CEE Growth & Development

UPCES
Lecture 9

Fall Semester, 2014

Growth Accounting

`Economic Growth and Development in Central and Eastern Europe after the Transformation`

The results of the growth accounting analysis demonstrate that the most important source of economic growth is the accumulation of *physical capital*.

Study is focused on ten countries from CEE region:
Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia

Three periods:
1990 - 1994 Transformation crisis
1995 - 2007 Robust growth
2008 - 2012 Global economic crisis

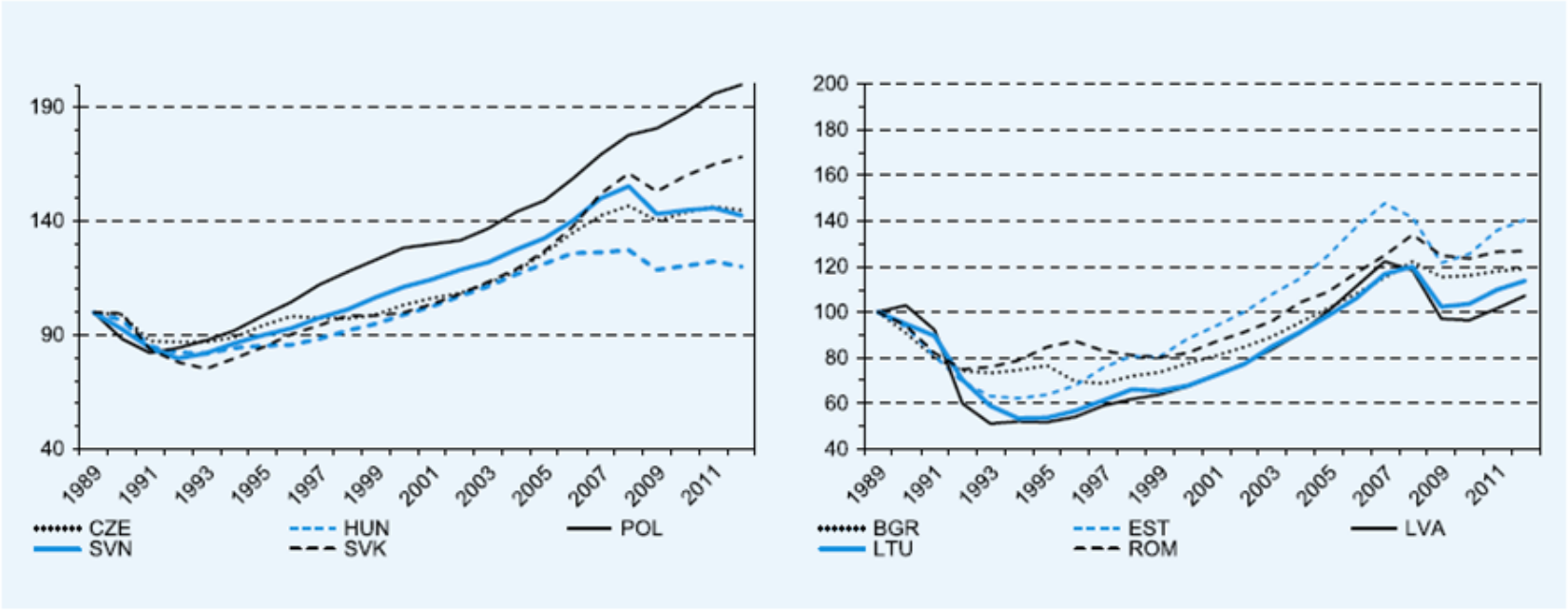
Stylized Facts

- I period – Drop in GDP, employment, and productivity rates
- II period – Period of investment growth as the most dynamic developing region in the world (Table 1)
- III period – Recession due to global economic crisis

GDP growth

Chart 1

REAL GDP (1989=100)



Source: Author's own calculation on the basis of real GDP data from EBRD (1989–1995) and Eurostat (1996–2012).

