Rapidly Rising Energy Prices: Does the Driver of the Energy Market Imbalance Matter?

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Key Issues

• Impact on economic activity
• Direct effect on headline inflation
• Mechanism that can lead to persistently high inflation
• Does the cause of rising energy prices matter?
Outline

- Overview of GEM and the integration of energy
- Cross-country comparison of energy price increase similar to that seen since end-2003
- Impact on UK of alternative responses of monetary authority and labor suppliers
- Impact on Euro area of energy price increases driven by different factors in the rest of the world
Global Economy Model - GEM

- New open economy DSGE model
- Complete choice-theoretic framework
- Representative agent model
  - Households
  - Firms
  - Government
GEM

- Multiple-good framework
- Rational expectations
- Real rigidities
  - Habits and adjustment costs
- Nominal rigidities
  - Adjustment costs in wages and prices
GEM

• Monopolistic competition
  – wages contain a markup over the marginal rate of substitution between consumption and leisure
  – prices contain a markup over marginal cost

• Two-country/region structure
Household Consumption Bundle

\[ A = f(N, Q, M, Q_E, M_E), \]

- Where
  - \( N \) is nontradables
  - \( Q \) is domestically produced tradable non-energy
  - \( M \) is imported non-energy tradable
  - \( Q_E \) is domestically produced tradable energy
  - \( M_E \) is imported tradable energy
  - \( f \) is a nested CES aggregator
Goods Production

\[ Y = f(K, L, Q_E, M_E), \]

• Where
  – \( Y \) represents nontradable and tradable goods
  – \( K \) is the capital input
  – \( L \) is the labor input
  – \( Q_E \) is the domestically produced energy input
  – \( M_E \) is the imported energy input
  – \( f \) represents CES production technology
Energy Production

\[ Q_E = f(K, L, Land), \]

- Where
  - \( Q_E \) is domestically produced energy
  - \( K \) is the capital input
  - \( L \) is the labor input
  - \( Land \) is the known available reserve of energy
  - \( f \) represents CES production technology
Calibration of Energy Prices

• Key energy price properties
  – home and foreign prices move together
  – energy prices more volatile over cycle

• Calibration of elasticities of substitution and importance of *Land* in energy production yield desired properties
## Calibration of Energy Intensities

**Oil and Natural Gas as Shares of GDP**

<table>
<thead>
<tr>
<th></th>
<th>United Kingdom</th>
<th>Euro Area</th>
<th>United States</th>
<th>Canada</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>2.23</td>
<td>0.16</td>
<td>1.50</td>
<td>6.80</td>
<td>0.02</td>
</tr>
<tr>
<td>Imports</td>
<td>0.71</td>
<td>1.60</td>
<td>1.26</td>
<td>1.22</td>
<td>1.38</td>
</tr>
<tr>
<td>Total Available</td>
<td>2.94</td>
<td>1.76</td>
<td>2.76</td>
<td>8.02</td>
<td>1.40</td>
</tr>
<tr>
<td>Total Use</td>
<td>1.94</td>
<td>1.76</td>
<td>2.72</td>
<td>4.05</td>
<td>1.40</td>
</tr>
<tr>
<td>Input</td>
<td>1.15</td>
<td>1.02</td>
<td>1.23</td>
<td>2.23</td>
<td>0.70</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.79</td>
<td>0.73</td>
<td>1.49</td>
<td>1.82</td>
<td>0.70</td>
</tr>
<tr>
<td>Net Exports</td>
<td>0.29</td>
<td>-1.60</td>
<td>-1.22</td>
<td>2.75</td>
<td>-1.38</td>
</tr>
</tbody>
</table>
Energy Prices Since End-2003

- Simulation done iteratively
- Energy prices and expected future path based on data and futures markets for oil prices
- Interest rates held at baseline for first nine quarters of simulation
Energy Prices Since End-2003

Solid Line - represents actual path and expected path beyond quarter 9.
Dashed Line - represents expected path at each quarter prior to quarter 9.

Energy Price Path in GEM Simulation
(percent deviation from baseline)

Oil Prices Spot and Futures
(percent deviation from $29 per barrel)

Source: Bloomberg and GEM Simulations.
Simulated Recent Energy Shock

Solid - United States          Dotted - Japan         Dashed - Euro area

-3.5                              -2.5
-1.5                              -0.5
0.5

Real GDP

-3.5                              -2.5
-1.5                              -0.5
0.5

Investment

-3.5                              -2.5
-1.5                              -0.5
0.5

Consumption

-3.5                              -2.5
-1.5                              -0.5
0.5

Nominal Interest Rates

-3.5                              -2.5
-1.5                              -0.5
0.5

CPI Inflation (y-o-y)

-3.5                              -2.5
-1.5                              -0.5
0.5

Real Wage

0 2 4 6 8 10 0 2 4 6 8 10 0 2 4 6 8 10 0 2 4 6 8 10

Source: GEM Simulations.
Simulated Recent Energy Shock

Solid - Canada          Dashed - United Kingdom

Real GDP

Investment

Consumption

Nominal Interest Rates

CPI Inflation (y-o-y)

Real Wage

Source: GEM Simulations.
Benign Inflation Outcome

- Monetary authority fully understands supply-side implications
- Labor suppliers accept decline in their real consumption wages
- Alternatives
  - Policymakers may only slowly learn about impact on potential output
  - Workers could temporarily recover some of the real wage decline
Alternative Responses – U.K.

Solid - base case.
Dotted - output gap in reaction function.
Dashed - output gap in policy rule and temporary increase in labor suppliers' market power.

Source: GEM Simulations.
Alternative Drivers of Energy Prices

• Increase in labor supply in emerging Asia (reduction in wage markup in the rest-of-world)

• Increase in tradable sector productivity in emerging Asia (increase in tradable sector productivity in rest of world)
Alternative Drivers of Energy Prices
Euro Area

Source: GEM Simulations.
Alternative Drivers of Energy Prices
Euro Area

Solid - Energy Sector          Dotted - Productivity          Dashed - Labor

Source: GEM Simulations.
Conclusions

• In the short-run, higher energy price will likely have a negative impact on activity in most industrial countries

• The long-run impact on economic activity will depend on the source of the energy market imbalance

• If faster than expected growth in Emerging Asia is the source, the stronger are the industrial countries’ trade ties with them, the larger will be the positive terms-of-trade effect
Conclusions

Under the pure energy sector shock persistent inflation effects may emerge if

– supply-side implications are not fully integrated into the monetary authority’s response and

– workers are able to temporarily resist the declines in real wages
Conclusions

- Persistent inflation effects may also emerge if non-energy sector supply factors in emerging Asia are driving energy prices.