1. Background/Motivation
2. Tech Change in Climate/Energy Models
3. Learning Curves
   1. Global and Local Learning Model
   2. National Energy Modeling System
4. My Research
5. Recap
Supply Push
Advances in Science and Technology

Demand Pull
Changes in Market Demand

R&DD
International Coop
Education/Training

Tax Incentives
Subsidies
Cap & Trade
RPS
1. Background/Motivation

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5. Recap
(a) Averaged effects of including ETC on carbon price

US$/tCO₂

- 550ppm without ETC
- 550ppm with ETC
- 450ppm without ETC
- 450ppm with ETC
- Models - 450ppm with ETC
1. Background/Motivation
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\[ Y = ax^b \]

Single Factor: \[ \log Y = \alpha + b (\log x) \]

\[ LR = 1 - 2^b \]

Two Factor: \[ \log Y = \alpha + b_{\text{ld}} (\log x) + b_{\text{lr}} (\log R) \]

Component Based: \[ Y = \sum_{i=1}^{n} a_n x^{b_n} \]
<table>
<thead>
<tr>
<th>Technology &amp; Energy Source</th>
<th>One Factor Models</th>
<th>Two Factor Models</th>
<th>Time Period</th>
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<tbody>
<tr>
<td></td>
<td>Range of Learning Rates</td>
<td>Range of LBD rates</td>
<td>Range of LBR rates</td>
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<td>Two Factor Models</td>
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<td>6%</td>
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<tr>
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<tr>
<td>New Nuclear</td>
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<td>4%</td>
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<tr>
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<td>13%</td>
<td>19%</td>
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<tr>
<td>Wind</td>
<td>8%</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Solar PV</td>
<td>18%</td>
<td>19%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Learning Curve including Different Learning Rates for Each Stage

- Revolutionary Stage
- Learning Rate 10% & Technological Optimism
- Learning Rate 5%
- Evolutionary Stage
- Learning Rate 1%
- Conventional Stage

Cost per next unit vs. Units Built
1. Background/Motivation
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Interaction Term

Demand Pull

Log Cost

$X \times 2^3$

$X \times 2^5$

Log Cumulative Capacity
1. Background/Motivation
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Hazel Says: Thank You!

Questions?