

# Reports of the Demise of Carbon Pricing are Greatly Exaggerated<sup>1</sup>

By Frank A. Wolak

Politicians in a number of jurisdictions with cap-and-trade markets for greenhouse gas (GHG) emissions or carbon taxes have argued that the evidence is in and the conclusion is clear: Carbon pricing doesn't work. A number of journalists and environmental groups have jumped on the bandwagon, amplifying a misguided message.

A better understanding of how markets and price mechanisms work might change their minds — and the conversation — on the benefits of carbon pricing.

A cap-and-trade market is designed to achieve a pre-specified reduction in GHG emissions by issuing “allowances to emit” equal to the desired level of GHG emissions. The carbon price that clears the market

for allowances equates the number of willing buyers with the available supply. Each potential buyer of an allowance has the choice between reducing GHG emissions by one ton or buying an allowance at the prevailing price. Profit-maximizing participants will buy an allowance if the cost of reducing their emissions by one ton is greater than the price of an allowance. Consequently, a competitive market for allowances sets the price equal to the marginal cost of abating the last ton of GHG emissions necessary to achieve the emissions cap.

A carbon tax is not guaranteed to achieve a specific quantity of GHG emissions. Entities covered by the tax pay a fixed price for each ton of GHGs emitted. Under this scheme GHG emissions will occur until the

marginal cost of abating the last ton of GHG emissions equals this price of carbon. All GHG emissions with an abatement cost greater than this price will continue to occur because it is cheaper for the emitter to pay the tax rather than the abatement cost.

The above logic implies that a cap-and-trade market achieves a certain quantity of total GHG emissions reductions from the sectors covered by the program, but the decisions of market participants to reduce their emissions or purchase carbon allowances yield an uncertain price of carbon. Conversely, a carbon tax provides certainty with respect to the price of carbon, but the decisions of market participants to reduce their emissions or pay the tax yield an uncertain amount of GHG emissions.

The choice between a cap-and-trade market and carbon tax depends on what form of uncertainty — price or quantity — a policymaker is willing to tolerate. Research I have undertaken with several colleagues on California's market for GHG emissions suggests a clear choice between these two carbon pricing

## About the Author



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From January 1998 to April 2011, he was Chair of the Market Surveillance Committee of the California Independent System Operator. He was a member of the Emissions Market Advisory Committee (EMAC) for California's Market for Greenhouse Gas Emissions allowances from January 2012 to December 2014.

<sup>1</sup> With apologies to Mark Twain.

mechanisms based on these two forms of uncertainty.<sup>2</sup>

Our research finds that in 2012, before the start of the cap-and-trade market in California, uncertainty in statewide business-as-usual (BAU) emissions over the eight-year term of the market (from 2013 to 2020) was so great that any carbon price between the price floor and above the price ceiling could be rationalized based on our estimated distribution of BAU emissions.

This magnitude of uncertainty in the price of carbon before the start of a cap-and-trade market with a finite duration is likely to reduce the volume of investments in carbon abatement technologies. That is because the profitability of these investments depends on the carbon emissions costs they avoid, and our research shows that the magnitude of these avoided costs was extremely uncertain as of late 2012.

This ex ante carbon cost uncertainty inherent in a cap-and-trade market (as revealed by our research) supports the use of a carbon tax. As I discuss below, our argument for a carbon tax is much stronger in the current GHG emissions control regime where only a small number of jurisdictions and sectors of economy price carbon.

## Does Carbon Pricing Really Not Work?

What is the evidence for the claimed failure of carbon pricing? The first is that all currently active cap-and-trade markets — in California, Quebec and Ontario, the Regional Greenhouse Gas Initiative (RGGI) in the Eastern United States, and the European Union Emission Trading System (EU-ETS) — have very low allowance prices. The second is that in regions with a carbon tax, such as the Canadian province of British Columbia, greenhouse gas emissions are as high as before the tax. A third piece of evidence is that the economic burden of carbon pricing falls primarily on low-income consumers.

It is certainly understandable that politicians would argue that a low allowance price implies a failed cap-and-trade market. Because the government receives much or all of the revenues from the initial sale of the carbon allowances, politicians have less money to spend if prices are low. However, a low carbon price is evidence of a very successful market because the cap on GHG emissions has been achieved at a very low cost.

