PRIVATE ECONOMIC EFFICIENCY

A KEY TO PROFITABILITY
PHYSICAL EFFICIENCY
FIRST

Before we can discuss private economic efficiency, we must define another measure of efficiency known as
PHYSICAL EFFICIENCY

(TECHNICAL EFFICIENCY, OR PRODUCTIVITY).
Simple ratio of:
Units of Output / Units of Input

For example,

Feed Efficiency = lbs. of gain / lb. of feed

Fertilizer Efficiency = lbs. of corn / lb. of fertilizer
Simple ratio of: units of output / units of input

Irrigation Efficiency = lbs. of tobacco / inch of water

Labor Efficiency = acres mowed / hour of labor
Let's examine the physical efficiency of corn production with respect to energy over time

- Define $\text{PE}_{\text{lab}}$ as bushels of corn produced / hour of labor.

- Define $\text{PE}_{\text{fuel}}$ as bushels of corn produced / gallon of fuel.
**Some Data:**

<table>
<thead>
<tr>
<th></th>
<th>1945</th>
<th>1971</th>
<th>1987</th>
<th>1988</th>
</tr>
</thead>
<tbody>
<tr>
<td>corn yields (bu/ac)</td>
<td>33.1</td>
<td>88.1</td>
<td>119.4</td>
<td>84.6</td>
</tr>
<tr>
<td>price of corn ($/bu)</td>
<td>1.23</td>
<td>1.08</td>
<td>1.94</td>
<td>2.55</td>
</tr>
<tr>
<td>price of labor ($/hr)</td>
<td>.43</td>
<td>1.64</td>
<td>5.00</td>
<td>5.02</td>
</tr>
<tr>
<td>price of fuel ($/gal)</td>
<td>.20</td>
<td>.26</td>
<td>.71</td>
<td>.73</td>
</tr>
<tr>
<td>hours labor per acre</td>
<td>19.2</td>
<td>5.10</td>
<td>1.90</td>
<td>1.90</td>
</tr>
<tr>
<td>gallons fuel per acre</td>
<td>0.00</td>
<td>15.0</td>
<td>12.0</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>1945</td>
<td>1971</td>
<td>1987</td>
<td>1988</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>PElabor</td>
<td>1.72</td>
<td>17.27</td>
<td>62.84</td>
<td>44.53</td>
</tr>
<tr>
<td>PEfuel</td>
<td>5.87</td>
<td>9.95</td>
<td>7.05</td>
<td></td>
</tr>
</tbody>
</table>
What does this data tell us?

- $P_{E_{labor}}$ and $P_{E_{fuel}}$ have gone up.
- The real price of labor has increased.
- The real price of fuel has decreased
- The real price of corn has decreased
How do you know the real price of corn decreased?

Turn to page 276 of your Notebooks.

There you will find a time-series of the Consumer Price Index

(update)
Analysis:

CPI for 1945 is 18.0
CPI for 1988 is 118.3

We find the INFLATION that occurred over this time period by calculating the percentage change in the CPI from 1945 to 1988
Analysis:

\[
\% \text{ Change in CPI} = \\
\frac{(\text{CPI}_{1988} - \text{CPI}_{1945})}{\text{CPI}_{1945}} \times 100 \\
\frac{(118.3 - 18.0)}{18.0} \times 100 = 557.22\% 
\]
Analysis:

\[
\% \text{ Change in Nominal Price of Corn} = \\
\left( \frac{P_{1988} - P_{1945}}{P_{1945}} \right) \times 100 \\
\left( \frac{\$2.55 - \$1.23}{\$1.23} \right) \times 100 = 107.31\% 
\]
Analysis:

Did Corn Prices increase as much as the inflation rate?

**Inflation = 557.22%**

**Increase in Corn Price = 107.31%**
Analysis:

What has the nominal price of labor done between 1945 and 1988?

Gone up 1067.44%

What has the nominal price of fuel done between 1945 and 1988?

Gone up 265%
Analysis:

What has the REAL price of labor done between 1945 and 1988?

????????????

What has the REAL price of fuel done between 1945 and 1988?

????????????
How many acres does it take to get 100 bushels of corn?

1945: \( \frac{100 \text{ bu.}}{33 \text{ bu./ac.}} = 3.02 \text{ acres} \)

1971: \( \frac{100}{88.8} = 1.14 \text{ acres} \)

1987: \( \frac{100}{119.4} = .84 \text{ acres} \)

1988: \( \frac{100}{84.6} = 1.18 \text{ acres} \)
Private Economic Efficiency

Value of output / Value of input.

Where,

Value of output = (units of output) * (price of output)

Value of input = (units of input) * (price of input)
What can we say about economic efficiency of corn producers over time?

Economic efficiency of labor in 1945,

\[
\text{value of output} = 33.1 \times \$1.23 = \$40.71
\]

\[
\text{value of labor} = 19.2 \times \$0.43 = \$8.26
\]

\[
\text{EE}_{\text{labor}} = \frac{\$40.71}{\$8.26} = 4.93
\]
What can we say about economic efficiency of corn producers over time?

**Economic efficiency of labor in 1971,**

- value of output $= 95.15$
- value of labor $= 8.36$
- $EEL_{labor} = 11.38$
What can we say about economic efficiency of corn producers over time?

