Foreign and Domestic Growth Drivers in Eastern Europe

Enzo Weber

Universität Regensburg, OEI Regensburg, IAB Nürnberg

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Introduction

- Economic growth in Eastern Europe
- Transition to market economy
- Opening to world trade and finance
- Catching-up process

Research questions:
- What have been the growth drivers in transition?
- What are potential growth drivers?
- Are there similarities or special patterns in Eastern Europe?
Introduction

Growth
- Growth Drivers
- Facts on Growth

Methodology
- Time-Series Model
- Identification

Application

Summary
Growth Drivers in Transition

- Exports
- Capital formation
- Foreign direct investment
- cf. East Asian experience
Export-led growth

Potential growth effects of exports:

- Competition / incentives / efficiency / reallocation (Feder 1982, Helpman and Krugman 1985)
- Learning / knowledge (Grossman and Helpman 1991, Krueger 1985)
- Scale / specialisation (Feder 1982)
Potential growth effects of investment:

- Factor accumulation
- Technological progress (Romer 1986), embodied growth (Solow 1960)
- Interaction with "human resources" (Lucas 1987)
Foreign Direct Investment

Potential growth effects of FDI (e.g., de Mello 1997):

- Diffusion of technology
- Management skills
- Competition (long run)
Facts on Growth I

Growth effects are **delayed**.
Facts on Growth I

Growth effects are **delayed**.

- Example needed...?
Facts on Growth I

Growth effects are **delayed**.

- Example needed...?
- Sarkozy: How has the French Revolution affected world economic growth?
Growth effects are delayed.

- Example needed...?
- Sarkozy: How has the French Revolution affected world economic growth?
- Solow: Too early to say.
Growth effects are delayed.

- Example needed...?
- Sarkozy: How has the French Revolution affected world economic growth?
- Solow: Too early to say.
- Obama: America is not - and never will be - affected by the French Revolution!
Facts on Growth II

GDP is driven by **permanent and transitory** impulses:

- Economic growth = long-run phenomenon
- Business cycle effects: short and medium run
- $\Rightarrow$ Realisations of GDP = mixtures of various shocks
The **invisible** growth phantom...

- Growth shocks not directly observed
- Econometrically: Shocks not identified from observed data
- $\Rightarrow$ Theory-based assumptions needed!
Facts on Growth III

The **invisible** growth phantom...

- Growth shocks not directly observed
- Econometrically: Shocks not identified from observed data
- $\implies$ Theory-based assumptions needed!
  (Obama-Method)
Features of an appropriate empirical model:

- Dynamic
- Potential long-run equilibria
- Interactive
- Structural (allows identification of shocks)
Long Run?!

- Non-stationary variables
- Persistent component in each variable
- "Persistent": Effects of shocks do not disappear over time.
- Long-run equilibria due to common persistent components ("cointegration")
- Number of equilibria ($r = k$) — number of stochastic trends
- Cointegration can be tested (e.g. Johansen trace test).
Modelling Approach

*Dynamic, long-run equilibria, interactive*

⇒ Vector error correction model (VECM):

\[
\Delta y_t = \alpha [\beta' y_{t-1} + c_1 (t-1)] + c_0 + c_2 d_t + \sum_{i=1}^{q} A_i \Delta y_{t-i} + u_t
\]

- \(y_t\): Vector of \(k\) endogenous variables (EXP, INV, GDP)
- \(\beta' y_{t-1}\): \(r\) cointegrating relations
- \(\alpha\): Adjustment coefficients
- \(\sum_{i=1}^{q} A_i \Delta y_{t-i}\): Short-run dynamics
- \(u_t\): Reduced-form residuals (correlated)
Short- and Long-Run Effects

- Unit impulse in $u_{it}$
- Responses of $y_t$ through dynamic interaction
- Moving-average representation:

\[ y_t = [\text{deterministics}] + \psi_0 u_t + \psi_1 u_{t-1} + \psi_2 u_{t-2} + \ldots \]

