Russia and Energy Security

The Aftermath of the Russian Presidential Elections: 38th Annual Outreach Conference in Slavic, East European, and Eurasian Studies

Barry W. Ickes

The Pennsylvania State University

April 28, 2012
Is Russia’s energy policy driven by imperatives of energy security?

Yergin: “Although in the developed world the usual definition of energy security is simply the availability of sufficient supplies at affordable prices, different countries interpret what that concept means for them differently.” Exporters need “security of demand” because the revenues are so central to their treasuries; Russia wants state control over production and pipelines; China and India need to adjust to global markets; Japan needs to offset its own lack of domestic supplies; Europe seeks to manage its dependence on imported natural gas. True, but what do these countries understand by “energy security”? Is there any meaning to it aside from war?
Is Russia’s energy policy driven by imperatives of energy security?

Confusion about meaning
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More meaningful to talk about price volatility
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Dvir-Rogoff Three Epochs
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Sample Statistics of Oil Prices

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Annual Price Changes

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More meaningful to talk about price volatility

**Dvir-Rogoff Three Epochs**

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Real Oil Price Volatility
Crucial to think about resource rents ≡ market value less actual cost
Resource rents

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- Future of oil and gas rents driven by the volatility of oil prices
Figure: Russian Oil and Gas Rents Since 1950 (Oil rents in black, natural gas rents in blue)
Components of Rents

Categories of Rent Distribution

- Formal Profits (FP)
- Informal Profits (IP)
- Formal Taxes (FT)
- Informal Taxes (IT)
- Price Subsidies (PS)
- Excess Costs (EC)

Total Rent

- Pre-tax profit
- Reported cost of production
Importance of Resource rents

Russian Oil and Gas Rents and GDP, 1970-2030

- **Real GDP (1970=100)**
- **Oil & Gas Rents (2009 USD)**

- **GDP**
- **Oil and Gas Rents**
Implications for Russia

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- there is also a need to secure supply channels for gas by avoiding transit states (return to later)
- Russia frames this as a security issue especially by alleging that its adversaries, US and NATO, can manipulate world oil prices.
Russian Fear: Price Manipulation

- Russian Security Council Secretary Nikolai Patrushev, January 11, 2012 on oil price manipulation:

  "The U.S. is persistently seeking to sustain its economic, political and military domination in the world. ... There are well-known statements of American politicians about the need to put Russia’ s energy, water and other resources under U.S. control. ... "The manipulation of hydrocarbon prices may in certain conditions be a powerful economic weapon ... Saudi Arabia made oil prices fall to weaken the USSR. The fall of prices was not the only reason, but it was an important one, why the Soviet state collapsed."

What if the US could manipulate prices this way?

This is a macroeconomic issue – but too much focus on budget

Key issue is the rent not the budget

CRIFES (The Pennsylvania State University)
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Stabilization Fund and the Iceberg

Russian Oil & Gas Rents 1970-2007

Real (2007) USD blns/yr

Stabilization Fund

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Total Rent and Stabilization Fund, 2003-2011

- Total Rent for Year
- Cumulative Amount in Stabilization Fund at Year End
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- Solution is risk sharing
Russia’s Future Oil Output without Investment

Russian Oil Output, 1945-2030

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- Domestic Gas Production declining. Yamal and East Siberia requires huge investments.
- Russia has to invest in Nordstream and South Stream to assure European markets and counter their efforts to diversify supply.
- Long-term gas contracts tied to oil prices transmitted volatility. But gas prices are coming under more pressure due to alternative supplies.
- Russia needs serious investment in gas industry to maintain this key rent source.
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The real problem is that Russia has on top of its efficiency issues some major (real or imagined) security concerns that shape its behavior as well.
Modernization Difficulties

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Russia could obtain higher growth if the oil and gas sectors were truly modern — freed from the obligation to share rents through the rent distribution chains.
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The kinds of investment envisioned in those efforts will preserve and reinforce the rent distribution chains.
Medvedev Portfolio Allocation Problem

- Toy Model
Toy Model

Suppose Medvedev chooses $\alpha \in (0, 1)$, the manufacturing share to solve

$$\max_{\alpha} \int_{R \times R} U(W(1 + \alpha r_{man} + (1 - \alpha) r_{oil}) f(r_{man}, r_{oil}) \, dr_{man} \, dr_{oil}$$
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Need expected returns and volatilities to compute optimal portfolio.
What is the optimal investment strategy?
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- rates of return highest in \( o \), lowest in \( m \).
- services least risky, oil most risky
Optimal Portfolio Shares

Optimal portfolio shares for 1995-2009 data

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- Skip $M$ move directly to $S$, but even this requires high risk aversion
Should Russia Have Diversified?

The bar chart shows the real dollar GDP (1999=100) for Russia, China + Hong Kong, India, and Brazil from 1999 to 2009.
Which BRIC Would You Invest In?
A Model

- An international real business cycles model with

---

A Model

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  - Portfolio investment (FPI)
  - Long-term equity investments (FDI)
Log energy prices follow an AR(1) process:

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\log p_{et} = \rho \log p_{e,t-1} + u_t
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u_t \sim N(0, \sigma_u^2)
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Model

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- Non-tradable final good:

\[ Y^H_{ft} = \left( \gamma_1 \left( Y^H_{mt} \right)^{\frac{\gamma_2-1}{\gamma_2}} + (1 - \gamma_1) \left( Y^H_{et} \right)^{\frac{\gamma_2-1}{\gamma_2}} \right)^{\frac{\gamma_2}{\gamma_2-1}} \]
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\]

