To: Gina McCarthy, National Climate Advisor, White House Office of Domestic Climate Policy
From: Linus Ghanadan, Policy Analyst, White House Office of Domestic Climate Policy
Re: Market-based Climate Change Mitigation Policies
Date: April 27, 2022

Introduction

In the 2015 Paris Agreement, 196 countries agreed on the goal to "limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels" (UNFCCC, 2022). However, according to The Breakthrough Institute, in a business-as-usual emissions scenario, the world is most likely to experience about 3 degrees Celsius of warming, and there are substantial differences in what the world would look like depending on how much warming occurs (Hausfather, Z., & Ritchie, J., 2019). This difference in warming will decide the severity of climate change impacts, such as sea level rise, floods, droughts, heatwaves, wildfires, biodiversity loss, and food and water insecurity (Levin, K., Boehm, S., & Carter, R., 2022).

To protect the Earth from these damages, it is critical for countries around the world to quickly implement policies that reduce GHG emissions to mitigate climate change. This paper focuses on how the United States, which accounted for about 13% of global emissions in 2018, can reduce GHG emissions through market-based policies (Friedrich, J., Ge, M., & Pickens, A., 2020). Many experts argue that market-based policies, such as a cap-and-trade (CAT) system or emissions tax, represent the most promising route for lowering GHG emissions both in the US and around the world (Kaufman, N., Obeiter, M., & Krause, E., 2016). This paper will first provide an overview of how these policies function and where they have already been implemented. Then, the pros and cons of the two major market-based mechanisms, CAT and emissions taxes, will be discussed. Finally, based on these pros and cons, this paper will make recommendations specifically for the US to consider for implementing market-based solutions to reduce GHG emissions.

Background

CAT systems

CAT systems seek to reduce GHG emissions by placing a cap on emissions, distributing permits (also called allowances) allowing firms to pollute a certain amount (typically through an auction), and then allowing firms to sell these permits to each other. Essentially, the idea is that firms will be motivated to find ways to reduce their emissions, since doing so means that they do

not have to pay for permits to pollute. These permits typically expire after a certain amount of time, often every few years. At this point, new permits are distributed that sum to a lower level of emissions, allowing for total emissions to gradually reduce over time.

The EU Emissions Trading Scheme (EU ETS) is the oldest, largest, and most successful CAT system that has been implemented, with Phase 1 starting in 2005 (European Commission, 2022). That being said, the EU ETS is by no means a perfect and all-encompassing emissions reduction policy. One major problem with the EU ETS is that the system is very limited in terms of the economic sectors it regulates. The system applies to carbon dioxide emissions from power generators, energy-intensive industries (e.g., oil refineries, steel works, etc.), and aviation, as well as nitrous oxide emissions from the production of nitrous acid. In total, these only account for about 39% of EU GHG emissions (The World Bank, 2021).

In the US, several states have implemented CAT systems. In 2009, the Regional Greenhouse Gas Initiative (RGGI) was established, with ten states participating: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont (RGGI, 2022). Virginia also joined the RGGI in 2021, bringing the total number of participating states to 11. Unfortunately, the RGGI is even more exclusive than the EU ETS in terms of the economic sectors it regulates. The system applies solely to the power generation sector, which only constitutes 18% of the total GHG emissions from participating states (US EPA, 2022).

Furthermore, US states California, Oregon, and Washington also each have their own CAT systems. California's system, established in 2012, is particularly effective at regulating many economic sectors, applying to 80% of GHG emissions in California (The World Bank, 2021). To achieve this, the system regulates emissions from electricity generation and large industrial facilities, as well as distributors of transportation, natural gas, and other fuels (California Air and Resources Board, 2015).

Emissions tax

Under an emissions tax, firms are required to pay a certain amount for every unit of GHG emissions they pollute. Finland became the first country to implement a carbon tax in 1990, and since then, several other countries have followed. As of 2021, 27 countries have implemented some form of carbon tax, including many developing countries such as Mexico, Argentina, Chile, Columbia, and South Africa (The World Bank, 2021). Compared to CAT systems,

emissions taxes are generally simpler for governments to implement, which contributes to their popularity around the globe. Like CAT systems, it is important for an emissions tax to apply to many economic sectors in order for the policy to be effective at reducing GHG emissions. For example, Mexico's carbon tax only applies to 23% of their emissions, severely limiting the policy's effectiveness. Meanwhile, the carbon tax in the Northwest Territories, a province of Canada, regulates 79% of their GHG emissions, allowing the policy to have widespread impact (The World Bank, 2021).

As was previously mentioned, the majority of GHG emissions in the EU are not regulated under the EU ETS. For this reason, many EU countries, such as France, Spain, Portugal, Netherlands, Switzerland, and Poland, have individually enacted carbon taxes to regulate other emissions in their countries (The World Bank, 2021). However, no US states have implemented a carbon tax, despite the fact that the vast majority of US emissions are not regulated under CAT.

