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Boxer–Sanders Carbon Tax: Economic Impact

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Senators Barbara Boxer (D–CA) and Bernie Sanders (I–VT) recently proposed the Climate Security Act of 2013,[1] which includes a tax on the use of carbon. Heritage analysis of the bill shows that it would increase the cost of energy, reduce incomes, lead to fewer jobs, and have minimal impact (if any) on global warming.

The economic impacts would include (after adjusting for inflation):

- A family of four losing more than $1,000 of income per year,
- Over 400,000 lost jobs by 2016,
- Coal production dropping by 60 percent and coal employment dropping by more than 40 percent by 2030,
- Gasoline prices rising $0.20 by 2016 and $0.30 before 2030, and
- Electricity prices rising 20 percent by 2017 and more than 30 percent by 2030.

This paper, in its entirety, can be found at
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A Tax on Most U.S. Energy. Hydrocarbon fuels (natural gas, petroleum, coal) provide 85 percent of the energy consumed in the United States. Petroleum provides over 90 percent of transportation fuel but 1 percent or less of electric power generation. Natural gas and coal fuel the majority of American electric power production. Basic chemistry dictates that carbon dioxide (CO2) will be emitted when these fuels combust to generate energy.

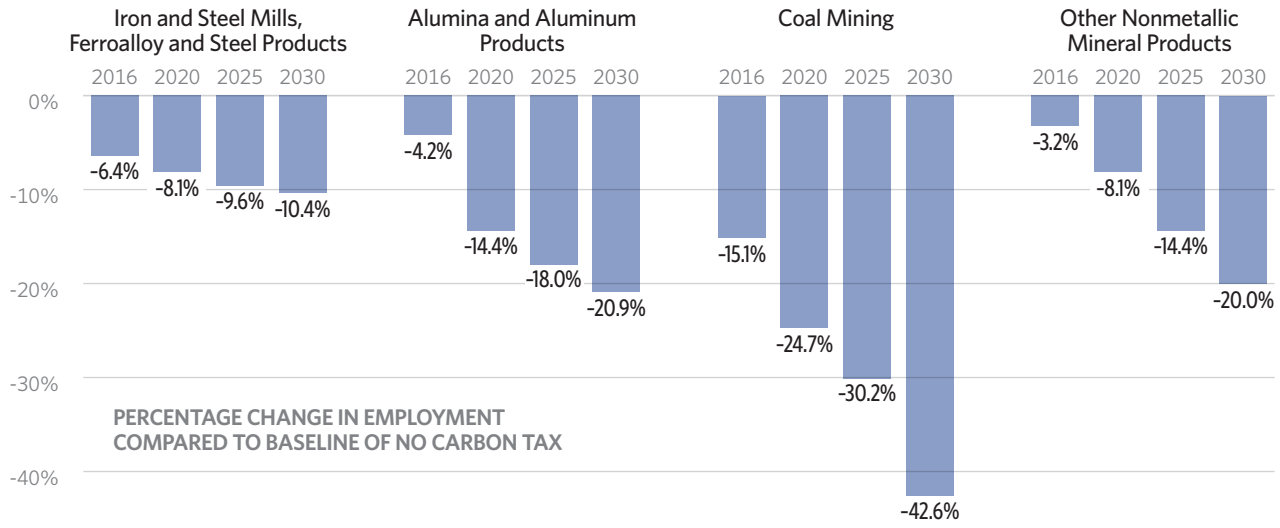
Therefore, a tax on CO2 would be a tax on the 85 percent of energy derived from hydrocarbons and would increase energy costs broadly. The higher energy costs would ripple through the economy, driving up costs of production of virtually all goods and services. Faced with higher costs for energy and other goods, consumers would cut consumption, translating into a reduction in sales and a marked decline in employment. Though rebating the tax partially offsets these impacts, there would still be a net loss of income and jobs.