- Final good is both consumption and investment good
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Production of intermediate goods

\[
\begin{align*}
Y^H_{et} &= A^H_e (K^H_{et-1})^\alpha \\
Y^H_{mt} &= A^H_m (K^H_m)^\alpha
\end{align*}
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Model

- Home has a fixed manufacturing capital ($\overline{K}_m^H$), foreign has fixed energy reserves, ($\overline{K}_e^F$)
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\]

- Intermediates are used as input and exported:

\[Y_{st}^i = y_{st}^i + x_{st}^i\]
Model

Households own the capital, make savings and consumption decision to maximize

\[ E_0 \sum_{t=0}^{\infty} \beta^t \left( \frac{(c_t^H)^{1-\nu}}{1-\nu} \right) \]

subject to the budget constraint

\[ p_{ft} \left( c_t^H + I_{et}^H + \delta_m K_m^H + \frac{\psi_b}{2} b_{Ht}^2 + \frac{\psi_a}{2} \sum_{i=H} F \sum_{s=e}^m (a_{Ht}^s - a_{Ht}^s)^2 \right) \]

\[ + b_{Ht} + \sum_{i=H}^F \sum_{s=e}^m a_{Ht}^s p_{at}^s \]

\[ = R_{mt}^H K_m^H + R_{et}^H K_{et}^{H-1} \]

\[ + \sum_{i=H}^F \sum_{s=e}^m a_{Ht-1}^s (p_{at}^s + d_{t}^s) + R_{bt-1} b_{Ht-1} \]
In equilibrium
In equilibrium

Households and firms maximize,
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- Households and firms maximize,
- Markets clear,

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\begin{align*}
    b_{Ht} + b_{Ft} &= 0 \\
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- Countries have balance of payments

\[
\chi_{mt}^i + p_{et}^i \chi_{et}^i = b_{it} - R_{bt-1} b_{it-1} + \sum_{j=H}^{F} \sum_{s=e}^{m} p_{at}^{sj} (a_{it}^{sj} - a_{it-1}^{sj})
\]
Four Financial regimes:
Model

- Four Financial regimes:
  1. Autarky:

\[ \psi_a \to \infty, \quad \psi_b \to \infty, \quad a^s_{ij} = a^s_{ji} = 0, \quad i \neq j \]
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4. **Long-term equity investment (FDI):**
   \[ \psi_a \text{ finite}, \quad \psi_b \text{ finite}, \quad \bar{a}_j^i > 0, \quad \bar{a}_i^j > 0 \]
Computation

- Solve the model using a second-order approximation to policy functions and laws of motion

\[ E f(y, y_0, x, x_0, u, \sigma) = 0 \]

where \( u \) is the shock, \( x \) is vector of endogenous state variables, \( y \) is endogenous choice variables, \( \sigma \) captures uncertainty.

Solve for the coefficients of the Taylor expansion of the policy functions and law of motion:

\[ y = g(x, u, \sigma) \]

\[ x_0 = h(x, \sigma) + \sigma u \]

around the deterministic steady state (\( \sigma = 0 \)).
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## Calibration

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<thead>
<tr>
<th>Parameter</th>
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<th>Value</th>
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<tbody>
<tr>
<td>$\beta$</td>
<td>discount factor</td>
<td>0.96</td>
</tr>
<tr>
<td>$\rho$</td>
<td>persistence of oil shocks</td>
<td>0.95</td>
</tr>
<tr>
<td>$\sigma_u$</td>
<td>std deviation of oil price shocks</td>
<td>0.05</td>
</tr>
<tr>
<td>$\gamma_1$</td>
<td>input share of manufacturing</td>
<td>0.9</td>
</tr>
<tr>
<td>$\gamma_2$</td>
<td>elasticity of substitution (m&amp;e)</td>
<td>0.1</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>returns to capital</td>
<td>0.36</td>
</tr>
<tr>
<td>$\delta_m$</td>
<td>depreciation of manufacturing capital</td>
<td>0.05</td>
</tr>
<tr>
<td>$\delta_e$</td>
<td>depletion of energy reserves</td>
<td>0.03</td>
</tr>
<tr>
<td>$\nu$</td>
<td>risk aversion</td>
<td>2</td>
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Calibration

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- for $(A^H_e, A^F_m, K^H_m, K^F_e) = (2, 6.85, 4.25, 0.85)$
Results: A Sequence of Shocks

Energy Prices

Periods

Energy Prices

Periods
Results: Home Consumption

![Home Consumption Graph]

- **Consumption**
- **Periods**
- **FPI**
- **Bond**
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 Consumption is smoother for both Home and Foreign.
Implications

- Large effect of financial regimes on consumption and, hence, welfare - larger effect for Home since it is importing the intensively used input.
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- Oil output responds faster to price shocks in financially open regimes.
- If OPEC oil supply was not perfectly elastic, then Russian oil response would smooth world supply, and consuming countries would benefit even more.
- **Conjecture**: If we introduce lumpy investment process for energy – high fixed costs – then we expect financial integration has bigger effect on energy security.
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→ one big question
Russia’s Paradoxical Solution

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Alternative Explanation

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Russia is not Nigeria

United States, 8,500
Russia, 10,000

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Government is the residual claimant
The Future

- PPR is a result of funnel economy and mutual conflict equilibrium

People dislike Putin’s behavior, but no easy solution to replace him. If anyone tells you Putin’s rule is bound to end, ask them to explain, How? In your scenario, What happens to the Protection Racket? What will the oligarchs do?

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The End

Thank You
Figure: Soviet and Russian Oil and Gas Rents, 1970 – 2011