GDP growth rates

THE AVERAGE ANNUAL GROWTH RATE OF REAL GDP

	BGR	CZE	EST	HUN	LTU	LVA	POL	ROM	SVK	SVN	GER	CEE	EU-15	L-A	E-A
1996–2001	1.03	2.07	6.68	3.08	5.03	5.80	4.72	0.52	3.43	4.10	1.82	3.65	3.67	2.15	3.19
2002–2007	6.03	5.02	7.87	3.53	8.32	9.10	4.53	6.20	6.67	4.65	1.42	6.19	2.71	4.30	5.34
2008–2012	0.74	0.34	–0.70	–0.94	–0.18	–2.16	3.38	0.42	2.10	–0.98	0.78	0.20	–0.51	4.35	3.83

Note: EU-15: the 15 Member States of the European Union before 2004; L-A: Latin America (Argentina, Brazil, Chile, Ecuador, Mexico, Paraguay, Peru, Uruguay); E-A: East-Asia (Indonesia, South Korea, Malaysia, Philippines, Taiwan, Thailand).

As our analysis focuses on CEE countries rather than the CEE region itself, the growth rate for each region is calculated as the unweighted mathematical average of the growth rates of member countries.

Source: Eurostat; or, in case of L-A and E-A: IMF (World Economic Outlook. October 2012)

Differences in growth strategy

There are two groups of countries in terms of volatility of a GDP growth rate:

- Less volatile – Visegrad group (4 countries + Slovenia)
- More volatile – Baltic states + Romania and Bulgaria

Why is there a difference in volatility of growth rates?

Differences in growth strategy

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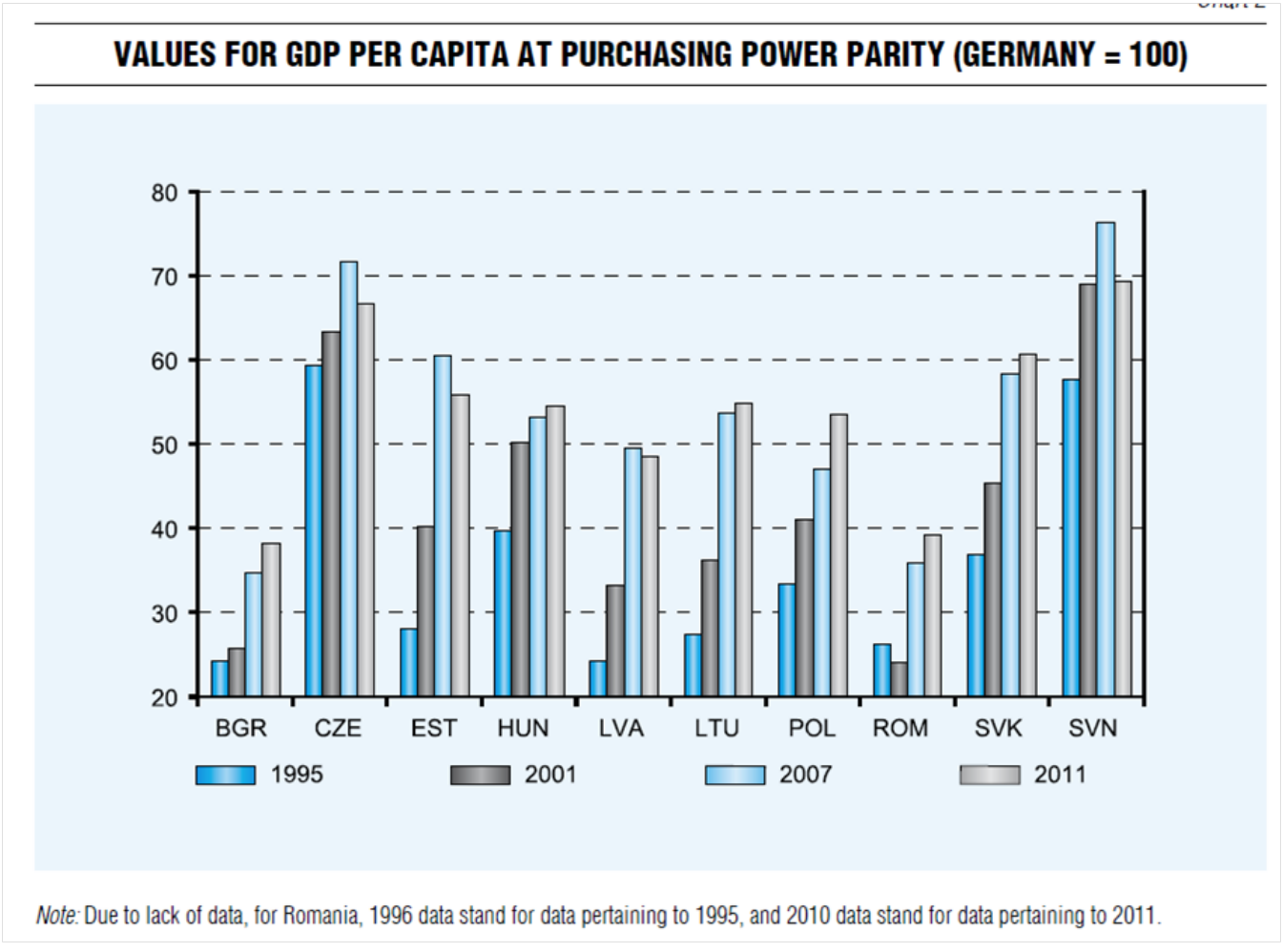
Why is there a difference in volatility of growth rates?
Two groups of countries had different growth models.

