An Implementable Index of Sustainability and Assessment of Energy Policy

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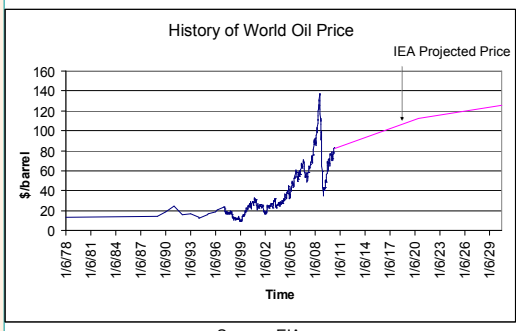
Oil Scarcity

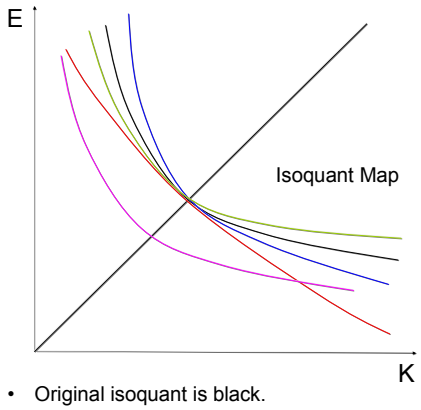


Source: EIA

Energy Policy - Technical Change - Sustainable Consumption

- Capacity to sustain consumption depends on ability of capital to substitute for fossil energy asymptotically.
- Substitutability is affected by technical change.
- Technical change is influenced by energy policy, e.g. Waxman-Markey.

Figure 1. Changes in Energy-Capital Substitutability



- Original isoquant is black.

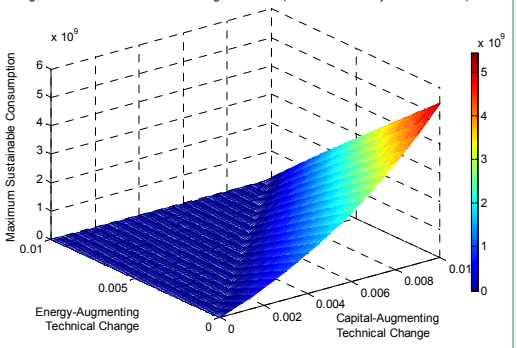
1. Biomass, wind, and solar. Capital-augmenting TC (blue isoquant).
2. Efficient appliances, smart grid, and combined heat and power. Energy-augmenting TC (green isoquant).
3. Co-fired power plants and flex-fuel vehicles. Elasticity of substitution-augmenting TC (red isoquant).
4. Hicks-neutral TC (pink isoquant).

- Only Hicks-neutral TC has been considered systematically (pink). This handicaps assessment of energy policy.
- We find link between technological progress, substitutability, and sustainable consumption.

Methodology and Results

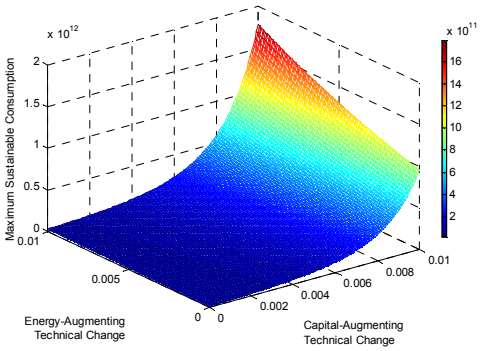
- Simulations of TCs other than Elasticity of substitution-increasing. Cobb Douglas approximation to US technology with Jorgenson's KLEM data set.

Figure 2: Non-neutral Technical Change and MSC (Constant Elasticity of Substitution)



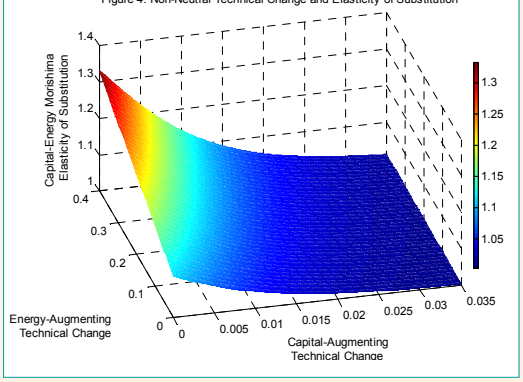
- Simulations of all types of TC. Transcendental approximation to US technology with Jorgenson's KLEM data set.
- Results on energy-augmenting technical change are reversed due to variable elasticity of substitution.

Figure 3: Non-Neutral Technical Change and MSC



- Impact of technical change on K-E elasticity of substitution.

Figure 4: Non-Neutral Technical Change and Elasticity of Substitution



Conclusions:

- Investment in alternative energy technologies (biofuels, solar, wind) are likely to increase sustainable consumption.
- Investment in energy efficiency measures (smart grid, combined heat and power) are **NOT** likely to increase sustainable consumption.
- Technologies that enhance flexibility (flex-fuel vehicles and co-fired power plants) are likely to increase sustainable consumption.
- More research is needed towards quantification of impact of relative diffusion of these technologies on substitution possibilities.

Main References:

• Aubin, J.P. 1991. Viability Theory. Springer Verlag, Birkhauser.

• Martinet, V. and Doyen, L. 2007. "Sustainability of an economy with an exhaustible resource: A viable control approach." *Resource and Energy Economics* 29, 17–39

• Solow, R.M., 1974. "Intergenerational equity and exhaustible resources." *Review of economic studies*, 41. In: Proceedings of the Symposium on the Economics of Exhaustible Resources. pp. 29–45.

• Stiglitz, J., 1974. "Growth with exhaustible natural resources: efficient and optimal growth paths." *Review of Economic Studies*, 41. In: Proceedings of the Symposium on the Economics of Exhaustible Resources. pp. 123–137.

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