

## How Can a Carbon Tax Reduce Emissions with Small Economic Impacts?



Countries can use carbon taxes to achieve their climate mitigation goals from the Paris Agreement with little economic disruption.



Using carbon taxes, the United States could achieve its Paris Agreement pledge of a 26% reduction in carbon emissions with a negative effect on yearly GDP of at most 0.8%.



Carbon taxes can have important effects on inequality. While skilled workers in polluting sectors experience substantial income losses from carbon taxes, they represent only a small share of the labor force: less than 2% in the United States. Workers in the green energy sector, however, stand to gain from carbon taxes.

### CONTEXT

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As greenhouse gas (GHG) emissions reach alarming levels, there is increasing pressure on countries to adopt more aggressive environmental policies. However, concerns regarding their economic and distributional effects hinder their adoption, as reducing emissions means reallocating resources away from high-carbon sectors towards low-carbon ones. A clear example of such tension can be found in the United States, with the Trump administration dropping out of the climate Paris Agreement Accord, only for the Biden administration to later re-join. Distributional effects also figure prominently in this discussion, as shown by the recent demonstrations of the gilets jaunes in France.

### PROJECT

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How does a carbon tax affect the economy? We assess this question via an economic model of occupational choice and multiple sectors. We analyze how individuals choose their occupation based on the wages offered in different sectors. Some sectors produce energy; among these, some produce “dirty” output (oil, natural gas, and coal) and some are clean (green energy). We estimate the model for the United States, China, and Brazil, using detailed data. With this framework, we can identify the long-run economic effects of introducing carbon taxes to reaching these countries’ Nationally Determined Contributions (NDC) from the Paris Agreement.

## RESULTS

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We estimate the carbon tax needed for the United States to achieve its original Paris Agreement NDC of a 26% reduction in emissions would amount to approximately a 64% tax rate on the production of dirty energy. This policy would cost the United States at most a 0.8% drop in yearly GDP. The same climate target was implemented for China and Brazil to capture cross-country heterogeneity in responses. China witnesses the largest economic loss of up to 3.7%. This higher impact in China is explained by the role of dirty energy production in the Chinese economy and not by different levels of development. Brazil, another emerging economy, suffers a loss comparable to that of the United States at 0.5%.

These aggregate effects mask sizable heterogeneity at the sectoral and individual levels. Dirty energy sectors directly exposed to the carbon tax witness the largest drop in production, and consequently the largest decline in the number of workers. Relatively lower-skilled workers in dirty energy production and energy-intensive sectors choose to relocate away from these sectors. By contrast, workers with a strong comparative advantage in the dirty energy sectors tend to remain and bear the cost of the drop in wages. In the United States, the welfare loss for this group is at least six times higher than workers in non-dirty sectors, and 1.8 times that of workers who manage to relocate away from dirty energy sectors. These workers nevertheless constitute only 2% of the US labor force. Workers in the green energy sector benefit from the carbon tax.

Key Concept

### CARBON TAX

A tax on carbon emissions aimed to reduce fossil fuel consumption.

## POLICY IMPLICATIONS

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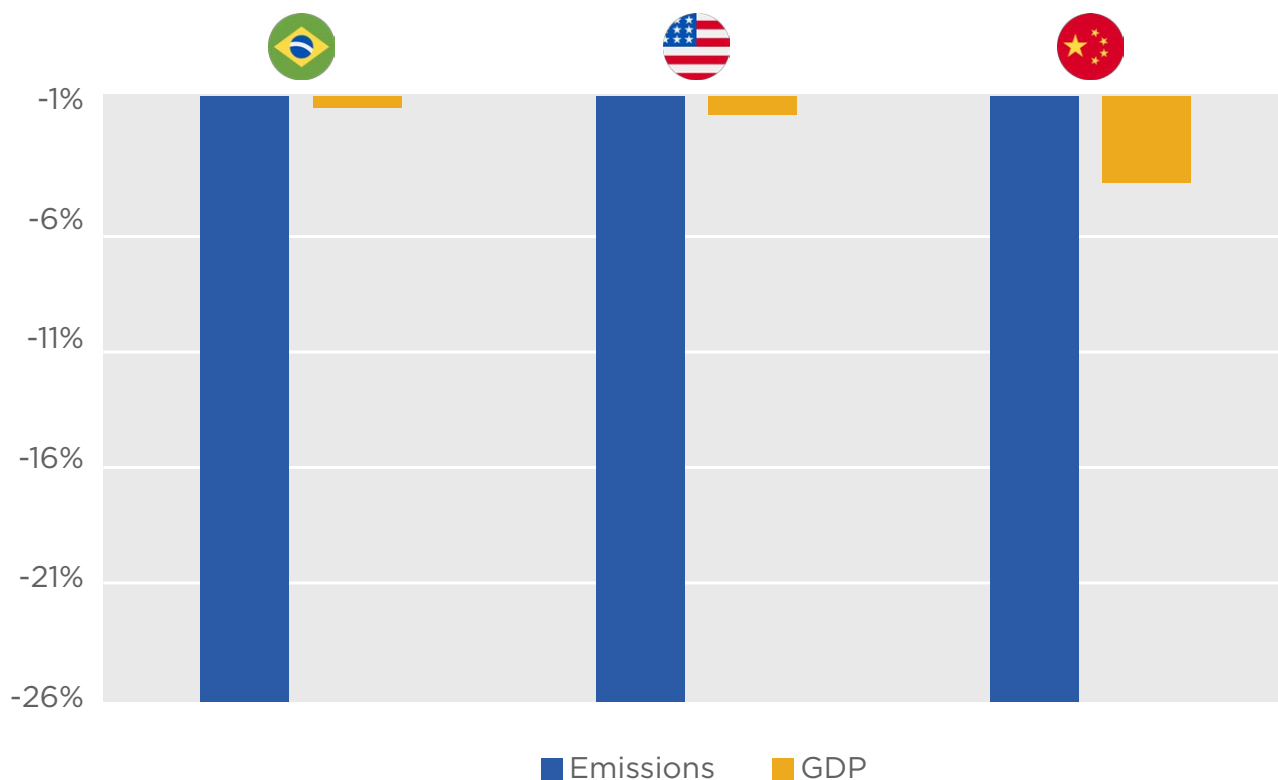
The results of this project suggest that countries can use carbon taxes to achieve their climate mitigation goals with relatively little economic disruption, as the total negative effect on GDP is generally small. Given the importance of curbing the emission of GHGs, carbon taxation is a worthwhile policy to pursue, with one important caveat: workers in dirty energy sectors stand to lose from the introduction of carbon taxes. Although constituting a relatively small fraction of the labor force, policymakers should anticipate the need for a safety net for these employees. Finally, the effects from carbon taxation can vary considerably across countries. For this reason, governments should seek specialized analysis accounting for their country's specific circumstances.

Key Concept

### GREENHOUSE GASES (GHG)

Gases emitted from burning fossil fuels that warm the atmosphere.

Figure 1. Estimated Effects of Carbon Taxes on Emissions and GDP



**Key Concept**

**PARIS CLIMATE AGREEMENT**

Plan to keep this century’s global temperature below 2 degrees Celsius above pre-industrial levels, with efforts to limit it to 1.5 degree.

**FULL STUDY**

[Cavalcanti, Tiago, Zeina Hasna, and Cezar Santos. 2022. “Climate Change Mitigation Policies: Aggregate and Distributional Effects.”](#)

**DEPARTMENT OF RESEARCH AND CHIEF ECONOMIST**

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