Differences in growth strategy continued

- Less volatile – Growth based on FDI and export structure
- More volatile – Growth driven by internal consumption financed by lending (soaring external debt)

(Chart 2)

Differences in GDP growth



Investment and Savings rates

There are three characteristics among CEE countries:

- CEE investment rates are higher compared to those in developed countries
- Savings rate are similar to those in developed world
- Investment rates are higher than savings rates

(Table 2)

Differences in Investment and Savings rates

CHANGES IN INVESTMENT RATES AND SAVINGS RATES

%	BGR		CZE		EST		HUN		LTU		LVA		POL	
	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y
1996–2001	*14.8*	*13.8*	*29.2*	*26.0*	*26.9*	*21.6*	*23.1*	*20.0*	*21.3*	*12.8*	*21.8*	*16.3*	*22.5*	*19.9*
2002–2007	*23.3*	*14.8*	*26.5*	*23.7*	*32.6*	*22.5*	*22.5*	*16.3*	*23.4*	*15.5*	*29.1*	*19.0*	*19.1*	*17.5*
2008–2012	*25.6*	*20.4*	*24.7*	*21.1*	*23.5*	*23.6*	*19.1*	*19.0*	*18.7*	*15.3*	*22.9*	*23.4*	*20.7*	*17.6*

%	ROM		SVK		SVN		FRA		GER		UK		USA	
	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y
1996–2001	*19.8*	*14.3*	*30.9*	*23.9*	*24.8*	*24.1*	*17.9*	*20.2*	*21.1*	*20.6*	*17.0*	*16.1*	*19.5*	*17.9*
2002–2007	*24.0*	*17.2*	*25.9*	*20.3*	*25.4*	*25.6*	*19.2*	*19.7*	*17.9*	*22.6*	*16.9*	*15.1*	*19.3*	*14.9*
2008–2012	*26.7*	*21.8*	*22.2*	*20.4*	*21.6*	*21.6*	*20.1*	*18.1*	*17.8*	*23.8*	*15.0*	*13.2*	*16.1*	*12.3*

Note: I/Y= investment rate, S/Y= savings rate. I= Gross Fixed Capital Formation, S= Gross Savings, Y= GDP. For all the three variables, values are measured in national currencies and at current prices. In each period, fields highlighted in grey indicate, in case of I/Y, values that are lower, and in case of S/Y, values that are higher than the maximum value recorded for the four developed countries.

Source: Eurostat

Growth Accounting versus Development Accounting

Growth Accounting decomposes GDP growth rate into contributions of capital, labor and technological progress.

Development Accounting decomposes relative level of GDP (compared to a benchmark country) into contributions of production factors.

$$Y_t = F(A, K, L)$$

Growth Accounting

GDP growth can be decomposed into growth in A, L, and K:

$$\frac{\dot{Y}}{Y} = \frac{MP_A A}{Y}\left(\frac{\dot{A}}{A}\right) + \frac{MP_K K}{Y}\left(\frac{\dot{K}}{K}\right) + \frac{MP_L L}{Y}\left(\frac{\dot{L}}{L}\right)$$

$$= g_{MFP} + (1 - S_L)\left(\frac{\dot{K}}{K}\right) + S_L\left(\frac{\dot{L}}{L}\right)$$

g_{MFP} growth rate of multi-factor productivity

$$s_L = \frac{MP_L L}{Y} = \frac{wL}{Y}$$

$$\Delta \ln Y_t = \Delta \ln MFP_t + \frac{(1 - S_{Lt}) + (1 - S_{Lt-1})}{2}\Delta \ln K_t + \frac{S_{Lt} + S_{Lt-1}}{2}\Delta \ln L_t$$