Economic efficiency of fuel in 1971,

\[ \text{value of output} = 95.15 \]
\[ \text{value of fuel} = 3.90 \]
\[ \text{EE}_{\text{fuel}} = 24.40 \]
What can we say about economic efficiency of corn producers over time?

Economic efficiency of energy in 1971,

\[
\text{value of output} = \$95.15 \\
\text{value of energy} = \$8.36 + \$3.90 = \$12.26 \\
\text{EE}_\text{energy} = 7.76
\]
What can we say about economic efficiency of corn producers over time?

Economic efficiency of labor in 1987,

\[
\text{value of output} = 119.4 \times \$1.94 = \$231.64
\]

\[
\text{value of labor} = 1.90 \times \$5.00 = \$9.50
\]

\[
\text{EE}_{\text{labor}} = \frac{\$231.64}{\$9.50} = 24.38
\]
What can we say about economic efficiency of corn producers over time?

Economic efficiency of fuel in 1987,

\[
\text{value of output} = \$231.64
\]

\[
\text{value of fuel} = 12.0 \times \$0.71 = \$8.52
\]

\[
\text{EE}_{\text{fuel}} = \frac{\$231.64}{\$8.52} = 27.19
\]
What can we say about economic efficiency of corn producers over time?

Economic efficiency of energy in 1987,

value of output = $231.64

value of energy = $9.50 + $8.52 = $18.02

\[ EE_{energy} = \frac{231.64}{18.02} = 12.85 \]
Analysis: What conclusions can we come to?

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<tr>
<td>EElabor</td>
<td>4.93</td>
<td>11.38</td>
<td>24.38</td>
<td>22.62</td>
</tr>
<tr>
<td>EEfuel</td>
<td>24.40</td>
<td>27.19</td>
<td>24.63</td>
<td></td>
</tr>
<tr>
<td>EEenergy</td>
<td>7.76</td>
<td>12.85</td>
<td>11.79</td>
<td></td>
</tr>
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</table>
Analysis: Why did producers shift from human energy to fossil fuel energy?

<table>
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<tr>
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<th>Fuel</th>
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<tr>
<td>1945</td>
<td>$ .43/hour</td>
<td>$ .20/gallon</td>
</tr>
<tr>
<td>1971</td>
<td>$ 1.64/hour</td>
<td>$ .26/gallon</td>
</tr>
<tr>
<td>1987</td>
<td>$ 5.00/hour</td>
<td>$ .71/gallon</td>
</tr>
</tbody>
</table>
Analysis:

1. % change in price = ( (P1 - P0) / P0 ) * 100

2. % change in price of labor, from 1945 to 1971 =

   281.4%

   (((P_{1971} - P_{1945}) / P_{1945}) * 100
Analysis:

3. % change in price of fuel, from 1945 to 1971 =

$\frac{(P_{1971} - P_{1945})}{P_{1945}} \times 100 = $

$\frac{($0.26 - $0.20)}{$0.20} \times 100 = 30\%$
Analysis:

4. % change in price of labor, from 1971 to 1987 =

\[ \frac{(P1987 - P1971)}{P1971} \times 100 = \]

\[ \frac{($5.00 - $1.64)}{$1.64} \times 100 = 204.9\% \]
Analysis:

5. % change in price of fuel, from 1971 to 1987 =

\[
\frac{(P_{1987} - P_{1971})}{P_{1971}} \times 100 =
\]

\[
\frac{($0.71 - $0.26)}{$0.26} \times 100 = 173.1\%
\]
Analysis:

If you were the producer, how would you have responded to these price changes with respect to the mix of energy inputs used?

- Use more fuel and less labor?
Analysis:

Why did tobacco producers use so much migrant Hispanic labor?

Why is there use of migrant Hispanic labor decreasing?

Why has the price of tobacco harvesters increased so much since 1986?
Why have greenhouse and field grown nurseries increased their use of immigrant Hispanic labor at the expense of "home grown" labor?
Why did we see an increase in the use of Hispanic labor on golf courses prior to 1986, and a subsequent decrease since?
Why have the steel and automobile labor unions' power and popularity declined?
What special interest group do you think strongly supported the Immigration Reform and Control Act of 1986?

Why?

Based on what basic economic concept?
But Herm, this is all well and good boy, but you forgot that our producer has to buy that tractor and the implements to go with it!!

And, they ain’t Cheap!
Let's assume the cost of the tractor, combine, and accompanying implements for corn production totaled $128,485.00 in 1987

and will have a useful life averaging 15 years

and a total salvage value of $21,963.00
Annual Ownership Costs:

We estimate annual ownership costs for budgeting:

Depreciation = (cost - salvage) / useful life = $7,101.46/yr
Interest = ((cost + salvage) / 2) * .08 = $6,017.92/yr
Insurance = ((cost + salvage) / 2) * .008 = $601.79/yr
Prop. taxes = ((cost + salvage) / 2) * .00445 = $334.75/yr

Total annual ownership cost = $14,055.92/yr
Ownership and Operating Costs

If producing 500 acres,
Total annual ownership cost/acre = $28.11/acre

Operating Costs per acre: (1987)

(12 gallons fuel / acre) * ($0.71 / gallon) = $8.52/acre
(1.9 hours / acre) * ($5.00 / hour) = $9.50/acre

Total $46.13/acre
If we use only human labor,

\[(19.2 \text{ hours/acre}) \times ($5.00/\text{ hour}) = $96.00/\text{acre}\]

And look, we have not accounted for the mules or the feed they eat.

What would you do?