- $\psi_j^*$: Impulse responses
Structural VECM

- Interpretation of $u_t$ shocks?
- Correlation modelled as linear combination: $u_t = B \varepsilon_t$
- $\varepsilon_t$: Uncorrelated "structural" shocks

$$y_t = \begin{bmatrix} \text{deterministics} \end{bmatrix} + \Psi_0 \varepsilon_t + \Psi_1 \varepsilon_{t-1} + \Psi_2 \varepsilon_{t-2} + \ldots$$

- $\Psi_j = B \Psi_j^*$: Structural impulse responses
Identification Problem

- $k(k - 1)/2$ measurable covariances between $u_{it}$
- $k(k - 1)$ unknown off-diagonal coefficients in $B$
- $\Rightarrow k(k - 1)/2$ assumptions needed.
- 3-variate case: $k(k - 1)=6$, $k(k - 1)/2=3$
Identifying Assumptions: Long Run

- Cointegration $\rightarrow$ reduced number of persistent shocks
- One transitory shock (zero long-run impact)
- Interpretation: demand shock
- Restrictions on long-run impact matrix

$$\Xi = \begin{pmatrix}
* & * & 0 \\
* & * & 0 \\
* & * & 0
\end{pmatrix}$$

with

$$\Xi = \beta_\bot (\alpha'_\bot (I_n - \sum_{i=1}^{q} A_i)\beta_\bot)^{-1} \alpha'_\bot$$

- Number of restrictions $= k - r$
Identifying Assumptions: Short Run

- Remaining restrictions on impact matrix $B$
- Disentangle permanent export and investment shocks!
- Shocks to investment unrestricted (business cycle forerunner)
- Exports in the short run determined by foreign demand
- $\rightarrow$ No contemporaneous impact of investment (and demand) shocks on exports

$$B = \begin{pmatrix} * & 0 & */0 \\ * & * & * \\ * & * & * \end{pmatrix}$$
Data I

- GDP, GCF, EXP, FDI
- 2002 per capita PPP US dollar
- Countries: CZE, EST, HUN, LAT, LIT, POL, SLO, RUS
Figure: Seasonally adjusted real p.c. GDPs
### Cointegration Tests

**EXP, GCF, GDP model:**

<table>
<thead>
<tr>
<th></th>
<th>CZE</th>
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<th>RUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0 : r = 0$</td>
<td>0.0</td>
<td>0.0</td>
<td>2.7</td>
<td>0.0</td>
<td>0.2</td>
<td>0.2</td>
<td>2.3</td>
<td>0.0</td>
</tr>
<tr>
<td>$H_0 : r = 1$</td>
<td>1.9</td>
<td>64.3</td>
<td>44.9</td>
<td>4.4</td>
<td>81.9</td>
<td>20.5</td>
<td>35.2</td>
<td>22.0</td>
</tr>
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Trace test p-values in %

**EXP, FDI, GDP model:**

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</thead>
<tbody>
<tr>
<td>$H_0 : r = 0$</td>
<td>1.4</td>
<td>6.8</td>
<td>–</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>$H_0 : r = 1$</td>
<td>4.8</td>
<td>79.2</td>
<td>–</td>
<td>13.1</td>
<td>47.3</td>
<td>19.9</td>
<td>7.4</td>
<td>25.1</td>
</tr>
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$\Rightarrow$ 1 cointegrating relation (CZE, LAT: 2)
## Cointegrating Vectors

**EXP, GCF, GDP model:**

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</thead>
<tbody>
<tr>
<td>EXP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GCF</td>
<td>0</td>
<td>5.63 (0.76)</td>
<td>22.2 (4.06)</td>
<td>0</td>
<td>3.44 (0.46)</td>
<td>1.95 (0.24)</td>
<td>2.94 (0.50)</td>
<td>5.12 (0.55)</td>
</tr>
<tr>
<td>GDP</td>
<td>-1.49 (0.20)</td>
<td>-0.32 (0.06)</td>
<td>-4.56 (0.52)</td>
<td>-6.14 (0.95)</td>
<td>-0.43 (0.09)</td>
<td>-0.53 (0.04)</td>
<td>-2.87 (0.28)</td>
<td>-1.92 (0.23)</td>
</tr>
</tbody>
</table>

