Inside efficiencies… (great and small things we often leave out)

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Where this leads is to discovering why ..*in a growth* economy.. efficiency improvement generally stimulates 2.5 times more consumption than consumption constraint! and how to learn from nature what that means to us...

That principle is well established, if unappreciated, 150 year old economics. The dark side is not discussed because it doesn't fit with the mythology of multiplying self-interests. Understanding why is a bit of a journey, though. The real consequence of not questioning it, though, is that most of the impacts we are trying to reduce with improved efficiency are multiplied by our own efficiency improvements.

Efficiencies are generally seen as creating advantages for the user, letting them have more results as for less effort. The effects of that ripple through the whole economy in various unexpected ways, though. In a growth economy that actually stimulate more growing kinds of consumption than growth constraint, though. That's the problem.

Where everyone is using efficiencies to gain economic advantages it also drives others to keep up, and so pushes the whole economy to continually reorganize and people to race to keep up. Continual improvement is good, but changing too fast and escalating struggle to do so isn't. Unexpectedly rapid technology change may destabilize mature industries on which most people rely, for example.

If you're interested in that aspect you might look at "How we got here" [1] about how our work ethic which served us so well for centuries needs to respond a world in which it multiplies conflicts with our planet too...

So the effect of efficiencies depends more on their various ripple effects, than the advantage they give those who use them. Their ripple effects can multiply, stimulating economic growth and increasing our accumulative impacts on the earth. That's the opposite of what most advocates of efficiency are relying on.

Instead of trying to explore them all, here's a list of some of the less recognized ones, followed by a discussion of where the best evidence indicates the main one is taking our world, followed by some thought on how we might get out of it.

[1] http://www.synapse9.com/issues/EffRaceNoEnd.htm

If our struggle to keep up with efficiency is just an ever steeper climb, as it appears, then it has no destination but instability. Especially if we don't realize it, that's very dangerous. We might better learn how nature makes increasingly complicated things simple again. That would let us change our strategy from "doing more with less" to "making things whole".

A few things we often leave out…

an outline view of the natural effects and features of efficiency

1. Efficiencies that save money or resources create savings that get used for other things. We tend to count the subtractions but not the additions…
   - *a.* Saved money and energy are like "printing money" and "creating energy" not previously available, and often used for leveraging other things
   - b. Say, a 10 year payback on insulating your house, uses resources to saves and create resources that didn't exist before… having a positive EROI
     - i. First you have the added energy use and other impacts of the work
     - ii. You also free up energy as a resource for others to use for powering other uses with various impacts,
     - iii. After the 10 years you have what amounts to a new source of income for spending on other entirely new resource uses yourself,
     - iv. You've also given the bank a profit, maybe equal to half of the cost of the work, for it to use in multiplying more investments…
     - v. the reduced impact you counted is probably equaled by (i & ii) and exceeded by (iii & iv), thus the growth effect.
   - c. When adding up impacts of spending we may count only what we see, and miss the hidden impacts of the whole system that delivered the goods.
     - i. we add up the impacts of the physical processes by which things are made, and ignore the usually larger hidden impacts of:
       1) the employee, business operation and finance costs and impacts
       2) the embodied business development costs and impacts
       3) the resource depletion opportunity costs
2. New efficiencies can collapse whole networks of mature technologies,
   - a. Free internet media now threatens the model of professional journalism
   - *b.* New technology used by low wage people can deny markets to formerly well paid people.

3. Creating efficiencies does determine what other people will use them for
   a. Saving water where that was a supply barrier to development, invites development, expanded urban infrastructure and demand on all resources.
4. "Do more with less" is what people want and but also and ever steeper climb
   a. Matching the efficiencies of competitors is needed to keep investors.
   b. With unlimited resources it has the effect of sharing ways to have more
   c. With limited resources the effect is sharing ways to take more from others.
5. Efficiencies are a limited resource that gets ever more expensive,
   a. Finding ever greater efficiencies is a non-renewable resource, with the same depletion points of vanishing return as diminishing EROI resources. You can plan on their becoming too expensive to use.
   b. 2nd law efficiency limits for technologies and whole systems may only be seen in diminishing returns on investment for no other apparent cause.
6. Efficiency has two faces, like Jekyll and Hyde, benefits that become real dangers, like relying on increasing use of specialization or monocultures.
   a. Increasing control is decreasing tolerance. It leads to loosing control due to complications that more tolerant designs can overlook.
   b. Environmental adaption benefits from complex diversity. Uniformity reduces options, adds to inflexibility and instability in response to change.
   c. Accelerating coordinated change becomes accelerating uncoordinated change due to increasingly narrow learning and delayed response.
7. Logic makes computers very efficient for problem solving, but needing perfect inputs to get meaningful outputs
   a. Computers treat complex questions as “garbage in” giving “garbage out”.
   b. Nature’s way of computing is wasteful in every step, but takes “garbage in” and produces “fruit and vegetables out” or “garbage in” with “art and music out” using physical system complexity as its tool.
   c. The ability to sort out undefined complexities to select what problem needs to be solved, that computers can't do at all, seems to be an important efficiency too.

