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The Claim That Energy Efficiency Investments Are Self-Defeating

It has become fashionable in certain circles to argue that efforts at improving the energy efficiency of our economy are self-defeating in the sense that they simply encourage more energy consumption rather than less. This is not a new argument. It was first popularized over a century and a half ago by English economist William Stanley Jevons. As the industrial revolution was getting under way, he noticed the rapidly increasing use of non-human and non-animal energy sources such as coal and concluded that improvements in the efficiency of the production and use of energy, such as improvements in the efficiency of the steam engine, would simply make these energy source more and more affordable, leading to a headlong charge toward a more energy intensive economy. That is, improvements in energy efficiency would lead us to use more and more energy.

Jevons' insight ultimately got labeled a "paradox" and was considered a curiosity with little public policy importance. His insight could also have been applied later in the 20th century to the development of electricity as an energy source, the development of the internal combustion engine to drive individual automobiles and trucks, and the development of computers and computerized devices. In all three cases, improvements in the efficiency, reliability, and convenience of these new technologies led to explosive expansion in the use of them and the energy needed to power them.

The electrification, motorization, and digitalization of our economy has primarily been the source of celebration of our industrial and then post-industrial economies and the standard of living supported by them.

But beginning with the first energy crisis in the mid-1970s, we have become a lot more worried and cautious about where the high energy path we are on is leading us. Concerns about greenhouse gases and global warming, the need to maintain a massive military presence and wage periodic wars to protect our access to foreign energy sources, and the disruption brought on by wildly fluctuating energy prices have us seriously worried about the sustainability of our current pattern of energy use.

That has led to periodic waves of enthusiasm (at least when energy prices are rising) for energy efficiency programs and innovations in renewable energy sources such as solar and wind energy. That emphasis on innovation to reduce our reliance on certain sources of energy, however, has led to a renewed interest in the Jevons Paradox: Are such efforts at energy conservation and renewable energy development self-defeating? A minority of energy analysts seem to be arguing that they are.

This is not a trivial matter. Improvements in the efficiency with which we use energy and investments in reducing the cost of solar, wind, and biofuels are central to our efforts to reduce greenhouse gas emissions and improve our energy security.

The idea that improvements in energy efficiency can lead to a “rebound” or “take-back” effect has been a part of energy analysis for as long as we have taken energy efficiency investments seriously. A central principle of economics for over a century is that the reduction in the price of a good has two effects, both of which may lead to increased consumption of that good. First, the lower price makes the good more

attractive compared to other goods whose price has not fallen. That leads to higher levels of consumption of the lower priced good. In addition, the low price means that the person's discretionary purchasing power has increase. That increased purchasing power can be spent on anything that is attractive to the person, including more of the now cheaper good. But this latter effect is unlikely to be focused only on the good whose price has declined. Just because compact fluorescent or LED lights have reduced the cost of indoor lighting does not mean that we will choose to spend all of that cost savings simply leaving the lights on.

In any case, these aspects of household behavior in the face of lower energy costs have been widely studied for decades. In general, there is a take-back or rebound impact of lower energy costs, but that rebound effect is quite modest compared to the direct energy savings. Energy efficiency measures are very effective in producing net reductions in energy usage. Investment in energy efficiency is not in any sense self-defeating.

But it is also true that total energy consumption continues to rise despite all of the progress that has been made in improving the energy efficiency of machines, buildings, and appliances. So something appears to be "self-defeating"! There is no mystery here. Both human population and the volume of goods and services our economies have been producing have been expanding rapidly. The American population, for instance, has doubled over the last 60 years while the volume of goods and services produced allowed the economic output available for every man, woman, and child to increase three fold. Those combined growth factors represented a six fold increase in the scale of the economy. If nothing had been done to improve the efficiency with which we used

energy, our energy consumption would have increased six fold too. But over those sixty years we cut in half the energy needed to produce a dollar's worth of output. As a result, energy consumption expanded about three fold rather than six fold. Energy efficiency was having a major impact, but not enough to counter the impact of many more people consuming many more goods and services.

Our energy problems are not tied to some mechanical rebound effect that makes energy conservation self-defeating. Rather it is rising populations, and more important, rising affluence that continues to drive energy usage upward despite major accomplishments in the field of energy efficiency.

Doing something about the energy implications of rising affluence and population is much more challenging and may not have a technological solution.

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