

Interactive comment on “Energetic regimes of the global economy – past, present and future” by Andrew Jarvis and Carey King

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I am very familiar with this type of analysis having done similar such analyses since 1980 (e.g. Cleveland et al. 1984) and obtaining similar results. I find this a pretty good review, well enough written, and worthy of publication. As with earlier reviewers I do not have much in the way of detailed comments or criticism because fundamentally the issue is straightforward and their writing is mostly clear. They are as competent as anyone to write such a review. I disagree with the reviewer who thinks the choice of ~1970 is arbitrary. Before 1970 oil was abundant and cheap and always growing. After 1973 none of those were completely true, and the economics of energy changed enormously. It's just a fact.

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EXCEPT there is one (set of) issue they have not covered. Most people assume any increase in the GDP/PEI increases due to “better engineering”, i.e. human creativity. Now most “improvements” in efficiency of how humans do things are through more energy being applied e.g. for increases in yields per ha of crops. But this does not work for the efficiency being examined here. And it is extremely difficult to tackle but, in my opinion, critical. Measuring energy (heat value) is pretty straightforward and I do not particularly question what they did, although the energy content of e.g. coal is declining over time. Have they also corrected for primary electricity (hydro, nuclear, PV etc.) with 3 fold higher “quality” vs pure thermal fuels? I assume they have corrected for these issues.

BUT the GDP or whatever we may wish to call it can be extremely squirrely, for the GDP estimates, measured in current dollars, must be corrected for inflation to be considered accurate. Simple enough, but that requires a “price deflator”. How does one obtain that? Traditionally (pre about 1980) one took a standard “market basket “ of goods (including, say, a dozen eggs, a loaf of bread, a pound of butter, a two bedroom house in a modest city, a new automobile) and calculates its price every year. The difference in price for the same basket of goods gives on an inflation index, and you could use this to compare the GDP of 1950 with that of 1951 or 1970. This index was usually about 3 percent a year. But after 1980, when inflation rates increased above two digits, horror set in. The Reagan administration began to change the market basket to include increasingly videos, computer games and so forth, items that could be pricey but were much less energy intensive. According to Shadow statistics, and I understand other more sophisticated sites, this overestimated efficiency increases by about 1 percent a year, equal to the ~ 1 percent per year that, supposedly, the efficiency of the economy was increasing. i.e. this could account for the difference in the two slopes plotted. It argues completely against the concept that the efficiency will increase even more in the future. If they (i.e. s.s.) are correct (and I have no idea but lean in their direction), then the supposed increase in the efficiency of our global economy is spurious, and we retain the near linear relation of energy and economic output. I think Hannes Kunz

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has thought about this more than a little.

Robert Kaufmann of Boston University also has examined this efficiency and has other reasons (mainly a turn in the economy away from manufacturing toward services – although I think this is more true for OEDP countries than more developing ones) for the increase in efficiency that are not purely technical. Ayres believes that we have learned to apply energy more precisely to the point of work –I suppose an increase in the usual meaning of efficiency. As manufacturing has spread around the world post 1970 has the global relation of relatively energy-intensive manufacturing decreased relative to less energy-intensive services? Kaufmann's papers should be used and references, and it would be best for the authors to talk to Kaufmann about all of this.

Thus my suggestion would be to leave the paper largely where it is but add a rather extensive assessment as to whether there might be other reasons for the increase in efficiency besides "better engineering".

These authors may have covered some of this but I did not see it in a quick read. I would love to see these issues treated very well. Certainly, in my opinion, they need to be more than discussed but addressed. If this were done well I would lean heavily toward acceptance.

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