Estimating the Magnitude of Capital Flight Due To Abnormal Pricing in International Trade: The Russia-USA Case

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and John S. Zdanowicz, Florida International University

Russian Caviar at $3/KG?

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Quantity</th>
<th>Price</th>
<th>Median Price</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAVIAR</td>
<td>$19,048</td>
<td>5,642 KG</td>
<td>$3</td>
<td>$260</td>
<td>LA 05</td>
</tr>
<tr>
<td>COOKING STOVES, Industrial</td>
<td>$2,400</td>
<td>400 N</td>
<td>$6</td>
<td>$2,281</td>
<td>LA 05</td>
</tr>
<tr>
<td>MOWERS, Tractor drawn or for Tractor mounting, not Rotary cutter type</td>
<td>$11,469</td>
<td>122 N</td>
<td>$94</td>
<td>$3,682</td>
<td>HSTN 11</td>
</tr>
<tr>
<td>GEAR BOXES for Passenger Car</td>
<td>$37,320</td>
<td>6,496 N</td>
<td>$6</td>
<td>$818</td>
<td>HSTN 12</td>
</tr>
</tbody>
</table>
Bicycle Tires at $364/tire from the U.S.?

1999 Russia’s Import from the US - abnormally high priced

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Quantity</th>
<th>Price</th>
<th>Median Price</th>
<th>District</th>
<th>MO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BICYCLES TIRES</td>
<td>$2,548</td>
<td>7 NO</td>
<td>$364</td>
<td>$3.09</td>
<td>DETROIT</td>
<td>02</td>
</tr>
<tr>
<td>MEN'S OR BOYS' RAINCOATS - cotton</td>
<td>$116,592</td>
<td>322 DOZ</td>
<td>$362</td>
<td>$40.46</td>
<td>NY CITY</td>
<td>03</td>
</tr>
<tr>
<td>WORN CLOTHING and OTHER WORN ARTICLES</td>
<td>$150,000</td>
<td>347 KG</td>
<td>$432</td>
<td>$0.88</td>
<td>GTFALLS</td>
<td>05</td>
</tr>
<tr>
<td>BURGLAR ALARMS, Electric</td>
<td>$105,954</td>
<td>7 NO</td>
<td>$15,136</td>
<td>$193.68</td>
<td>NY CITY</td>
<td>01</td>
</tr>
<tr>
<td>SWITCHES, PUSH-BUTTON, rated at &lt; 10A, 1,000 V</td>
<td>$179,080</td>
<td>10 NO</td>
<td>$17,908</td>
<td>$1.47</td>
<td>SEATTLE</td>
<td>07</td>
</tr>
</tbody>
</table>

Abnormal Pricing in International Trade

- May be related to:
  - Capital flight
  - Import duty fraud
  - Income tax evasion / Transfer Pricing
  - Money laundering

- Other Explanations:
  - Clerical/Recording Errors
  - Product Heterogeneity for a given HS10 code
    - $25,000 fax machine from Japan – prototype industrial sample
Our Research

- Estimate the amount of capital flight from Russia to the U.S. through under-invoiced export and over-invoiced import during 1995 ~ 1999
- An empirical test: Is the capital flight due to a portfolio consideration in search of higher returns on wealth?
- Suggest an efficient Method of Inspection / Audit of Export and Import Transactions

Effects of Abnormally Low Priced Export

(Russian Caviar at $3/KG)

- Exporter (Russian):
  - Lower revenue and
  - Lower taxable income
- Importer (American):
  - Lower import duty
- Transfer wealth through excessively Low Priced goods
  - Capital outflow from Russia, the exporting country
  - Money laundering
Effects of Abnormally High Priced Import

(Bicycle tires at $364 from the U.S.)

- **Importer (Russian):**
  - Higher COG and higher import duty
  - Income tax saving > Increased import duty
    - Chen-Sunrider v. the U.S.
- **Exporter (American):**
  - Higher revenue & higher taxable income
    - May offset against negative profit
  - In some countries: Higher Export subsidy
    - Medical equipment export from Pakistan to the U.S.
- **Transfer wealth through Payments for excessively High Priced goods**
  - Capital outflow from Russia, the importing country
  - Money laundering

Prior Estimates of Russian Capital Flight

- **Tikhomirov 1997**
  - Compared the Russian average contract prices with average world prices compiled by the gov’t
    - Asserts that the actual capital flight is three to six time of $35 ~ $400 billion estimated for 1990 – 1995 by Russian Government
- **Abalkin & Whalley (1999)**
  - Used the balance of payment data
    - Estimated $56-$70 billion during 1992-93
    - Estimated $17 billion/year during 1994 – 97
Our Estimation: Data and Methodology