The energy-intensive sectors of the economy would generally suffer greater losses since the higher energy costs affect them disproportionately. For example, Chart 1 shows the percentage employment losses (compared to the baseline without a carbon tax).

The past six years have seen repeated legislative attempts to restrict CO_2 emissions, most notably the various cap-and-trade bills. As with those bills, Boxer–Sanders would tax trillions of dollars from energy consumers. If 90 percent of carbon emissions are subject to the tax, Boxer–Sanders would extract over $100 billion from the private sector in its very first year (2014) and over $200 billion in 2030 (after

CHART 1

Boxer–Sanders Effect on Employment in Select Industries



Source: Heritage Foundation calculations using the Heritage Energy Model. See Methodology for details.

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adjusting for inflation). The total revenue for the years 2014 through 2030 is nearly $3 trillion.

The Boxer–Sanders bill calls for a tax on CO2 emissions that starts at $20 per metric ton in 2014. This tax rate rises by 5.6 percent per year, growing to $50 per metric ton by 2030 (after adjusting for inflation). Though the tax-driven higher price of conventional fuels induces a 23 percent increase in total renewable energy production by 2030 (compared to baseline), this is not enough to offset the loss of conventional energy. The overall increase in energy prices is the market measure of the tax-induced energy scarcity that constrains economic activity.

A Bigger Slice from a Smaller Pie. Unlike input-output models, the Heritage Energy Model calculates overall, net impacts of policy. It finds that the energy price shocks created by the Boxer–Sanders bill would reduce national income by $92 billion in 2020. This negative economic impact gets worse and cuts $146 billion from gross domestic product (GDP) in 2030.

Thus, with a carbon tax, the federal government takes a larger slice from a smaller economic pie.

Minimal Impact on Climate Change. As the name implies, the intent of the carbon tax is to protect the climate from purported damage. Though the actual damage CO2 will impose on the climate is debatable,[2] the climate impact of this carbon tax would only be minimal.

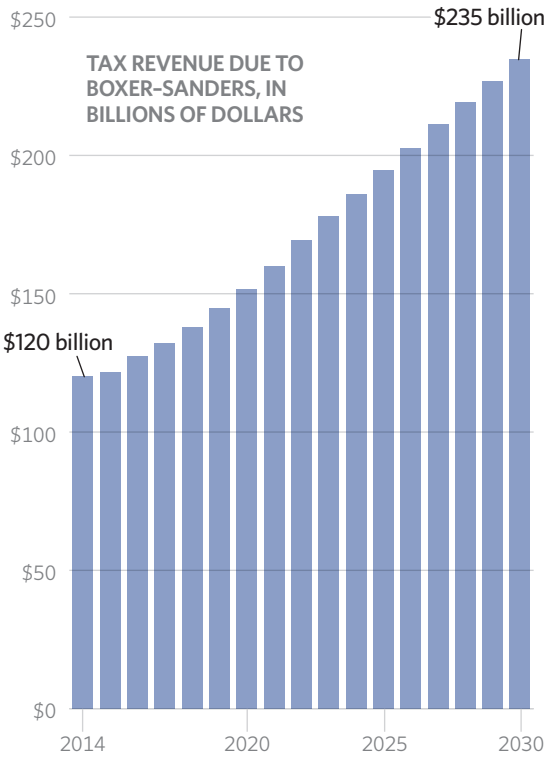
Because the growth in carbon emissions over the remainder of this century will come overwhelmingly from the developing world,[3] even a severe

1. Climate Protection Act of 2013, http://www.sanders.senate.gov/imo/media/doc/0121413-ClimateProtectionAct.pdf (accessed March 22, 2013).
2. For a discussion of competing estimates of the social cost of carbon, see Joanna M. Foster, "The Social Cost of Carbon: How to Do the Math?," *The New York Times, September 18, 2012,* http://green.blogs.nytimes.com/2012/09/18/the-social-cost-of-carbon-how-to-do-the-math/ (accessed April 10, 2013). For examples of research showing benefits from additional carbon dioxide, see http://www.co2science.org/subject/a/agfeedworld.php (accessed April 10, 2013).
3. U.S. Energy Information Administration, "International Energy Outlook 2011: Energy-Related Carbon Dioxide Emissions," http://www.eia.gov/forecasts/ieo/emissions.cfm (accessed April 5, 2013).