Growth Accounting continued

$$\Delta Y = MP_A \Delta A + MP_K \Delta K + MP_L \Delta L \quad \text{[divide by } Y\text{]}$$

$$\frac{\Delta Y}{Y} = MP_A \frac{\Delta A}{Y} + MP_K \frac{\Delta K}{Y}\left(\frac{K}{K}\right) + MP_L \frac{\Delta L}{Y}\left(\frac{L}{L}\right)$$

$$= MP_A \frac{\Delta A}{Y} + \frac{MP_K K}{Y}\left(\frac{\Delta K}{K}\right) + \frac{MP_L L}{Y}\left(\frac{\Delta L}{L}\right)$$

$$= g + \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L}$$

$MP_K K/Y$ share of output addressing to capital

$MP_L L/Y$ share of output addresssing to labor

α rental rate (the cost/price of capital)

β wage rate (the cost/price of labor)

Developments in Human Capital

$$L = H \cdot Q_L$$

where Q_L stands for the population's education level

$$Q_L = e^{r \cdot s_y}$$

s_y years of schooling

r return on schooling

Q_L can be though of as an efficiency multiplier of labor (Chart 3)

Developments in Capital Stock

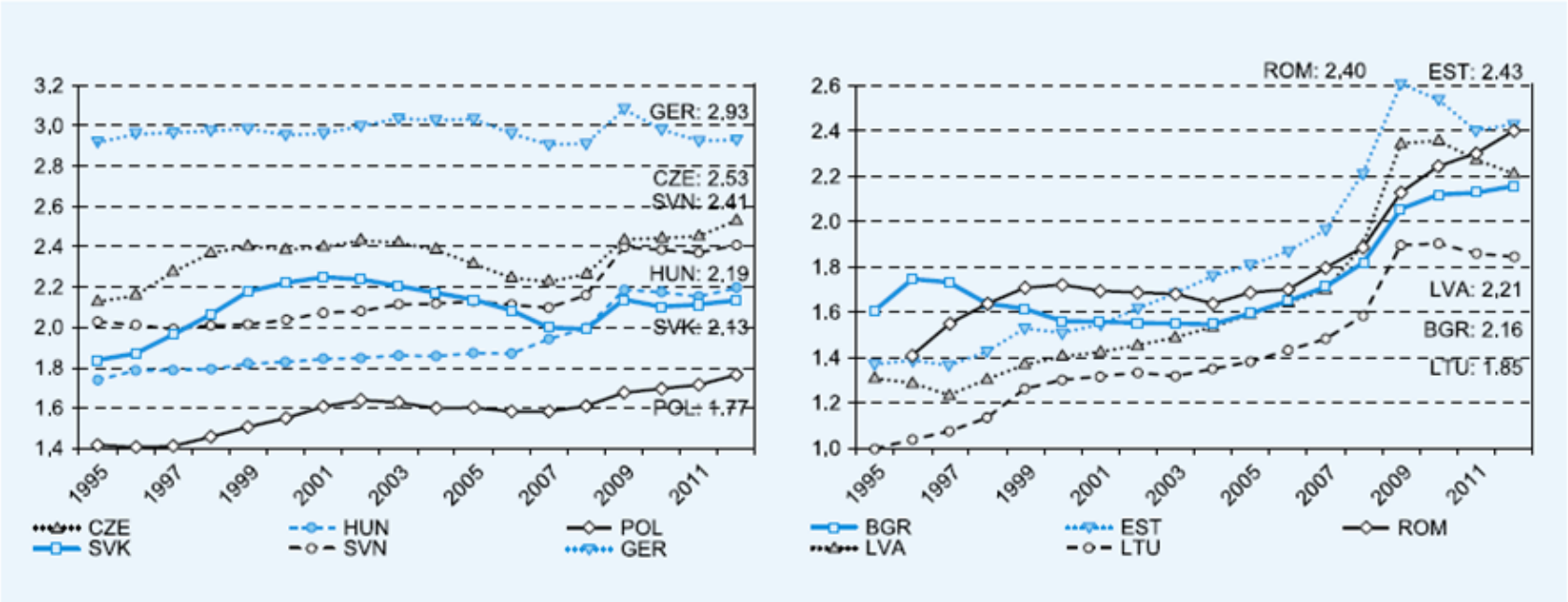
- σ (depreciation rate) is more volatile and higher than in CEE countries relative to developed economies. ($\sigma > 6\%$)
  (Chart 4)