Comparison of CAT versus emissions taxes

Advantages of a CAT system: cap on emissions, more energy efficiency innovation

One advantage of a CAT system is that policymakers can set an emissions cap, effectively ensuring that GHG emissions will not exceed that amount. This appeals to many environmentalists, since there can be more certainty that a specific level of GHG emissions reduction will occur compared to under an emissions tax mechanism, where there is no explicit limit on GHG emissions. Furthermore, compared to an emissions tax policy, CAT systems also tend to provide more of an incentive for firms to invest in technological innovations that reduce emissions (Chen, Y., Chan, W., Nie, P., & Chen, Z., 2020). Under a CAT system, firms can typically make more of a profit from energy efficiency investments, since doing so means that they can sell their allowances to other firms. Meanwhile, for emissions taxes, this extra incentive to innovate is not present.

Disadvantages of a CAT system: further government intervention necessary

Even though CAT systems are supposed to avoid the need for government intervention in the market for allowances, in practice such intervention has been necessary to keep allowance prices from being too low. Even the most effective CAT system historically, the EU ETS, struggled with low allowance prices for a long time. From 2009 to mid-2018, EU ETS allowances were selling for under 20 euros per allowance, and many economists considered this price to be too low to incentivize substantial emissions reductions (Bayer, P., & Aklin, M., 2020).

However, since 2019, EU ETS allowance prices have skyrocketed, peaking at nearly 98 euros per allowance in late 2021. As of April 2022, the allowance prices remain high at about 89 euros per allowance (Sandbag Institute, 2022). While economists consider the extremity of this spike to be due to a decrease in demand for permits resulting from the COVID-19 pandemic, they also attribute the increase greatly to the effectiveness of new EU ETS policy changes introduced in 2019, particularly the Market Stability Reserve (MSR). Since 2019, the MSR has played a key role in overseeing the market for allowances and deciding how many allowances to make available in auctions to ensure there is not a surplus of allowances being auctioned, which was what was previously causing very low allowance prices (European Commission, 2022).

The success of the MSR demonstrates that CAT systems can be successfully managed to ensure that the cost firms pay to pollute is high enough. However, the low allowance prices in the EU ETS that lasted all the way until 2019 also speak to the fact that this additional government intervention is necessary to ensure an effective CAT system. Due to the high operating costs of running CAT systems (i.e., monitoring the market, running auctions, etc.) and other related factors, the International Monetary Fund (IMF) estimates that CAT systems only generate about 30-50% of the government revenue that can be generated from an equivalent carbon tax (Keen, M., Perry, I., Davies, M., & Mylonas, V., 2019).

Advantages of an emissions tax: government revenue, stronger price-signal, can apply to imports

Compared to CAT systems, emissions taxes are much simpler to implement and generate more government revenue. According to a 2019 IMF report, the most economically productive way to use this government revenue is to reduce income and payroll taxes, as well as fund various public investments, particularly those that promote sustainable development (Keen, M., et al, 2019). Other ideas for how to use such funds include using them to cover social security costs or giving them back to American citizens as lump-sum dividends. While the IMF report argues that giving out dividends is economically inefficient, a paper published by the Columbia University Center on Global Energy Policy argues that doing so could make the policy more equitable, if the payments are distributed mostly to low-income households (Kaufman, N., Larsen, J., Marsters, P., Kolus, H., & Mohan, S., 2019). According to the paper, in the absence of dividends, low-income communities will likely be disproportionately burdened by the tax (i.e., the tax will be regressive), since low-income families spend a larger share of their income on carbon-intensive goods compared to those with higher incomes.

In addition, by explicitly setting a price on emissions, a tax sends a stronger price-signal to firms and investors than a CAT system, where the price for emitting can be quite volatile (Kaufman, N., 2016). Having a strong price-signal means that the economic actors will take the emissions price more seriously and will consider it more often when making economic decisions. This is particularly important when it comes to the decisions of investors. If investors take the emissions price more seriously, they will likely be more diligent in emphasizing sustainable practices to companies they invest in.

Lastly, another advantage of emissions taxes is they can be applied to imports from other countries. By taxing imports from other countries based on the emissions footprint of their products, the US can ensure that carbon leakage does not occur. Carbon leakage occurs when facilities in the US shut down and relocate to another country where they are not subject to the regulation, but they still import their products to consumers in the US. When carbon leakage occurs, global emissions are not actually reduced, since the facility simply moved to another country. Thus, applying the emissions tax to imported goods would help reduce emissions, while also protecting American jobs from getting sent overseas.