CHART 2

Tax Increases Due to Boxer–Sanders

The Boxer–Sanders carbon tax bill would raise taxes by nearly $3 trillion through 2030.



Source: Heritage Foundation calculations using the Heritage Energy Model. See Methodology for details.

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reduction in U.S. emissions would have only a negligible impact on ambient CO2 levels.[4] A high-end estimate of a $25-per-ton tax concludes that it would moderate global warming by 0.11 degrees C by the end of the century.[5] Since Boxer–Sanders starts with a lower tax rate, the expected temperature moderation would be even smaller yet.

High Cost, Little Reward. The Boxer–Sanders carbon tax, like the cap-and-trade bills before it, would drive up energy costs.[6] These higher energy costs not only would add to consumers' energy bills but would increase the costs of virtually all other products they buy, which would decrease employment as well.

And all this damage to the economy would come with little or no impact on projected global warming.[7] Even assuming the Intergovernmental Panel on Climate Change's models are accurate, the Boxer–Sanders carbon tax would have, at best, a negligible impact on world temperatures.

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4. Derrick Morgan, "A Carbon Tax Would Harm U.S. Competitiveness and Low-Income Americans Without Helping the Environment," Heritage Foundation *Backgrounder No. 2720, August 21, 2012,* http://www.heritage.org/research/reports/2012/08/a-carbon-tax-would-harm-us-competitiveness-and-low-income-americans-without-helping-the-environment.
5. Paul C. "Chip" Knappenberger, "Carbon Tax: Climatically Useless," Cato Institute, December 3, 2012, http://www.cato.org/publications/commentary/carbon-tax-climatically-useless (accessed March 22, 2013).
6. See Charli Coon, "Why President Bush Is Right to Abandon the Kyoto Protocol," Heritage Foundation *Backgrounder* No. 1437, May 11, 2001, http://www.heritage.org/research/reports/2001/05/president-bush-right-to-abandon-kyoto-protocol; Ben Lieberman, "The Economic Impact of the Waxman–Markey Cap-and-Trade Bill," testimony before the Senate Republican Conference, June 26, 2009, http://www.heritage.org/research/testimony/the-economic-impact-of-the-waxman-markey-cap-and-trade-bill; and William W. Beach, Karen Campbell, David W. Kreutzer, Ben Lieberman, and Nicolas D. Loris, "The Economic Consequences of Waxman–Markey: An Analysis of the American Clean Energy and Security Act of 2009," Heritage Foundation *Center for Data Analysis Report* No. CDA09–04, August 6, 2009, http://www.heritage.org/research/reports/2009/08/the-economic-consequences-of-waxman-markey-an-analysis-of-the-american-clean-energy-and-security-act-of-2009.
7. See David W. Kreutzer, "The Right Time for a Carbon Tax Is Never," The Heritage Foundation, The Foundry, November 20, 2012, http://blog.heritage.org/2012/11/20/the-right-time-for-a-carbon-tax-is-never/.

Appendix: Methodology

Overview of Heritage Energy Model. This analysis utilizes the Heritage Energy Model (HEM), a derivative of the National Energy Model System (NEMS).[8] NEMS is used by the Energy Information Administration (EIA) of the Department of Energy as well as various nongovernmental organizations for a variety of purposes, including forecasting the effects of energy policy changes on a plethora of leading economic indicators. The methodologies, assumptions, conclusions, and opinions in this report are entirely the work of statisticians and economists at The Heritage Foundation's Center for Data Analysis (CDA) and have not been endorsed by and do not necessarily reflect the views of the developers of NEMS.

