From Primary Resources to Useful Energy: The Pollution Ceiling Efficiency Paradox

by

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Discussion

Paper summary

- Hotelling type model with exhaustible (coal) and renewable (solar) energy resources, and a cap on atmospheric carbon
  - Main feature: Distinguishes between crude and useful energy, conversion from crude energy to useful energy costly
  - Must decide how much crude energy to extract/produce AND conversion rates between crude and useful energy (but not innovation)

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  - Main feature: Distinguishes between crude and useful energy, conversion from crude energy to useful energy costly
  - Must decide how much crude energy to extract/produce AND conversion rates between crude and useful energy (but not innovation)
- Analyzes economy's transition from polluting non-renewable energy to clean renewable energy – some results:
  - Crude-useful energy conversion rates (coal and solar) increasing over time
  - But, conversion rates constant when carbon constraint binds

Questions and comments

1. Crude-to-useful energy conversion rates vs. innovation
   - How (and why) to think about increasing crude-to-useful conversion rates separately from efficiency-improving innovation?
   - For example, in steam engine example from introduction, how much of increase in energy efficiency is due to choice of conversion rate rather than innovation?
2. Can we disentangle choice of conversion rate from efficiency-improving innovation?
   - Interdependencies?
   - Joint analysis for complete understanding of long-run effects?
   - F.ex.: Innovation shifts energy conversion cost curve down

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3. The efficiency paradox
   - Elaborate more on the efficiency paradox mentioned in the title
   - Currently not explicitly mentioned in paper, but should perhaps be?

Questions and comments

4. Renewable energy conversion rate
   - Model's solar conversion rate captures both scale of solar energy production (e.g. solar PV covered area) and efficiency of technology used ($\bar{y}$ given)
   - Implications for energy conversion cost and transition to solar?

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   - What if energy conversion rates for power plants are determined at time of investment (tech lock-in)?

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6. Empirical relevance and policy implications
   - Analysis focuses on social planner case with global carbon cap
   - Implications for other (perhaps more realistic) policy scenarios?
   - What should policy makers do given your results?