

2.83/2.813 Homework Efficiency and Growth

Ref: Can Efficiency Improvement Reduce Resource Consumption? (Dahmus and Gutowski).

1. Of the ten activities studied, which one had the highest average annual efficiency ($\Delta e/e$) improvement? According to the paper, what led to this high efficiency increase? B) Which activity had the lowest average annual $\Delta e/e$? What was the reason given for this low value?

Ans. see Table 1; Freight rail travel is highest at 2.0% due to deregulation, refrigerators are lowest at -0.4% due to increased size and improves features.

2. What range of values is typical for the average annual $\Delta e/e$ for the three material production activities studied?

Ans see Table 1; 1.0 to 1.4%/yr

3. Please explain why you think it has been common over recent history for $\Delta Q/Q > \Delta e/e$.

Ans. More and wealthier buyers and lower prices usually lead to increases in demand for normal goods. Saving resources is secondary to the larger goals of the manufacturer (maximize profits and share holder value – usually by selling more), and to the consumer (maximize utility – often enough by buying and/or using more).

4. Give three historical examples of when $\Delta e/e \geq \Delta Q/Q$. What were the circumstances that lead to this result?

Ans.

Pig iron – price increases, fall in demand, closing down of inefficient operations

Freight rail travel – deregulation

Residential refrigeration – efficiency mandates