*standard errors in parentheses*

**EXP, FDI, GDP model:**

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</thead>
<tbody>
<tr>
<td>EXP</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FDI</td>
<td>0</td>
<td>35.7 (6.02)</td>
<td></td>
<td>0</td>
<td>10.5 (1.27)</td>
<td>3.48 (1.91)</td>
<td>15.0 (3.13)</td>
<td>10.9 (1.79)</td>
</tr>
<tr>
<td>GDP</td>
<td>-1.40 (0.05)</td>
<td>-0.10 (0.02)</td>
<td>-15.0 (3.87)</td>
<td>-0.46 (0.09)</td>
<td>-0.21 (0.02)</td>
<td>-1.95 (0.30)</td>
<td>-4.95 (0.48)</td>
<td>-1.97 (0.28)</td>
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⇒ Positive equilibria
## GDP Long-Run Effects of Structural Unit Shocks

### EXP,GCF,GDP model:

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</tr>
</thead>
<tbody>
<tr>
<td>EXP</td>
<td>0.73(0.19)</td>
<td>0.50(0.11)</td>
<td>0.05(0.11)</td>
<td>1.97(0.54)</td>
<td>0.77(0.20)</td>
<td>0.59(0.20)</td>
<td>0.94(0.27)</td>
<td>0.73(0.28)</td>
</tr>
<tr>
<td>GCF</td>
<td>0.54(2.35)</td>
<td>1.10(0.22)</td>
<td>3.01(0.49)</td>
<td>1.19(0.37)</td>
<td>1.43(0.26)</td>
<td>0.89(0.14)</td>
<td>0.68(0.27)</td>
<td>4.18(2.81)</td>
</tr>
<tr>
<td>FEVD</td>
<td>99/1</td>
<td>44/56</td>
<td>0/100</td>
<td>66/34</td>
<td>55/45</td>
<td>15/85</td>
<td>85/15</td>
<td>21/79</td>
</tr>
</tbody>
</table>

Bootstrapped standard errors in parentheses
FEVD: long-run GDP variance decomposition

### EXP,FDI,GDP model:

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</thead>
<tbody>
<tr>
<td>EXP</td>
<td>1.12(0.41)</td>
<td>0.57(0.16)</td>
<td>-</td>
<td>1.45(0.564)</td>
<td>0.63(0.26)</td>
<td>0.43(0.12)</td>
<td>0.81(0.26)</td>
<td>0.83(0.35)</td>
</tr>
<tr>
<td>FDI</td>
<td>-1.09(1.92)</td>
<td>4.50(4.35)</td>
<td>-</td>
<td>2.61(0.61)</td>
<td>3.33(0.57)</td>
<td>0.66(0.16)</td>
<td>0.54(0.60)</td>
<td>9.05(3.76)</td>
</tr>
<tr>
<td>FEVD</td>
<td>96/4</td>
<td>59/41</td>
<td>-</td>
<td>36/64</td>
<td>44/56</td>
<td>25/75</td>
<td>92/8</td>
<td>27/73</td>
</tr>
</tbody>
</table>
GDP rises with export dependence:

- High potential FDI impacts
- HUN, POL, RUS: Prevalent role of investment
- EST, LIT: non-manifested potential of GCF
Comparison to Asia Pacific

- Weber (2009, *JJIE*): AUS, HK, IDN, JPN, KOR, MAL, NZL, PLP, SGP, THL, TWN
- Dependence on investment higher than on exports (except HK, SGP, THL)
- Investment effects higher than export effects, especially for industrialised countries
- Export effects relatively higher in developing countries
Exports and the Crisis

Figure: Structural shocks (mean) and GDP loss vs. export shocks
Summary

- Potential and historical growth drivers in Eastern European transition
- Large differences between countries
- High potential impacts of FDI
- Exporting beneficial and but risky!
- Strengthen trade sector, balance fiscal policy and current account!