Dutch Disease or Agglomeration? The Local Economic Effects of Natural Resource Booms in Modern America

Hunt Allcott\textsuperscript{1} Daniel Keniston\textsuperscript{2}

\textsuperscript{1}New York University and NBER
\textsuperscript{2}Yale University and NBER

April 2014
“It’s hard to think of what oil hasn’t done to life in the small communities of western North Dakota, good and bad.

Locals hope that unlike the boom of the 1970s and early 1980s, this boom “won’t afflict the state with the so-called Dutch Disease in which natural-resource development and the sugar rush of fast cash paradoxically make other parts of the economy less competitive and more difficult to sustain.”

"North Dakota Went Boom."
The Resource Curse

- Standard trade models: If no market failures, increases in resource prices benefit resource-abundant regions
- Resource Curse: Market failures interact with resource production to reduce growth
- One potential mechanism: Dutch Disease
  - Resource boom decreases manufacturing output
  - Manufacturing contraction reduces long-term productivity due to forgone local TFP spillovers
    - Greenstone, Hornbeck, and Moretti (2010), Kline and Moretti (2013)
    - Common assertion: Little TFP spillover from resource extraction to manufacturing
- But can resource extraction drive manufacturing growth?
  - Wright and Czelusta (2007), David and Wright (1997)
- Many existing studies, but poor data, conflicting results
Our Questions

1. How do oil and gas booms and busts differentially affect economic growth in resource-abundant U.S. counties?
2. Does manufacturing contract during oil and gas booms?
Our Approach

1. Remarkable data
   1.1 New county-level dataset of oil and gas resources
   1.2 Standard publicly-available local economic data
   1.3 Restricted-access microdata from U.S. Census

2. “Bartik” identification
   2.1 Geographic variation in resource abundance
   2.2 Time series variation in booms and busts

3. Better data + clean econometrics = surprising results
Background: Oil and Gas Booms in Modern History

![Graph showing historical data on oil price and oil and gas employment over the years from 1960 to 2010. The graph illustrates the relationship between oil price and employment in the oil and gas sector.]
Pre-2000 Endowment per Square Mile

$Millions of Oil & Gas Endowment per Sqr. Mile

- 0
- 0 - 0.01
- 0.01 - 0.1
- 0.1 - 0.5
- 0.6 - 1
- 1 - 5
- 5 - 10
- 10 - 159

Allcott and Keniston
Natural Resource Booms
Change in Endowment Post-2000

$Millions of Oil & Gas Endowment per Sqr. Mile
-4.63 - -0.5
-0.49 - -0.1
-0.09 - 0
0
0 - 0.01
0.01 - 0.1
0.1 - 0.5
0.5 - 1
1 - 5
5 - 10
10 - 47.44

Allcott and Keniston
Natural Resource Booms 8 / 19
Graphical Results: Employment

The graph illustrates the change in national oil and gas employment (in thousands) along with the outcome difference per $10M endowment per square mile from 1970 to 2010. The x-axis represents the year, and the y-axis shows the employment difference.

- **ln(Employment)**: This line tracks the natural logarithm of employment.
- **National Oil and Gas Employment**: This line indicates the national oil and gas employment in thousands.

The graph shows a significant increase in employment during the 1980s, followed by a decline and subsequent increase in the 2000s.
Clear Aggregate Growth Effects

Outcome Difference per $10M Endowment/Sq Mile

ln(Employment)  ln(Wage Earnings/Worker)  ln(Population)  National Oil and Gas Employment

year


ln(Employment)  ln(Wage Earnings/Worker)  ln(Population)  National Oil and Gas Employment

Allcott and Keniston  Natural Resource Booms
Manufacturing Employment Pro-Cyclical with Resources

![Graph showing the relationship between ln(Manufacturing Employment) and National Oil and Gas Employment over the years 1970 to 2010. The graph illustrates how manufacturing employment tends to be pro-cyclical with natural resource employment.](image-url)
Alternative Outcomes Consistent with Employment

