurdles to harmonization, it is worth mentioning that offsets (particularly, projects conducted in other countries) pose another hurdle to harmonization.

85. *See* Janzen, *supra* note 82, at 22 (arguing that "unilaterally imposed" restrictions are inconsistent with a "globally coordinated approach" to the reduction of GHGs).

> protect human, animal or plant life or health"—but *only* where such action does not constitute "arbitrary or unjustifiable discrimination" or represent a disguised trade restriction.[86]

So long as the border adjustment for imported goods applies a tax of equal value to imports as to like domestic goods, it is consistent with the national treatment principle. A joint UNEP and WTO report, *Trade and Climate Change*, discusses the implication of the second notion quoted above:

> The general approach under WTO rules has been to acknowledge that some degree of trade restriction may be necessary to achieve certain policy objectives, as long as a number of carefully crafted conditions are respected. WTO case law has confirmed that WTO rules do not trump environmental requirements. If, for instance, a border measure related to climate change was found to be inconsistent with one of the core provisions of the GATT, justification might nonetheless be sought under the general exceptions to the GATT (i.e. Article XX) . . . .[87]

Although this statement does not authoritatively state that justification will be granted on Article XX grounds, at a minimum it provides the pathway for a strong argument on those grounds.

No climate change-related policies have been disputed through the WTO yet.[88] However, a tax on imports could be viewed as a trade restriction and therefore form the basis of a claim from a WTO member that the U.S. is discriminating against their exports.[89] If such a claim were valid, an environmental tax may not fit into the narrow statutory definition of the Article XX defense.[90] This determination rests with the WTO.[91] The WTO is split over whether trade regulation based on processes and production methods (PPMs)—as opposed to physical attributes—is permitted.[92] A WTO case, the Shrimp-Turtle Case, involved a PPMs regulation, yet the court did not resolve whether PPMs are "arbitrary or unjustifiable discrimination" under Article XX.[93] Rather, the court sidestepped the issue

86. *Id.* at 24 (emphasis in original).
87. LUDIVINE TAMIOTTI ET AL., U.N. ENV'T PROGRAMME AND THE WORLD TRADE ORG., TRADE AND CLIMATE CHANGE xix (2009).
88. *Id.*
89. Janzen, *supra* note 82, at 24.
90. *Id.*
91. *Id.*
92. *Id.*
93. *Id.*

and stated that import restrictions are not "arbitrary or unjustifiable discrimination" if the regulating country made a "serious, good faith effort" to negotiate an international agreement that treats impacted parties equally.[94] The court distinguished between the obligation to negotiate with the countries involved in the import and export of the good and the obligation to reach an agreement finding that negotiation is all that is required.[95] This court decision will make the United States' meaningful participation in climate talks critical in upholding the U.S. tax on imports of carbon intensive goods and fossil fuels under WTO rulings.

E. Flexibility in Tax Rates—The Pigovian Model

In addition to enforcement issues, another significant challenge will be determining how to set a tax rate that will pay for the costs (i.e. damage to human health and the environment) of pollution, and thereby decrease emissions to the socially optimal level. In the ideal world, a Pigovian tax satisfies this goal. Named after English economist Arthur Cecil Pigou (who presented the concept in his seminal work, *The Economics of Welfare*) a Pigovian tax is a tax used to correct a negative externality.[96] Its tax rate is equal to the social marginal damage from an additional unit of emissions.[97] The rate schedule is essentially the marginal damage curve: the tax changes with each unit of emissions.[98] Economists typically present this scenario by using a curve showing the marginal benefit of emission reductions, which is basically equivalent to the marginal damage curve.[99] Using this convention, the tax rate schedule is the marginal benefit curve.[100] If the tax has to be set at a fixed rate—as commonly done in legislation—it should be set where the marginal cost of abatement equals the marginal benefit curve.[101] Figure 1 illustrates this efficient tax rate.

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94. *Id.*
95. *India etc versus US: 'Shrimp-Turtle,'* WORLD TRADE ORG., http://www.wto.org/english/tratop_e/envir_e/edis08_e.htm (last visited Feb. 27, 2013).
96. Robert H. Frank, *Heads, You Win. Tails, You Win, Too,* N.Y. TIMES (Jan. 5, 2013), http://www.nytimes.com/2013/01/06/business/pigovian-taxes-may-offer-economic-hope.html?_r=0.
97. Metcalf & Weisbach, *supra* note 68, at 511.
98. *Id.*
99. *Id.*
100. *Id.*
101. *Id.*

