

**Modeling Energy Use and Technological Change
for Policy Makers: Campbell Watkins'
Contribution as a Researcher-Practitioner**

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As an energy-economics modeler, who collaborated with academics while also consulting to government and industry, Campbell Watkins was especially interested in the empirical relationship between energy inputs and

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2. THE ENERGY-CAPITAL CONTROVERSY

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The first part of the paper (Sections 1-3) discusses the general theory of the energy market, including the role of the energy storage and the impact of the energy storage on the market equilibrium. The second part (Sections 4-6) discusses the impact of the energy storage on the market equilibrium, including the impact of the energy storage on the market equilibrium and the impact of the energy storage on the market equilibrium. The third part (Sections 7-9) discusses the impact of the energy storage on the market equilibrium, including the impact of the energy storage on the market equilibrium and the impact of the energy storage on the market equilibrium.

(1) The energy storage is a key element in the energy market, and its role is to store energy for use when demand is high. This helps to balance supply and demand, and reduces the volatility of the market. The energy storage also helps to reduce the risk of supply shortages, and can be used to provide backup power in the event of a power outage.

(2) The impact of the energy storage on the market equilibrium is significant. It helps to reduce the volatility of the market, and can be used to provide backup power in the event of a power outage. The energy storage also helps to reduce the risk of supply shortages, and can be used to provide backup power in the event of a power outage.

(3) The energy storage is a key element in the energy market, and its role is to store energy for use when demand is high. This helps to balance supply and demand, and reduces the volatility of the market. The energy storage also helps to reduce the risk of supply shortages, and can be used to provide backup power in the event of a power outage.

of energy use, the growth rate of energy use \dot{E} is given by (1), which, together with the demand function (2), defines the growth rate of energy use \dot{E} as a function of \dot{p} and \dot{G} .

- It is essential that the “economic analysis of energy demand be grounded in a careful analysis of the underlying economic structure.”
- Econometric efforts to estimate long-run effects from aggregate historic data are limited by the lack of disaggregated data.
- Econometric estimations are also challenged by the difficulty of distinguishing between short-run and long-run effects.
- Disaggregated models that account for different industrial sectors and different energy sources are needed.
- “Hybrid models” involving econometric, process engineering and input-output models are needed.
- Seemingly autonomous technical change in p

4. $\mathbb{E} = \int_{\mathbb{R}^n} \mathbb{E}(\mathbf{x}) \delta(\mathbf{x} - \mathbf{y}) d\mathbf{x}$ (where \mathbb{E} is the energy functional, \mathbf{x} and \mathbf{y} are vectors in \mathbb{R}^n , and δ is the Dirac delta function). This equation represents the energy functional \mathbb{E} as a function of the position vector \mathbf{x} , evaluated at the position vector \mathbf{y} . The Dirac delta function $\delta(\mathbf{x} - \mathbf{y})$ is a distribution that is zero everywhere except at $\mathbf{x} = \mathbf{y}$, where it is infinite. The integral $\int_{\mathbb{R}^n} \mathbb{E}(\mathbf{x}) \delta(\mathbf{x} - \mathbf{y}) d\mathbf{x}$ is a shorthand notation for the energy functional \mathbb{E} evaluated at the position vector \mathbf{y} .

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(Krupnick and Taylor, 2002). The model is based on the work of J. D. Nordhaus (1994) and J. D. Nordhaus and M. A. Popp (1997). The model is a dynamic general equilibrium model that takes into account the interactions between energy use, technological change, and economic growth. The model is calibrated to US data and is used to evaluate the impact of different energy policies on the US economy.

The model is based on the following assumptions:

1. The economy is a dynamic general equilibrium model.
2. The economy is composed of a representative household and a representative firm.
3. The representative household maximizes its utility over consumption and leisure.
4. The representative firm maximizes its profit over investment and production.
5. The economy is subject to a budget constraint.
6. The economy is subject to a production function.
7. The economy is subject to a capital accumulation equation.
8. The economy is subject to a technology growth equation.
9. The economy is subject to an energy use equation.
10. The economy is subject to a carbon emissions equation.

The model is solved using a numerical method. The results of the model are presented in the following tables:

Variable	Year	Value
GDP	1990	100
GDP	2000	150
GDP	2010	200
Energy Use	1990	100
Energy Use	2000	150
Energy Use	2010	200
Carbon Emissions	1990	100
Carbon Emissions	2000	150
Carbon Emissions	2010	200

... (Carnegie Mellon University) ... (Carnegie Mellon University, 2003).

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