- Baltic states had the highest increase of K/Y ratio. (Note: Think of different causes of this change)

Accumulation of Capital

Chart 4

DEVELOPMENTS IN CAPITAL STOCK/GDP *(K/Y)*



Source: owen calculations. K/Y data for Germany are obtained from the AMECO database. The right-hand side of each figure indicate K/Y values for 2012.

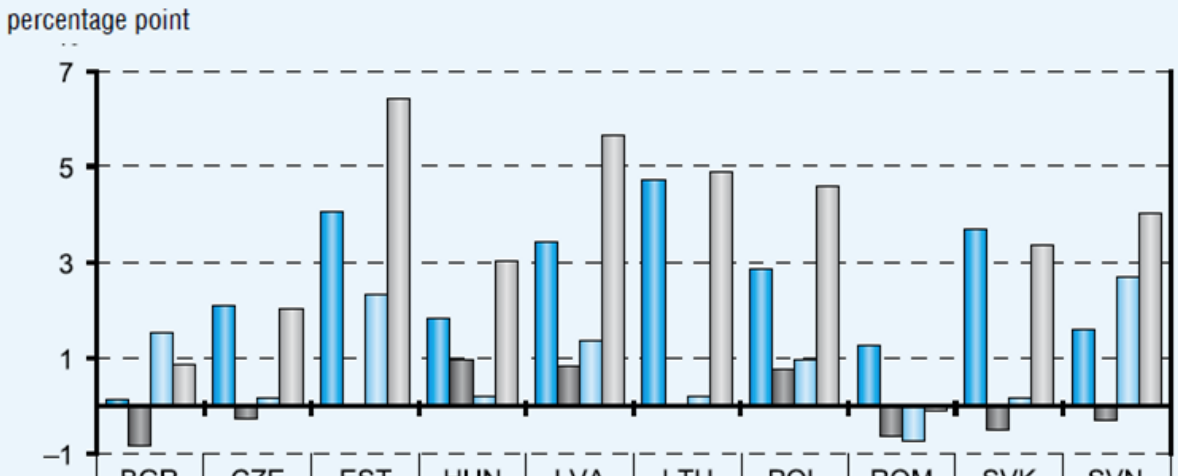
Growth Accounting: Case of Hungarian economy

- From 1995 to 2001 growth rate of Hungarian GDP was 3.3%. Using growth accounting, the growth is composed of:
  - Accumulation of capital 1.84%
  - Growth of labor force 0.98%
  - Growth of MFP (multifactor productivity) 0.2%
- 60% of Hungarian economy growth originates from accumulation of capital. (Charts 5, 6, 7)

How was growth realized?