Disadvantages of an emissions tax: difficult to set tax rate

Unlike a CAT system where the free market sets the price of emitting, an emissions tax requires government regulators to set the tax rate on emissions. According to the National Bureau of Economic Research, it is most economically efficient to set an emissions tax rate equal to the marginal damages caused by emissions, though estimating these marginal damages can be very difficult (Goulder, L.H., & Schein, A., 2013). In addition, setting an emissions tax can be extremely challenging politically, since there are so many special interests that want the tax rate to be as low as possible (Frank, C., 2014). Alas, in most countries with a carbon tax, the tax rate is much too low to create the level of incentive necessary for substantial emissions reductions. In 2020, the average carbon tax rate was only $3 per ton of emissions, which is far less than what is necessary for the policy to be effective (Perry, I., 2021). According to the IMF, to limit warming to 1.5 or 2 degrees Celsius, a tax rate of either $75, $50, or $25 should be implemented by 2030 by the world's 20 largest economies, depending on whether the country has an economy that is advanced (e.g., US), high-income developing, or low-income developing (Perry, I., Black, S., & Roaf, J., 2021). Thus, while setting a tax rate for GHG emissions is challenging, it can be done effectively when there is close collaboration between scientists, economists, and policymakers.

Recommendations for the US

In 2021, the US, in compliance with the 2015 Paris Agreement, submitted an updated NDC commitment, setting the goal to reduce net domestic GHG emissions by 50-52 percent below 2005 levels in 2030. In addition, the Biden Administration has also set the goal for the US electricity generation sector to be carbon pollution-free by 2035, as well as to achieve net-zero emissions economy-wide by no later than 2050 (Climate Watch, 2022). To reach these targets, the Biden Administration will need to initiate major policy actions before 2024. Based on my research, I recommend that the Biden Administration implement a federal CAT system for the electricity generation sector, in addition to a federal tax on GHG emissions covering other major sectors. Through implementing these two market-based mechanisms, the US can reach its climate targets, while also setting a strong example for the rest of the world.

Federal CAT system for US electricity generation sector

As of 2020, there are about 11,070 utility-scale electric power plants in the US, releasing about 25% of US GHG emissions (US EIA, 2021; US EPA, 2022). Since these power plants are already extensively monitored and regulated by the US Department of Energy (DOE), having the DOE operate a federal CAT system makes the most sense for reducing US GHG emissions from electricity generation. In addition, the cap on emissions could be gradually lowered to allow the US to reach its goal of net-zero emissions from electricity generation by 2035. By following the example laid out by the EU ETS and RGGI, the US DOE could implement a federal CAT system for the US electricity generation sector, which would represent a significant step towards improving sustainability in the US.

Federal tax on GHG emissions from industrial buildings, transportation fuels, fuels used for heating and cooling, and imported goods

Implementing a tax on GHG emissions represents the simplest and most cost-effective way to reduce emissions from entities other than electric power plants. In 2020, transportation, industry, and commercial and residential buildings (mostly heating and cooling) accounted for 27%, 24%, and 13% of US GHG emissions (US EPA, 2022). Thus, through taxing transportation fuels, fuels used for heating and cooling, and industrial buildings based on emissions, the tax would cover about 64% of US GHG emissions. In addition, also applying the tax to imported goods based on their emissions footprint would prevent carbon leakage, protect American industry from moving abroad, and encourage other countries to become more energy efficient.

Following the aforementioned guidance from the IMF, the US should ensure its tax rate on emissions reaches $75 per ton by 2030 (Perry, I., Black, S., & Roaf, J., 2021). According to the same report, the best way to introduce the tax would be to start the tax rate at $15 per ton in 2022 and gradually raise it yearly until reaching $75 per ton in 2030. By introducing the tax gradually, the US economy would be able to adjust to the tax much more easily.

Lastly, this emissions tax would generate large sums of government revenue, some of which should be reinvested in the economy through reducing income and payroll taxes and funding public investments. The remaining tax revenue should be given back to American citizens as lump-sum dividends, distributed such that households with lower income-levels receive more benefits. By redistributing part of the tax revenue in this way, the emissions tax policy would be significantly more equitable.

Conclusion

The debate over how to address climate change is often framed as a choice between environmental protection versus economic opportunities. Though it is true that policies to protect the environment will decrease economic opportunities in some sectors, what is more important is that the lack of environmental protection will lead to economic disaster. A 2017 study showed that for every 1 degree Celsius of warming the world experiences, US GDP is likely to decline 1.2% (Hsiang, S., et al, 2017). Furthermore, policies to promote environmental protection create new economic opportunities. For example, recent studies have shown that carbon pricing in Europe has overall had a slightly positive impact on GDP, due to growth in new sectors driving clean technology adoption (Metcalf, G.E., & Stock, J.H., 2020). To prevent both environmental and economic catastrophe from climate change, the US should follow the example set by Europe and implement market-based mechanisms to reduce GHG emissions, specifically a federal CAT system for the US electricity generation sector and a federal tax on GHG emissions from industrial buildings, transportation fuels, fuels used for heating and cooling, and imported goods. By taking these actions, the US can reach its climate goals, demonstrating to the international community that the US is committed to mitigating climate change.

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