Economic and Environmental Impacts of Increased U.S. Natural Gas Exports

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Shale Gas Benefits

• Shale gas is a game changer.
• It is part of the reason behind the manufacturing resurgence in the U.S.
• It will stimulate much more conversion of old coal fired electric power plants in the U.S. to natural gas, thereby providing environmental benefits.
• The IEA estimates that shale gas done right is only 7% more expensive than business as usual, so it can be done with minimal adverse environmental impact.
Free trade is beneficial in almost all cases from a global perspective. However, that does not mean that free trade in all cases is good for every country. In fact, there are many examples of countries or regions losing from trade liberalization. The question, then, is what are the impacts on the U.S. economy and environment of permitting increased natural gas exports.

We use a model called MARKAL-Macro to evaluate the impacts of increased natural gas exports. MARKAL is a bottom-up energy model that solves for the lowest cost mix of meeting energy service demands over the specified time horizon. MARKAL-Macro adds a macroeconomic sector to provide two way feedback on energy service costs and demands.
Impacts of Increased Natural Gas Exports

- We conducted our analysis for three cases: export increases of 6, 12, and 18 BCF/day.
- Our results suggest that all of these levels of increased export actually reduce GDP by a small amount - 0.04%, 0.11%, and 0.17% for the year 2035 for the three cases respectively.
- Natural gas prices increase 16%, 41%, and 47% for the three cases.
- The biggest change in the energy resource mix is less domestic use of gas and more use of coal.

Electricity Sector Impacts of Increased LNG Exports

- The main impacts are higher electricity prices and higher GHG emissions with higher exports.
  - Electricity prices are 1.1%, 4.3%, and 7.2% higher than in the reference case for the three export levels.
  - The change in GHG emissions varies over the time period and by level of exports, but ranges between +2% and +12%.
Transportation Impacts of Increased LNG Exports

- Transport use of CNG rises substantially in the reference case, is flat in the 6 BCF export case, and declines in the 12 and 18 BCF/day cases.
- The main impact is on LNG use for trucks.

Energy Intensive Sector Impacts of Increased LNG Exports

- Energy use in the manufacturing sectors is a proxy for level of economic activity.
- Energy use declines in primary metal, non-metals manufacturing, paper, and chemicals.
- For the 12 BCF/day case, the declines range from 2 to 3.1%.
Combination of Clean Energy Standard and Increased LNG Exports

- Imposition of the CES by itself leads to increased natural gas prices because of the greater use of gas for electricity.
- The combination of CES and increased exports causes the electricity price increase to be greater.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price Change of Natural Gas (%)</th>
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<tbody>
<tr>
<td>2020</td>
<td>20%</td>
</tr>
<tr>
<td>2030</td>
<td>40%</td>
</tr>
<tr>
<td>2040</td>
<td>60%</td>
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</tbody>
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Export Policy with CES 12 Bcf/day
Export Policy 12 Bcf/day

DOE-NERA Study

- This study concluded that there is a net economic gain from LNG exports, about $12 billion.
- For 2030, labor and capital income and indirect taxes fall about $45 billion, and natural gas resource income and net transfers increase about $57 billion.
- Wage income falls in agriculture, energy intensive sectors, and the electricity sector. The % wage declines are greater than the increase in net national income.
- Natural gas price increases always < 20%.
Comparison of NERA and Purdue Analyses

• Different models, different data sets, and different model parameters.
• Many differences, but some similarities. Income change in both is small - positive in NERA and negative in Purdue MARKAL-Macro.
• Purdue MARKAL-Macro gets much larger natural gas price increases than NERA.
• Trade policy changes are as much about who wins and who loses as about the net change.

Comparison of NERA and Purdue Analyses

• We agree that the global net impact is positive from larger US exports, but differ in the direction of impact on the US - driven mainly by the size of natural gas price increases.
• Within the US, there is also the distributional question. Winners are natural resource owners, and losers are labor and capital in other sectors.
• NERA does not estimate changes in GHG emissions, but US emissions clearly increase with higher LNG exports.
Conclusions

• Whether the net gains are positive or negative, they are quite small.
• Decisions must turn at least partly on distributional issues.
  • With such a large drop in labor income (NERA), and the high unemployment rate in the US, this is an important issue.
• For low levels of LNG exports, impacts are minor.
• Policy makers need to be cautious in approving higher LNG exports.

Thanks!
Questions and Comments