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Prices of Energy and the Polish Economy

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Plan of the presentation

• Energy in the Polish economy
• Model
• Assumptions for simulations
• Results of simulations
• Conclusions
Energy in the Polish economy

World energy consumption (mtoe) and the share of Poland

- TOTAL WORLD
- Poland/World
Energy in the Polish economy

EU energy consumption (mtoe) and the share of Poland
Energy in the Polish economy

Energy use per capita (kgoe) in Poland and other countries
Energy in the Polish economy

Structure of primary energy consumption in Poland & other countries
Energy in the Polish economy
Changes in structure of primary energy consumption in Poland

[Graph showing changes in energy consumption structure from 1990 to 2006]

- Other
- Renewable
- Natural gas
- Oil
- Solid fuels
Energy in the Polish economy

Structure of fuels used for electric power generation in Poland
Model

Blocks of the IMPEC model

**Production block**
- Productivity
- Employment
- Production
- Final demand
  - private consumption
  - govt. consumption
  - investment
  - foreign trade

**Input-output parameters**

**Price-income block**
- Value added
  - labor costs
  - gross operating surplus
  - taxes on production
- Final users prices

**Accountant**
- Distribution of income flows
- Primary and disposable incomes of institutional sectors
- Savings and mutual liabilities of institutional sectors, incl. balance of payments & budget deficit
Model

Data used:
– io tables of 2000, 54 sectors of economy (divisions of NACE classification)
– io matrix in base prices (domestic and import)
– io matrix in purchasers prices (to determine taxes and margins)
– Make and use tables 1995-2006, 37 sectors (sections and subsections of NACE)

Stochastic equations
– PCE
– labor productivity
– wages
– operating surplus
– deviations in output and prices
**Model**

**Specification of some equations**

**Labor productivity** 45 sectors

\[
\ln \text{labprt}_t = \alpha_0 + \alpha_1 \text{timet}_t + \alpha_2 \text{timetYYYY}_t + \alpha_3 \text{outRdown}_t + \alpha_0 \text{outRup}_t + \epsilon_t
\]

where

\text{timet} \text{ and } \text{timetYYYY} – \text{time trend variable}

\[
\text{outRdown}_t = \begin{cases} 
\ln \text{outR}_t - \ln \text{outRpeak}_{t-1} & \text{if } \text{outR}_t < \text{outRpeak}_{t-1} \\
0 & \text{if } \text{outR}_t \geq \text{outRpeak}_{t-1}
\end{cases}
\]

\[
\text{outRup}_t = \begin{cases} 
\ln \text{outR}_t - \ln \text{outRpeak}_{t-1} & \text{gdy } \text{outR}_t > \text{outRpeak}_{t-1} \\
0 & \text{if } \text{outR}_t \leq \text{outRpeak}_{t-1}
\end{cases}
\]

\[
\text{outRpeak}_t = \begin{cases} 
\text{outR}_t & \text{if } \text{outR}_t > \text{outRpeak}_{t-1} \\
\text{outRpeak}_t & \text{if } \text{outR}_t \leq \text{outRpeak}_{t-1}
\end{cases}
\]
Model
Specification of some equations

Labor costs (wages) 37 sectors

\[
\ln waga_{\text{avgtot}} = 6,143 + 0,888 \ln pc_{t-1} + 0,304 \ln labprttot_t + 0,697 \frac{1}{un_t}
\]

- where
- \(waga_{\text{avgtot}}\) – average wage
- \(pc\) – CPI
- \(labprttot\) – labor productivity
- \(un\) – unemployment rate

\[wagav_{t} = \alpha_0 + \alpha_1 waga_{\text{avgtot}} + \epsilon_{it}\]
Model

Specification of some equations

Operating surplus

\[ \Delta \text{markup}_t = \alpha_0 + \alpha_1 \Delta \text{outRT}_t + \alpha_2 \Delta \text{wagmark}_t + \alpha_3 \text{markup}_{t-1} + \]
\[ + \alpha_4 \text{outRT}_{t-1} + \alpha_5 \text{wagmark}_{t-1} + \epsilon_t \]

where

\text{outRT} \text{ growth rate of real output (outR)}

\text{wagmark} – \text{ratio of labor costs and material costs (both in current prices)}
Model

Spreading changes of energy prices over the economy

\[ m_i \rightarrow q^d_i \rightarrow fd_i \rightarrow othfd_i \]

\[ pq_p, pq_e \rightarrow p^m_i \rightarrow wag_j \rightarrow yp \rightarrow y \]

\[ pc_k \rightarrow cpi \rightarrow B \rightarrow c_k \]

\[ pq_p, pq_e \]
Assumptions for simulations

Simulation period 2008 - 2020
- Base scenario
- High growth
- Frozen
- Renewables frozen

Mel30i – increase of domestic price of electric power
Mcoal30i – increase of domestic price of coal by 30% in 2010
Moil50i – increase of crude oil price by 50% in 2010
### Results – base scenario (growth rates)

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<thead>
<tr>
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<td><strong>GDP</strong></td>
<td>2.7</td>
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<td>2.3</td>
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<td><strong>Output (deflators)</strong></td>
<td>1.8</td>
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<td>2.6</td>
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<td>1.9</td>
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<td>2.7</td>
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<td>2.3</td>
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<tr>
<td><strong>Average wage</strong></td>
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## Results – multipliers (percentage deviations from baseline)

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<td>Moil50i</td>
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<td>Moil50i</td>
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## Results – scenario analysis (deviations from growth rates)

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<td><strong>Real income (hholds)</strong></td>
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<td>0.0</td>
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Conclusions

– Poland uses relatively low amount of energy
– The share of Poland in world energy use is decreasing (but not in Europe)
– Coal is a very important energy source for Poland so EU policy influence Polish economy in a large extent
– The most important energy source in Poland is coal, used mainly in power plants
– IMPEC model of the Polish economy is rebuilt
– Simulations show that high energy prices cause noticeable loss of 0.2 p.p. of GDP growth
– Multiplier analyses showed that IMPEC dynamic features should be improved