HEM is based on well-established economic theory as well as historical data and contains a variety of modules that interact with each other for long-term forecasting. In particular, HEM focuses on the interactions among (1) the supply, conversion, and demand of energy in its various forms; (2) American energy and the overall American economy; (3) the American energy market and the world petroleum market; and (4) current production and consumption decisions as well as expectations about the future.[9] These modules include:

- a Macroeconomic Activity Module,[10]
- a Transportation Demand Module,
- a Residential Demand Module,
- an Industrial Demand Module,
- a Commercial Demand Module,
- a Coal Market Module,
- an Electricity Market Module,
- a Petroleum Market Module,
- an Oil and Gas Supply Module,
- a Renewable Fuels Module,
- an International Energy Activity Module, and
- a Natural Gas Transmission and Distribution Module.

HEM is identical to the EIA's NEMS with the exception of the Commercial Demand Module. Unlike NEMS, this module does not make projections regarding commercial floor-space data of pertinent commercial buildings. Other than that, however, HEM is identical to NEMS.

Overarching the above modules is an Integrating Module that consistently cycles, iteratively executing and allowing the various modules to interact with each other. Unknown variables that are related (such as if they are a component of a particular module) are grouped together, and a pertinent subsystem of equations and inequalities corresponding to each group is solved via a variety of commonly used numerical analytic techniques, using approximate values for the other unknowns. Once these group's values are computed, the next group is solved similarly and the process iterates. Convergence checks are performed for each price and quantity statistic to determine whether subsequent changes in that particular statistic fall within a given tolerance. After all group values for the current cycle are determined, the next cycle begins. For example, at cycle *j,* a variety of n pertinent statistics represented by the vector $(x_1^j, x_2^j, \ldots, x_n^j) \in \mathbb{R}^n$ is obtained.[11] HEM provides a

8. U.S. Department of Energy, Energy Information Administration, "The National Energy Modeling System: An Overview," http://www.eia.gov/oiaf/aeo/overview/pdf/0581(2009).pdf (accessed April 3, 2013).
9. Ibid., pp. 3–4.
10. HEM's Macroeconomic Activity Module makes use of the IHS Global Insight model, which is used by government agencies and Fortune 500 organizations to forecast the manifestations of economic events and policy changes on notable economic indicators. As with NEMS, the methodologies, assumptions, conclusions, and opinions in this report are entirely the work of CDA statisticians and economists and have not been endorsed by and do not necessarily reflect the view of the owners of the IHS Global Insight model.
11. S. A. Gabriel, A. S. Kydes, and P. Whitman, "The National Energy Modeling System: A Large-Scale Energy-Economic Equilibrium Model," *Operations Research,* No. 49 (2001), pp. 14–25.

number of diagnostic measures, based on differences between cycles, to indicate whether a stable solution has been achieved.

Carbon Tax Simulations and Diagnostics. We used the HEM to analyze the economic effects of instituting the Boxer–Sanders proposal. HEM is appropriate for this analysis, as similar models have been used in the past to understand the economic effects of other carbon tax proposals.[12] In particular, we conducted simulations running a carbon fee that started in 2014 at $20 (in 2013 dollars) and increased by 5.6 percent per year and compared this against a baseline model without any carbon tax. We chose a revenue-neutral carbon tax where 100 percent of the carbon tax revenues are returned directly to taxpayers. We ran the HEM for 12 cycles to get consistent feedback into the Macroeconomic Activity Module, which provided us with the figures presented in this study.

The diagnostic tests, based on differences between cycles, at the end of the 12 runs suggested that the forecasts provided by the model had stabilized. The 12 cycles were therefore sufficient to attain meaningful convergence, thus providing us with macroeconomic statistics from which we can make informative inferences.

12. The Department of Energy, for example, has used NEMS to evaluate some carbon tax proposals. See, for example, U.S. Department of Energy, Energy Information Administration, "AEO Table Browser," http://www.eia.gov/oiaf/aeo/tablebrowser/ (accessed April 2, 2013).