Direct estimate based on reported import & export transaction data

- Data Source
- Criteria for Price Abnormality
- Estimated Amount of Capital Flight / Income Shift
- Limitations of the Method

DATA SOURCE

- U.S. Merchandise Trade Data from U.S. Census Bureau
- Two CD’s each, monthly:

<table>
<thead>
<tr>
<th></th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk size (Dec 1999)</td>
<td>371 MB</td>
<td>641 MB</td>
</tr>
<tr>
<td>Transactions(1999)</td>
<td>20,420,064</td>
<td>30,173,714</td>
</tr>
<tr>
<td>Records(Dec 1999)</td>
<td>1.1 million</td>
<td>1.5 million</td>
</tr>
</tbody>
</table>

- All Import (> $1,250) and Export (> $2,500) Transactions
  - Ten digit harmonized commodity code
    - 8,635 export codes in 1999
    - 17,179 import codes
  - Country – 233 countries in 1999
  - Customs district – 44 customs districts
  - Month
  - Quantity & Dollar value
Criteria for Price Abnormality
A Price Filter – Global Price Matrix

- **Global Price Matrix** is constructed from the data:
  - For each commodity code and each country
    - The average price, the standard deviation, upper- and lower quartile prices
      - **Upper bound** = the mean + $a \times \text{STD}$ or **Upper Quartile Price**
      - **Lower bound** = the mean - $a \times \text{STD}$ or **Lower Quartile Price**
  - Total Number of Cells in 1999
    - $(8,635 + 17,179) \times (233+1) = 6.04$ million cells

- **Why use Upper- and Lower Quartiles?**
  - IRS Reg 482 on transfer pricing
  - Price Matrix for Mexico: Import and Export

Estimation of Income Shifted from Russia to the US

- **Abnormality Criteria**
  - imports at prices exceeding the import upper quartile price;
  - exports at prices below the export lower quartile price

- **Dollar value of over or under invoicing**
  - Dollar value of deviations from the inter-quartile prices
    - $\text{Max}(0, (\text{Import Price} - \text{upper quartile price}) \times \text{Qty})$
    - $\text{Max}(0, (\text{Lower quartile price} - \text{Export Price}) \times \text{Qty})$
  - 60 monthly data sets during 1995 - 1996
    - Every import and export transaction between Russia and the United States for every month
### Estimated Income Shifted from Russia to the US

#### All Items - based on US-World Upper/Lower Quartile Prices

<table>
<thead>
<tr>
<th></th>
<th>Exports</th>
<th>Imports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>736</td>
<td>292</td>
<td>1,028</td>
</tr>
<tr>
<td>1996</td>
<td>632</td>
<td>380</td>
<td>1,012</td>
</tr>
<tr>
<td>1997</td>
<td>662</td>
<td>364</td>
<td>1,026</td>
</tr>
<tr>
<td>1998</td>
<td>679</td>
<td>331</td>
<td>1,010</td>
</tr>
<tr>
<td>1999</td>
<td>4,533</td>
<td>313</td>
<td>4,847</td>
</tr>
<tr>
<td><strong>Five Year Total</strong></td>
<td><strong>7,242</strong></td>
<td><strong>1,681</strong></td>
<td><strong>8,923</strong></td>
</tr>
</tbody>
</table>

All Items - based on US-Russia Upper/Lower Quartile Prices

<table>
<thead>
<tr>
<th></th>
<th>Exports</th>
<th>Imports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>131</td>
<td>129</td>
<td>260</td>
</tr>
<tr>
<td>1996</td>
<td>262</td>
<td>166</td>
<td>428</td>
</tr>
<tr>
<td>1997</td>
<td>99</td>
<td>146</td>
<td>245</td>
</tr>
<tr>
<td>1998</td>
<td>164</td>
<td>213</td>
<td>377</td>
</tr>
<tr>
<td>1999</td>
<td>495</td>
<td>55</td>
<td>551</td>
</tr>
<tr>
<td><strong>Five Year Total</strong></td>
<td><strong>1,152</strong></td>
<td><strong>709</strong></td>
<td><strong>1,861</strong></td>
</tr>
</tbody>
</table>
### TOP 25 ITEMS IN RUSSIA-US TRADE

