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Efficiency Policy, Jevon's Paradox, and the "Shadow" Rebound Effect

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This is a guest post by Jeff Vail.

Is the push for greater energy efficiency a good policy choice to address energy scarcity after Peak Oil? Here's a bold answer: NO, at least not in a vacuum. Efficiency is not a standalone solution, but part of the much more complex problem of reducing total energy consumption that must address Jevon's Paradox and the Rebound Effect.

Jevon's Paradox tells us that when we increase the efficiency of the use of a resource, we initially decrease the demand for that resource, but that ultimately this lower demand reduces price, which causes a "rebound" of increasing demand. When applied specifically to energy efficiency, this is commonly referred to as the "Rebound Effect."

Here's a real-world example. Let's magically double the average fuel economy of America's cars and trucks. Gasoline demand would drop immediately by 50%. This would affect the supply-demand equilibrium of gasoline, reducing its price significantly. However, with dramatically lower gas prices, many people would choose to drive more than they had in the past—this is the "rebound," where some of the energy savings provided by gains in efficiency are negated by the corresponding effect on energy prices. Clearly, a 50% drop in gas prices won't result in the average American doubling their driving, as would be required to completely negate the efficiency gains in this scenario. Even if gas was free, there would be some limit to how much we would drive. So this "rebound effect" doesn't negate the entirety of energy savings due to efficiency. Studies suggest that it erases perhaps 10%-30% of the gains.

If Jevon's Paradox, via the "rebound effect," only negates 10%-30% of gains from improved efficiency, then efficiency appears to be a very viable policy option to reduce energy consumption, right? Not so fast. Jevon's Paradox and the Rebound Effect are models that create snapshots in time of the operation of a highly complex system—it is important that we approach this problem with the entire system in mind. Consider the cascading effects in the energy-consumer system: when you save energy because of improved efficiency, you also save money. What do you do with that money? Chances are that most or all of it is spent on goods and services, and that these reflect energy consumption in some form. Whether you spend your savings on a trip to Hawaii, a new coffee table, or merely a plastic bauble, that expenditure reflects energy consumption. The exact form of energy consumed, as well as the relative quantity of energy consumed compared to energy initially saved via an improvement in efficiency is difficult to quantify, but in aggregate these two may be roughly equal. This is the "shadow" rebound effect. The "direct" rebound effect

—that is, the increase in consumption of the same energy resource through the same process that experiences an improvement in efficiency—may be only 10%-30%, but it is possible that the true rebound effect approaches 100% when this "shadow" is accounted for.

Does this mean that efficiency is an invalid policy choice? No: true conservation, the goal of efficiency policy, can be achieved, but this represents a far more challenging policy dilemma. It is relatively simple, for example, to legislate higher CAFE standards. But what happens with the money saved on gasoline? It is quite a policy challenge to ensure that the energy saved by CAFE changes doesn't simply go to another use of energy. One solution—the one that I am proposing—is that monetary savings from efficiency legislation is offset by an energy tax that is then invested in a manner that minimizes its energy consumption. Options for this offset fund reducing existing spending deficits, encouraging social pressure for absolute conservation, or my personal choice, funding efforts to design for quality of life using less energy—what I have called the Design Imperative. But selling this policy combination—CAFE increases paired with gas tax increases, for example—is a much more difficult task.

My intent is not to discourage the push for energy efficiency—quite the opposite: energy efficiency is a key part of addressing the challenges posed by Peak Oil, but ONLY if it is paired with measures to address both the direct and shadow rebound effects. There are valid arguments to focus on efficiency first, because it takes time to develop the technologies that create efficient energy use. However, we must be careful not to present efficiency as a standalone panacea, but rather to spur debate of systemic solutions of which efficiency is a key part.

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