Where efficiency seems to lead…

Some of you may know that I gave a curiously contrarian talk for Charlie Hall's BioPhysical economics meeting in Syracuse on Oct 17[2]. There's a lot of evidence that investing in efficiency is doing just what the neo-classical economists always promised it would do, let us all have an ever bigger impact! That's not what people think of it as doing at all.

From the classical economic view it's in an investor's interest to invest in the most efficient new technology so businesses can use less human effort to produce more products[3]. Individuals, businesses and the whole economy all get to increase their total output by decreasing their unit inputs.

What gets overlooked is how that becomes a repeated process of increasing the scale and complexity of the economy. The profitable efficiencies that attract investments tend to decrease the resources needed to use one thing and serve to remove a 'bottleneck' for increasing the use of others.

It's that leverage that is the attraction to investors. Learning how to make one improvement leverage others creates the jumps in profit that result. The "new idea" for how to eliminate barriers for a business start-up is what allows it to deliver a service that couldn't have been provided before. It might be new automation, engineering, or just new packaging.

In that way creating new efficiencies could be described as nature's way of "printing money". The effect is to allow a small change in one thing to leverage much more of other things. Nature use it in her amazingly efficient designs too. Even accidental arrangements that are more productive tend to multiply, naturally. That's at the heart of why natural system economies develop.

Economies are market systems. Examples of natural economies include organisms, weather systems, ecologies, cultures and lots of other things. They have adaptive parts that take direction from each other, and sometimes that's the contagious use of innovations.

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[2] "Why efficiency multiplies consumption" http://www.synapse9.com/pub/EffMultiplies.htm

[3] A neo-classical economic view from Wikipedia: http://en.wikipedia.org/wiki/Growth_theory "According to this view, the role of technological change [i.e. efficiency improvement] became crucial, even more important than the accumulation of capital."

How innovative efficiencies are somewhat like "printing money" can even be seen in the normal effect of our own innovative use of efficiency in lifestyle choices. Your way of using less to enjoy it more probably reduces your consumption of some things. If you save money by it, though, that also creates money to spend where it didn't exist before.

That's the main story of economic growth in a nut shell. The accumulative effect is the same as we see in business competition to find efficiencies that allow using less effort to make more valuable products. It's the accumulative effect that counts. It's easy to overlook,.. and almost everyone does.

The data on world energy use and the efficiency of the economy in using that energy to produce GDP (fig. 1), clearly shows economic energy efficiency increasing ever more rapidly. It also shows world energy use, and by implication all the impacts of what we use energy for, increasing at ever faster rates.

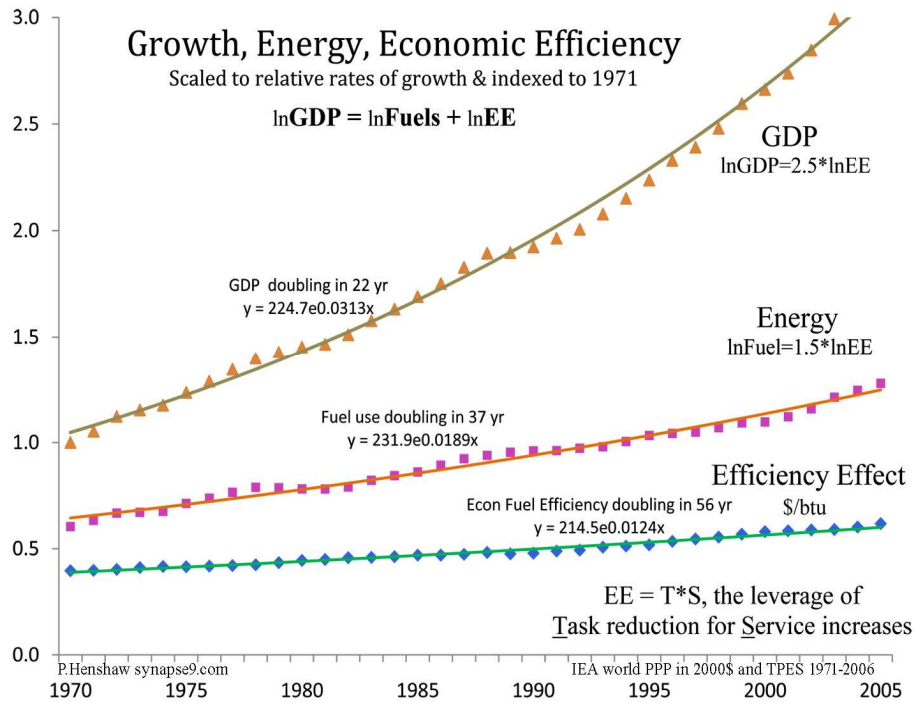

Fig. 1- IEA world data 1971-2006: Economic product (GDP in 2000$), Energy use (TPES in btu's) & Economic Energy Efficiency ($/btu), each scaled to their relative growth rates and indexed to 1971 value; The "efficiency effect" is implicitly the result of improving 'know-how' in using energy to create what

I'm sure it's hard for many people to imagine that this could be true. The presumed effect of efficiency for most people is the opposite. From the common view of using efficiency to reduce our energy use, the data appears to say that our ever greater success in doing so is having a large reverse effect.