This claim is often met with the counterargument that low allowance prices are due to the GHG emissions cap being set too high. Again, the wrong culprit is being blamed

because it's the politicians who set the value of the emissions cap. A competitive cap-and-trade market achieves the emissions cap set by the politicians at least cost. A higher emissions cap implies a lower carbon price, and a lower emissions cap implies a higher carbon price. Politicians understand this trade-off when they set the level of the cap, but they seem to forget it when the carbon price outcome implied by this choice occurs.

This logic also implies that a positive carbon tax may not reduce GHG emissions if their baseline rate of growth is sufficiently high. In a growing economy there may be an increase in the number of activities with marginal abatement costs higher than the prevailing carbon tax, which would imply an increase in GHG emissions. This is not a failure of carbon pricing. Politicians set the level of the carbon tax, and they clearly understand that a high enough carbon tax would eliminate virtually all GHG emissions. But they also understand that a high tax would eliminate a significant amount of economic activity in the region.

Finally, the charge that carbon pricing has failed because the economic burden falls primarily on low-income households can be leveled against any market or price mechanism used to allocate a scarce resource. This is why all modern economies have

<sup>2</sup> Borenstein, Severin, Bushnell, James, Wolak, Frank A., and Zaragosa-Watkins, Matthew (2018) "Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design," available at <http://www.stanford.edu/~wolak>.

social programs to address these equity concerns. The income tax system provides a straightforward way to address these concerns with a carbon tax. Households can receive refunds for their payments for GHG emissions in the goods and services they consume. A revenue neutral carbon tax refunds the revenues raised in a manner that protects low-income consumers from bearing more than what the political process determines is their “fair share” of the economic burden of the carbon tax.

## Why Is Carbon Pricing the Solution?

Virtually everyone would agree that reducing global GHG emissions to the levels recommended by climate scientists will require a massive change in the global capital stock. Fossil-fuel generation units will have to be replaced with renewable generation units and significant amounts of electricity storage capacity to manage the intermittent supply of energy from these resources. Massive investments in carbon capture and sequestration facilities will be necessary in order to continue to burn fossil fuels without producing GHG emissions. Gasoline- and diesel-powered cars and trucks must be replaced with electric and other zero- or low-carbon vehicles. The equipment needed to heat and cool our homes and offices will need to be replaced with zero- and low-carbon alternatives.

How can the world make such a massive shift in its capital stock? By harnessing the same force that drives investment in all sectors of the economy — price signals. Firms with a fiduciary responsibility to their shareholders only make investments that they expect will earn the highest possible return. If the price of its output increases, a firm is likely to invest in new plants and equipment because it expects to earn more money than needed to purchase them because its output now sells at a higher price. Similarly, if the price of a major input to the production process increases, the firm is likely to substitute lower-cost alternatives and/or reduce its level of output.

With carbon pricing, GHG emissions become just another input to the production process that the firm must purchase in order to produce. If the price of this input increases, the firm will substitute lower-priced alternatives and/or reduce its output. The higher the price of carbon, the more the firm will reduce its “use” of GHG emissions in the production process.

Many environmentalists argue that firms have an obligation to invest in low-carbon forms of production even if lower-cost but more carbon-intensive modes of production exist. However, firms that did this would be at a competitive disadvantage relative to other firms employing the lower-cost mode of production, unless consumers were willing to pay more for a product made using the less carbon-intensive mode of production.

Unfortunately, there is very little empirical evidence that a significant number of consumers are willing to pay more for the identical good produced in a less carbon-intensive manner. Consequently, firms that do not employ the lowest-cost mode of production would not be serving their fiduciary responsibility to their shareholders to earn them the highest possible return on their investment. Moreover, these firms would find themselves losing sales to firms offering the same product at a lower price and so eventually they may be forced to exit the industry.

This logic is precisely why all government support mechanisms for low-carbon energy sources are typically set to make the cost of low-carbon energy roughly the same as the lower-cost but higher-carbon content energy. Keeping all other factors the same, firms would clearly prefer to produce their output with the least possible amount of associated GHG emissions. However, without a sufficiently high price of carbon, a firm would be at a competitive disadvantage if it used a higher-cost, low-carbon mode of production rather than the least cost mode of production.

## How High Should the Carbon Tax Be?

What would happen if the regions with cap-and-trade mechanisms suddenly reduced their emissions caps and the regions with carbon

taxes suddenly increased the level of their taxes to address the above criticisms of existing carbon pricing programs? Many firms would then be left with the unpleasant choice between declining sales (because of the need to charge a higher price to recover the substantially higher carbon costs or immediately ceasing production) and moving their operations outside of these regions.