<table>
<thead>
<tr>
<th></th>
<th>US-World Upper/Lower Quartile Prices</th>
<th>US-Russia Upper/Lower Quartile Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exports</td>
<td>Imports</td>
</tr>
<tr>
<td>1995</td>
<td>$457</td>
<td>$128</td>
</tr>
<tr>
<td>1996</td>
<td>$397</td>
<td>$222</td>
</tr>
<tr>
<td>1997</td>
<td>$416</td>
<td>$149</td>
</tr>
<tr>
<td>1998</td>
<td>$388</td>
<td>$154</td>
</tr>
<tr>
<td>1999</td>
<td>$4,251</td>
<td>$230</td>
</tr>
</tbody>
</table>

Five Year Total: $5,909 ($884 $6,793 $997 $477 $1,475)

### TOP 25 ITEMS IN RUSSIA-US TRADE (%)

(The Income shifted through the top 25 items as a percent of the income shifted through all items)

<table>
<thead>
<tr>
<th></th>
<th>US-World Upper/Lower</th>
<th>US-Russia Upper/Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exports</td>
<td>Imports</td>
</tr>
<tr>
<td>1995</td>
<td>62%</td>
<td>44%</td>
</tr>
<tr>
<td>1996</td>
<td>63%</td>
<td>58%</td>
</tr>
<tr>
<td>1997</td>
<td>63%</td>
<td>41%</td>
</tr>
<tr>
<td>1998</td>
<td>57%</td>
<td>47%</td>
</tr>
<tr>
<td>1999</td>
<td>94%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Five Year Total: 82% 53% 76% 87% 67% 79%

**TOP 25 ITEMS account for over 75% of Total Income Shifted**
Limitations

- Heterogeneity for a given HS10
- **Aggregated data:**
  - By HS10, Month, Country, and Customs District
- **No distinction between**
  - Related party transactions vs unrelated party transactions
- **Current pilot research project:**
  - Examines each transaction - no aggregation
  - Use information on related party vs. unrelated party transactions

Expected Outcome of the Pilot Project

- Profiles of Importers and/or Exporters with a high degree of abnormal pricing
- Identify Commodity or Commodity groups with a high degree of abnormal pricing
- Difference in the degree of abnormal pricing between related-party transactions and unrelated-party transactions
- Policy recommendations based on the findings
  - Uniform commodity classification for both imports and exports?
  - Auditing procedure for inbound and outbound cargos?
  - Effective use of the Exp/Imp data in tax audits?
Why Capital Flight?

- Money laundering
- Tax evasion
- Higher Returns on Wealth Portfolio

In Search of Higher Returns on Wealth?

- Intuitively one might move wealth to foreign countries due to:
  - Higher foreign interest rates
  - Lower domestic interest rates
  - Overvalued domestic currency
  - Higher domestic inflation
- Two portfolio models for capital flights
Capital Flight – Pastor Model

- Capital Flight: Investors’ transfer of domestic assets to foreign assets
  - Financial Assets or
  - investments in real productive activity

- Explanatory Variables
  - change in inflation rate
  - financial incentive for capital flight: (Interest rate differential adj’d for FX rate change)
  - degree of overvaluation: (Avg REER) – (Equil. REER)

Pastor Model and Variables def’s

\[ \text{CF} = f(\text{CHINF}, \text{FINC}^1, \text{OVAL}) \] (1)
\[ \text{CF} = f(\text{CHINF}, \text{FINC}^2, \text{OVAL}) \] (2)

\[ \text{CF} = \text{Capital Flight} \]
\[ \text{CHINF} = \text{Change in inflation rate, calculated as the difference in logarithms of consumer price indexes.} \]
\[ \text{FINC}^1 = (i_{US} - (i - \dot{e})) \text{ following Pastor’s definition and} \]
\[ \text{FINC}^2 = \ln(1 + i_{US}) - \ln(1 + i) + \ln(e) - \ln(e^e) \text{ following Dolley’s definition} \]
\[ i_{US} = \text{The rate paid on US Treasury bills} \]
\[ i = \text{Domestic interest rate, Deposit rate} \]
\[ e = \text{Ratio of local currency to dollar} \]
\[ \dot{e} = \text{Rate of change of the exchange rate (local currency to dollar)} \]
\[ \text{OVAL} = \text{The degree of overvaluation measured as the average real exchange rate for the current year relative to an equilibrium value (please see the definition for R in Cuddington’s model)} \]
\[ e^e = \text{Real exchange rate} \]
\[ P = \text{Domestic price level – producer price index for Russia} \]
\[ P_{US} = \text{US Price level - producer price index for the US} \]
Capital Flight – Cuddington Model

- a “standard three-asset portfolio adjustment model”
  - domestic financial assets
  - domestic inflation hedges- land, consumer durables
  - foreign financial assets.
- defines capital flight "the year-to-year increase in domestic holdings of foreign financial assets"
- The explanatory variables:
  - domestic interest rate,
  - domestic inflation rate, and
  - foreign interest rate augmented by the expected rate of depreciation of the domestic currency.