Most businesses trying to become more efficient are not doing it thinking it will reduce their impacts, nor trying to increase their impacts. They're doing it to stay in business. This is a major key to understanding the uncontrolled behavior of the economic system as a whole. To stay in business in our competitive investment economy, businesses need to be ever more efficient to keep from losing their investors. As one business adopts better efficiencies, all others have to follow suite to maintain their profits. Otherwise they loose their investors, need to close business and have their parts sold off.

Needing to achieve ever increasing efficiencies is an endless steeper climb. For entrepreneurs it forces them to always push the limits of what is possible. They do it to let investors have regular % returns on their investments. The investors then use them to add to investments and so multiply their returns. The problem is this greatly biases the choices business entrepreneurs can make. It ties them into the unsustainable goal of continually multiplying profits, which has no end but eventual instability.

That instability might be from new business models upsetting old ones. It might also be from businesses being prevented from investing for the long term. You can see that in our failure to make sustainable investments in energy resources. As we see happening, investing for short term profits is causing business to continue consuming high EROI resources, ever faster. As they are depleted they still are not able to invest in the much less profitable use of lower EROI resources that would be sustainable.

Efficiency in multiplying short term profit is inefficient for sustaining long term profit. The value of the efficiency depends on what it leverages.

How we get out of this…

(one dangerous learning step at a time)[4]

How to get out of this really remarkable, but apparently very real dilemma is beyond the scope of this chapter. We seem to be touching on some of our deepest misunderstandings of nature, how we somehow came to define cultural stability as ever more rapidly expanding economic scale, complexity and speed of change. How it seems I got here is apparently having contradictions spark my curiosity, and having a personal intellectual habit of saying "oops…" when discovering my own mistakes. It's "practical". Certainly I pushed pretty hard to figure things out from time to time too.

Going further with this subject is problematic. It seems to require a constituency of equally "practical" scientists and other people who are intrigued by the stark differences between our cultural models of nature and the complex physical systems that are our common experience. There's a vast difference. For a continued discussion, see the link below. The following is a preview of the next chapter's conclusion….

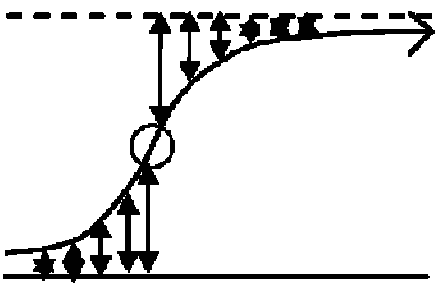

Fig. 2 A map of development, efficiency for growth and then maturity

Responsive self-investment systems, the kind that stop growing and mature by themselves, can be recognized by their histories of development. You can see the broad familiar pattern in fig. 2. That "S" curve is found in changes over time for any measure that is a stand-in for their rates or accumulations of energy flows. Development processes start with small simple steps of scale and increasing complexity, relating to the origin environment, that get successively bigger. Then they switch to developing by smaller steps, relating to their destination environment, and a new simplicity, in completing their development

[4] Chapter 2 "How we get out of this" www.synapse9.com/issues/HowWeGetOut.pdf

process. Examples are as simple as “making dinner”, starting with initial planning, then more complex and energetic steps, to end by preparing to put it on the table and the small finishing touches that make it ready to eat. The same applies to business plans and projects of all scales. In every case the real value of starting up ever more complex tasks is in completing them. It’s rare to have their value be in leaving them uncompletable.

Understanding the stages of natural system development also helps you understand why natural systems are cohesive, and to get beyond seeing them as a “jumble of parts without a theory”. Our theories will always be inadequate, but identifying the natural subjects of our curiosity goes a long way to helping connect our limited theories with them.

It’s sort of the ultimate efficiency, ending the growth process by finding a greater goal and purpose in making things whole [5]. What a savings! pfh

[5] For the details see:
Economies that become part of nature, www.synapse9.com/issues/NaturalEconsLtr.pdf
A longer version, www.synapse9.com/drafts/NaturalEcons.pdf
Financial Models and discussion of our “Three Bubble Economy”, www.synapse9.com/concept$.htm
General research methods www.synapse9.com and related writing www.synapse9.com/phpub.htm