



The Experts

Why Energy Efficiency Might Not Cut Emissions As Much as You Think

Many governments see energy efficiency as a key decarbonization strategy. In fact, some scenarios assume efficiency can drive approximately 40% of emissions reductions under the Paris climate accord.

For policymakers, the assumption is straightforward: Improving efficiency will lower energy consumption, which in turn reduces greenhouse gas emissions. And many prominent organizations support this assumption.

But a case can be made that strategies that rely heavily on efficiency to reduce emissions are bad bets. Historical data show that increased energy efficiency has gone hand-in-hand with *more* energy consumption over the long term, not less. I would argue that any decarbonization approach that fails to take this into account runs the risk of backfiring.

The paradox

The idea that that more efficiency can spur more consumption rather than less is known as the Jevons Paradox. Named after the British economist William Stanley

Jevons, who first described it in his 1865 book “The Coal Question,” the paradox challenges the intuitive belief that efficiency gains automatically lead to energy savings.

Critics who dismiss Jevons’s idea often focus on consumer behavior. For example, it is hard to imagine that a driver would drive 50% more miles if purchasing a car that uses 50% less fuel per mile. They might drive a little more, but it wouldn’t be enough to make a difference.

When you zoom out further to the global economy, however, you see that industry reacts much differently to increasing efficiency. More efficient firms generate greater profits, which leads to more investment, more production and, crucially, more energy consumption to support more food production and population. Efficiency makes it economically viable to extract and consume harder-to-reach energy resources, such as oil from hydraulic fracturing or wind from less windy areas, which then fuels the production of more machines, vehicles and industrial processes.

Consider these two questions:

First, have we continually developed machines and processes that are more energy-efficient? The answer is yes.

Second, has global energy consumption continued to rise alongside this increase in efficiency? Again, the answer is yes, unequivocally so for the past two centuries.

These two points often help skeptics grasp the paradox. While efficiency isn’t the sole driver of economic growth, it plays a significant role.

Faulty assumption

The real challenge comes when energy efficiency is presented as an economywide climate solution by itself. When policymakers use efficiency as a cornerstone of environmental policy without acknowledging its broader economic impact, they build their strategies on faulty assumptions.

Fortunately, recent research is starting to properly assess the relationship between energy, efficiency and growth. Metastudies show “economywide rebound effects” can erode more than half of the anticipated energy savings from efficiency improvements, undermining its effectiveness as a climate-mitigation strategy. My own research shows that it takes about six years, on average, for improvements in energy efficiency to lead to higher overall energy consumption. Additionally, an increasing body of work suggests that economic “productivity” can largely be explained by gains in energy efficiency.

What is the takeaway for policymakers?

If growth is the goal and you want to spur more of it, then keep promoting investment in energy efficiency with no other policies to restrict profits and investment. But if the goal is to balance growth with lower greenhouse-gas emissions, you have to direct investments toward low-greenhouse-gas technologies and away from high-greenhouse-gas technologies by penalizing emissions.

Energy efficiency is a valuable tactic for improving well-being by expanding access to energy services. However, we must confront its unintended consequences. By failing to account for the rebound effect, we risk being “surprised” that efficiency ends up driving more emissions. Jevons’s insights from over 150 years ago still hold today. It’s time we incorporate them into climate strategies that genuinely reduce emissions—before another 150 years pass us by.

—*Carey King, research scientist and assistant director at the Energy Institute at the University of Texas at Austin, and author of “The Economic Superorganism: Beyond the Competing Narratives on Energy, Policy, and Growth.”*

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