<table>
<thead>
<tr>
<th>Category</th>
<th>Coefficient Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employ</td>
<td>0.15</td>
</tr>
<tr>
<td>Rev</td>
<td>0.05</td>
</tr>
<tr>
<td>Invest</td>
<td>0.05</td>
</tr>
<tr>
<td>Estab</td>
<td>0.15</td>
</tr>
<tr>
<td>births</td>
<td>0.05</td>
</tr>
<tr>
<td>Death</td>
<td>0.05</td>
</tr>
<tr>
<td>Wage</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Allcott and Keniston

Natural Resource Booms
Employment Growth for Upstream/Local Plants

- Coefficient Estimate
  - Upstream
  - Non-Linked Non-Tradable
  - Non-Linked Tradable

- Allcott and Keniston
- Natural Resource Booms
Manufacturing Productivity Pro-Cyclic with Resources

Coefﬁcient Estimate

ln(VA/Worker) ln(TFP)

Upstream Non−Linked
Non−Linked Non−Tradable Non−Linked Tradable

0 .002 .004 .006 .008

Coefficient Estimate

ln(VA/Worker) ln(TFP)

Upstream Non−Linked
Non−Linked Non−Tradable Non−Linked Tradable

0 .002 .004 .006 .008
Why No Dutch Disease?

- Point estimate: Wages rise less for non-linked non-tradable plants
- Wages don’t increase by enough to substantially reduce profits
  - County aggregate wages averaged 1.6 percent higher for counties with one standard deviation additional endowment between 1975 and 1985, relative to the 1969 levels
    - Conservative: May overstate wage increases for non-linked tradable plants
  - Average labor input revenue share $\approx 0.25$.
  - $\Rightarrow$ Total input costs increased by 0.4 percent of revenues
  - Not large, although:
    - Much larger share of profits
    - Other local input costs may have risen

- Revenue productivity increases. Why?
  - Output price increases? No evidence of this
  - MORG data: Worker transitions from oil & gas to manufacturing rare
  - Point estimates: Productivity gains larger for linked industries
    - Lower transport costs for goods?
Conclusion: Takeaways

1. Resource booms can significantly increase growth
2. Clearly reject the idea of Dutch Disease within the U.S.
   2.1 Despite wage increases, manufacturing is pro-cyclical with resource booms
3. A meaningful share of manufacturers benefit from very local demand growth
4. Counter the argument that natural resource extraction is unlikely to drive productivity growth
   4.1 Significant growth in linked manufacturing
   4.2 Positive spillovers to revenue TFP, potentially physical TFP
## Initial Manufacturing Sector Composition

**Table: 1967/69 Baseline County Characteristics**

<table>
<thead>
<tr>
<th>Manufacturing Employment</th>
<th>Mean (000s)</th>
<th>Association with Endowment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing employment</td>
<td>5.99</td>
<td>0.090*</td>
</tr>
<tr>
<td>Upstream manufacturing  employment</td>
<td>1.63</td>
<td>0.156**</td>
</tr>
<tr>
<td>Non-linked manufacturing employment</td>
<td>4.35</td>
<td>0.033</td>
</tr>
<tr>
<td>Non-linked local manufacturing employment</td>
<td>1.16</td>
<td>0.015</td>
</tr>
<tr>
<td>Non-linked tradable manufacturing employment</td>
<td>3.19</td>
<td>0.029</td>
</tr>
</tbody>
</table>
CPS Wage Regressions: All Workers

![Graph showing CPS Wage Regressions: All Workers](graph.png)
CPS Wage Regressions: Manufacturing Only

![Graph showing the relationship between natural oil and gas employment and wage regressions over the years 1980 to 2010. The x-axis represents the year, and the y-axis represents the natural log of the wage difference per $10M endowment per square mile. The graph includes a trend line for wage coefficient and another for national oil and gas employment (in thousands).]

---

Allcott and Keniston