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Cuddington Model and Var’s def’s

\[
KF_t = a_0 + a_1 \pi_t + a_2 r_t + a_3 (r^*_t + x_t) \quad (3)
\]

KF = Capital Flight
\( \pi = \) Domestic inflation rate, calculated as the ratio of the logarithms of consumer price indexes (i.e., log (CPI / CPI\(^{-1}\)).
\( r = \) Domestic interest rate, Deposit rate
\( r^* = \) Foreign interest rate, T-bill rate
\( x = \) Expected rate of depreciation of the domestic currency, calculated as \( x = a (\text{REER}_t - R) \)
REER = Real effective exchange rate. Since IMF- International Statistics does not publish the real effective exchange rate for Russia we estimated this variable using Pastor’s definition, i.e., \( \epsilon = \frac{P}{e^{\text{REER}}^P} \)

R = Equilibrium rate. We are using the value of the real effective exchange rate for 1995 as the equilibrium rate. This is the year IMF-International Statistics uses as its index year.

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Additional Data Source

**International Financial Statistics (IFS)**
- Monthly data from January 1995 to December 1999
- The variables utilized include
  - interest rate (i.e., deposit rate)
  - exchange rate
  - consumer price index and
  - the producer price index for Russia and the United States.

Regression Results

The Determinants of Capital Flight for Russia

- Regressions using both models
  - Dependent Variables: Capital flight in ($ amount) & (% of Trade Volume)
  - Independent Variables: No lag, lagged one period, lagged two periods
  - Total of 18 equations estimated
- Most Equations – statistically insignificant
  - The regression results do not support the hypothesis that Capital Flights are due to a portfolio consideration
- A few equations with significant variables
  - But wrong signs!
    - Overvalued Currency in Pastor model – negative sign
    - Expected Rate of Currency Depreciation in Cuddington Model – negative sign
## Regression Results

### The Determinants of Capital Flight for Russia

<table>
<thead>
<tr>
<th>Specification</th>
<th>Variables</th>
<th>CHINF</th>
<th>FINC1</th>
<th>FINC2</th>
<th>OVAL</th>
<th>r</th>
<th>B</th>
<th>r*</th>
<th>x</th>
<th>R2/R2 Adj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Pastor’s Model 1 month lag</td>
<td></td>
<td>0.2234 (1.59)</td>
<td>-0.0474 (-1.40) ‡</td>
<td>-0.2148 (-2.10) §</td>
<td></td>
<td>0.111/0.053</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Pastor’s Model 1 month lag</td>
<td></td>
<td>0.199 (1.49) †</td>
<td>-0.0489 (-1.42) ‡</td>
<td>-0.2105 (-2.07) §</td>
<td></td>
<td>0.111/0.053</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Cuddington’s Model 2 month lag</td>
<td></td>
<td></td>
<td>0.0003 (0.96)</td>
<td>-0.2327 (-1.34) †</td>
<td>0.0802 (1.52) †</td>
<td>-0.4805 (-2.38) §</td>
<td>0.129/0.052</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Specifications 4 & 5 are obtained using Pastor’s definition. Specification 9 is obtained using Cuddington’s model. The dependent variable is defined as a percentage of total trade. t-values are reported in parentheses below the coefficient estimated, d.f. = 50.

‡ Significant at the 10% level (two-tailed test)
† Significant at the 5% level (two-tailed test)
§ Significant at the 2% level (two-tailed test)
FINC1 = FINC using Pastor’s definition
FINC2 = FINC using Dooley’s definition

### It appears the capital flight from Russia to the U.S. is motivated by:

- Income Tax avoidance and/or
- Money Laundering
How can Abnormal Pricing be Detected?

- Optimal level of inspection/audit may be determined by comparing
  - the expected marginal benefit
  - the expected marginal cost
- Possible Approach:
  - No inspection? – zero cost and zero benefit
  - Inspection of all transactions?
  - Random inspection?
  - Use of Systematic Filters such as the price filter
    - EG: Top 25 items: over 75% of capital flight between 1995 and 1999

CONCLUSION

- Capital Flight from Russia to the U.S.
  - Based on transaction data in the U.S. Merchandise Trade Database
  - Estimated amount: $1.86 billion ~ $8.92 billion during 1995 ~ 1999
  - Regression results indicate capital flight may be motivated:
    - Other than by portfolio consideration
    - Such as by income tax avoidance and money laundering
- Extension of the study:
  - Estimate capital flight through trade from Russia to ALL countries using Russian import and export database