This would be a Pyrrhic victory for carbon pricing because of the significant economic harm imposed on the regions with carbon pricing and corresponding benefits to those without carbon pricing. Moreover, the shift in economic activity outside of the regions with carbon prices could even increase global GHG emissions because the goods produced outside of the region may require the same or more GHG emissions and then these goods must be shipped back to the carbon pricing regions where they are consumed.

This logic is precisely why politicians do not set tight emissions caps or very high carbon prices in the few jurisdictions that currently price carbon. These policies are unlikely to reduce global GHG emissions, but are virtually certain to reduce the level of economic activity in the regions with high carbon prices. Citizens of jurisdictions with high carbon prices may feel virtuous, but this virtue comes at a significant cost because carbon-intensive activities will likely exit these jurisdictions. If consumers in these regions continue to demand

the same amount of carbon-intensive goods and services, their virtuous behavior will also have no impact or may even increase global GHG emissions.

So, what should the jurisdictions that currently price carbon do to reduce global GHG emissions? A high carbon price in these jurisdictions has the adverse consequences described above because carbon-intensive economic activity can move to jurisdictions that do not price carbon.

Consequently, these regions should focus their efforts on spreading carbon pricing to as many jurisdictions and industries as possible, as quickly as possible. Regions that emit the vast majority of global GHG emissions, such as China, India, Latin America, and Asia, as well as the rest of the United States, must first adopt carbon pricing, and only then will raising the price of GHG emissions produce significant global GHG emissions reductions. Otherwise, the more likely outcome is the movement of economic activity from the small number of regions that do price carbon to those that do not.

Once the vast majority of jurisdictions and industries are subject to a carbon pricing regime, raising the price of carbon creates a very different dynamic. If all regions are subject to the same global price of carbon, economic activity has little incentive to leave regions with a high price of carbon, as long as that high

price prevails in the vast majority of jurisdictions and industries. In this world, all increases in the price of carbon create incentives for firms to use lower carbon-intensive modes of production instead of moving carbon-intensive economic activity to jurisdictions that do not price carbon.

In a world with a global price of carbon, our research on the California cap-and-trade market becomes extremely relevant. A certain high price of carbon set through a carbon tax is likely to yield more long-lived investments in carbon emissions abatement and lower carbon technologies than an uncertain price of carbon set through a low emissions cap from a cap-and-trade market.

### How Do We Get More Jurisdictions to Price Carbon?

The first step to getting more jurisdictions to price carbon is to demonstrate that a carbon pricing mechanism can be imposed without a significant loss in aggregate economic activity within the jurisdiction. Here the evidence is surprisingly positive. It would be difficult to argue that any of the regions that currently price carbon have experienced a significant loss in aggregate economic activity as a result of pricing carbon. Unfortunately, the lack of evidence for adverse consequences from carbon pricing has not resulted in a

significant increase in the adoption of carbon pricing mechanisms.

Border adjustments are an important tool for increasing the number of jurisdictions that price carbon because they require all imports to pay for an estimate of their carbon content at the prevailing price of carbon. Suppose that widgets are imported into a region that prices carbon and the jurisdiction determines that producing a widget results in one ton of GHG emissions. The buyer of a widget would have to pay the prevailing carbon price for the one ton of carbon embodied in every imported widget.

The country that produces widgets has an economic incentive to adopt carbon pricing if it sells a substantial fraction of its output to a region that prices carbon. Every imported widget

must be sold at a price that reflects the importing jurisdiction's estimate of the price of carbon. The revenue from assessing the border adjustment goes to the importing country that prices carbon. However, if the country that produces widgets adopts a carbon pricing mechanism that the importing country finds acceptable, it could collect this price of carbon on the production of widgets and therefore be exempt from the border adjustment set by the importing country.

If the United States adopted a single national price of carbon, border adjustments could be a very effective mechanism for causing China, India, and other major importing countries to adopt carbon pricing mechanisms.

## Carbon Pricing Can Work

Carbon pricing is working as well as can be expected. It cannot be expected to reduce global GHG emissions if only a small fraction of jurisdictions around the world price carbon. Setting more stringent caps or higher carbon taxes in the few jurisdictions that price carbon is likely to be counterproductive to reducing global GHG emissions and getting more regions to price carbon. Those regions with carbon pricing programs should focus on increasing the geographic scope and number of industries covered. Once this happens, the focus can change to increasing the price of carbon to reduce global GHG emissions. A known time path for the magnitude of the carbon tax into the distant future will be the most cost-effective way to reduce global GHG emissions.

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