Designing Energy Tax Credits to Drive Greater Emission Reductions

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GOVERNMENTS may choose among three types of policies to promote carbon dioxide emission reductions. They can prescribe specific low-emission technologies through regulatory mandates. They can raise the price of fossil energy through carbon tax and cap-and-trade systems. And they can subsidize investment and operation of low- and zero-emission technologies. In the United States, the most politically viable of these types have been subsidies, especially through the tax code.

Since 1992, the federal government has subsidized the electricity output of wind farms and other renewable power plants through the production tax credit, ranging up to about 2.5 cents per kilowatt-hour. In recent years, this subsidy is equal to about half of the average price the wind farm receives from selling its power. The federal government has also used investment tax credits, such as subsidies equal to 30 percent of the costs of installing solar panels and $7,500 for a new electric vehicle.

Choosing which alternative policy gives the greatest bang for the buck

Subsidies for clean energy technologies have historically faced challenges in delivering the biggest bang for the climate buck. In order to claim tax credits, a business typically needed to have tax liabilities at least as great as the value of the tax credits.

To unlock access to these tax credits, financial companies began providing "tax equity"—financing for a renewable project in which the equity supplier gains returns by claiming the project's tax credits. A large bank, such as JP Morgan or Bank of America, would then become a financial partner for the project and effectively monetize the tax credits to enable the project to move forward. Providing this financial service comes at a cost: as much as 15 cents of each dollar of taxpayer subsidies for renewable power went to a large bank for this financial engineering instead of the renewable developer.

In the wake of the 2008 financial crisis—and of banks, such as Lehman Brothers, exiting the tax equity market—the American Recovery and Reinvestment Act gave renewable power developers the option of claiming a grant equal to 30 percent of investment costs—effectively equal to the value of the investment tax credit without the need for tax liability to monetize the subsidy. For the first time, wind project developers could claim a subsidy for their investment, instead of their output.

This policy innovation jump-started a decade of unprecedented growth in U.S. wind and solar power investment. On the downside, subsidizing wind power investment, as opposed to wind power output, weakened incentives for wind farm maintenance and optimization necessary to maximize electricity generation. In my research with Todd Gerarden and Rich Sweeney, we find that investment subsidies caused wind farms to produce about 10 percent less electricity than they would under output subsidies.

Recent legislative proposals have attempted to circumvent the need for tax equity without such adverse incentives for output through "direct pay" of tax credits. Under these proposals, a firm with a qualifying renewable project would be deemed as having sufficient tax liability such that the government would directly pay the subsidy under the applicable tax credit. As a result, a wind farm would receive its subsidy for production without having to give up some of its value by entering into a financial arrangement with a tax equity supplier.

The other barrier to maximizing the climate bang for the taxpayer buck lies in the uncertainty about what these subsidized renewable projects displace in the electricity system. If a new wind farm's output substitutes for electricity generated by a coal-fired power plant, then that delivers twice the emission reductions than if it displaced power from a gas-fired power plant. And if the wind farm displaces power from a nuclear power plant, then it would deliver no incremental emission benefits. Exploiting high frequency, high-resolution spatial data and power system modeling tools could enable the design of modified subsidies that target and value power generation that delivers the greatest emission reductions.

In the absence of more ambitious carbon pricing legislation and in the wake of the Supreme Court's *West Virginia v. EPA* decision, constraining Clean Air Act regulations, subsidies may be the most viable near-term policy tool for decarbonization. Modifying such subsidies to be more cost-effective will contribute to deeper decarbonization for a given amount of federal spending, which is critical given the political constraints—especially in a period of relatively high inflation—on public spending.