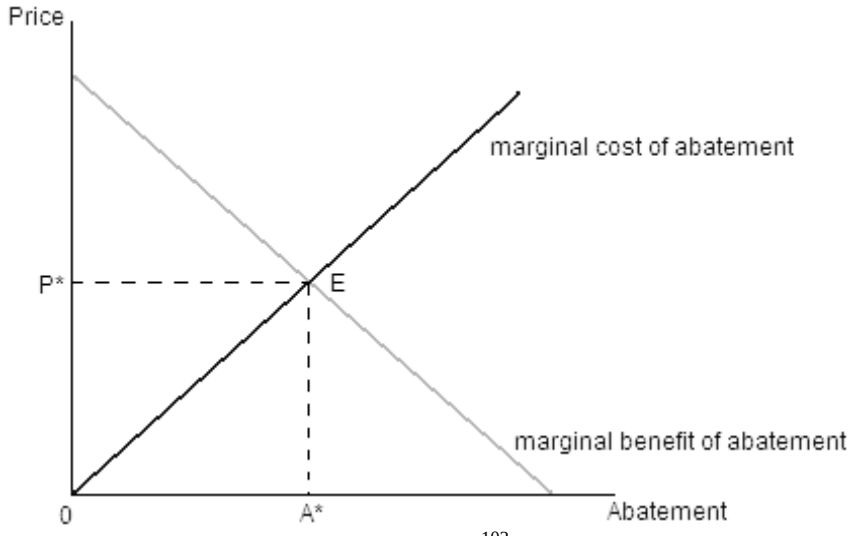

Figure 1[102]

The Pigovian economic model assumes perfect knowledge, a nearly impossible feat. To set a tax rate at the optimal rate, the government must estimate the marginal cost and the marginal benefit of abatement curve.[103] In the long term, uncertainty in these areas is virtually limitless: the government must know the science and related effects of climate change, be able to predict future economic and technical developments, and must discount all values to the present.[104] In the short term, however, economists can make reasonable estimates about an initial carbon tax rate that will maximize investment in energy efficiency and renewable energy at the least cost to the economy. This fixed rate for a finite period will allow businesses to properly plan for future investment and will provide predictability for future growth.

As the country gains experience with a carbon tax, adjustments will undoubtedly be needed to equate the marginal cost of abatement with the marginal benefit. Depending on the circumstances, these adjustments could require lowering the rate to alleviate unforeseen economic burdens or increasing the rate to stimulate greater efficiencies needed to avoid the

102. In the graph, abatement is shown on the x-axis (increasing to 100% abatement as you move right from the origin) and price is shown on the y-axis. The marginal cost of abatement curve equals the marginal benefit of abatement curve at E, which has a corresponding tax rate of P*. A* represents the socially optimal level of abatement, a figure correlated to the socially optimal level of emissions.

103. Metcalf & Weisbach, *supra* note 68, at 511.

104. *Id.*

more catastrophic consequences of climate change. Therefore, the tax rate should be reevaluated and adjusted at regular intervals to ensure economic and environmental targets are being achieved. Finally, it must be remembered that while a carbon tax rate may be based on a desired emissions target (such as an eighty percent reduction of 2005 levels by 2050), it is merely a target, not a mandatory limit. If the target is not reached, other means—such as renewable portfolio standards (RPS) and command-and-control regulations—must still be considered.

F. Other Incentives Needed to Cause a Switch to Alternatives

As the Pigovian tax discussion demonstrates, the carbon tax is unlikely to reduce CO_2 emissions to the exact optimal level, particularly as it pertains to stimulating investment in alternative energy sources. Congress should be careful to understand the alternative energy market and RPS, and to anticipate events other than price points that might affect consumer choices. For example, solar panels are not widely in use. There are problems with grid compatibility, and consumers may be uninformed about potential tax credits or unwilling or unable to pay upfront capital costs. These barriers could prevent their widespread use even as the cost of their installation declines. In short, a carbon tax cannot be all things to all people, and while it may prove helpful in switching to alternative fuel sources, stimulating energy efficiency may prove to be a more realistic goal.

CONCLUSION

Today a carbon tax is a simple, easy to implement, market-based means of reducing GHG emissions. Although smuggling can be problematic, the lessons learned from the ODS tax can be our guide to implement an effective enforcement system. Carbon tax legislation with strong enforcement provisions could be the most equitable way to reduce carbon emissions. Congress should be careful to understand the tax's limitations in that it will be more successful in stimulating energy efficiency than in changing consumer preferences or making alternative energy sources on par with fossil fuels. If these limitations are properly understood and factored into any ensuing legislation, a carbon tax can be the United States' first best step at solving the greatest environmental challenge of our time.