Chart 5

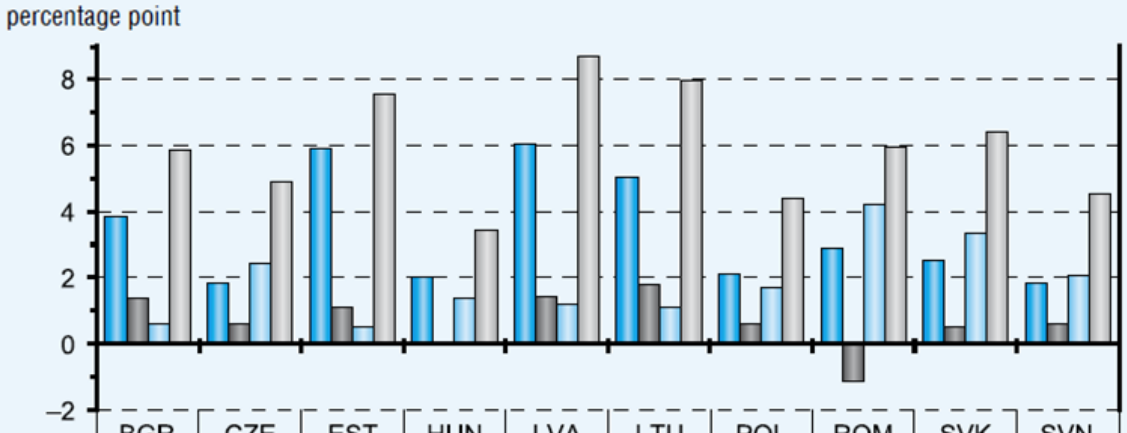
DECOMPOSITION OF THE AVERAGE ANNUAL GROWTH RATE OF GDP BETWEEN 1996 AND 2001



	BGR	CZE	EST	HUN	LVA	LTU	POL	ROM	SVK	SVN
con. ΔlnK	0.16	2.10	4.07	1.84	3.43	4.71	2.85	1.28	3.69	1.60
con. ΔlnL	–0.83	–0.25	0.01	0.98	0.84	–0.05	0.77	–0.64	–0.51	–0.28
con. ΔlnMFP	1.54	0.17	2.33	0.20	1.38	0.21	0.98	–0.73	0.17	2.71
ΔlnY	0.87	2.03	6.41	3.03	5.65	4.88	4.59	–0.09	3.36	4.02

How was growth realized?

THE DECOMPOSITION OF THE AVERAGE ANNUAL GROWTH RATE OF GDP BETWEEN 2002 AND 2007



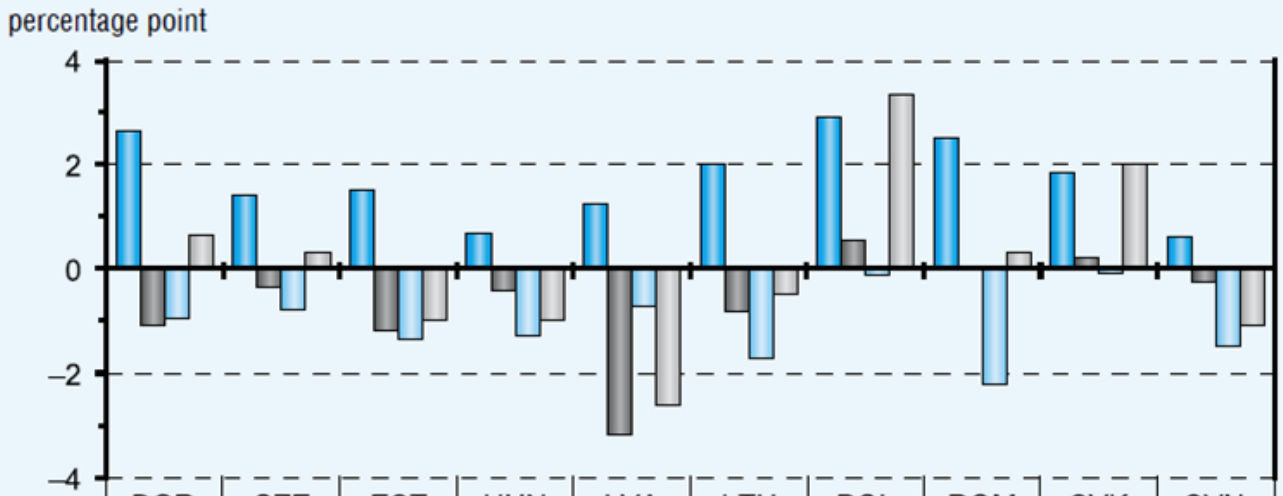
	BGR	CZE	EST	HUN	LVA	LTU	POL	ROM	SVK	SVN
con. ΔlnK	3.88	1.84	5.93	2.02	6.07	5.05	2.09	2.89	2.54	1.84
con. ΔlnL	1.39	0.59	1.09	0.06	1.42	1.81	0.63	–1.12	0.52	0.63
con. ΔlnMFP	0.59	2.47	0.54	1.37	1.20	1.12	1.72	4.22	3.36	2.08
ΔlnY	5.86	4.89	7.55	3.45	8.70	7.98	4.43	6.00	6.42	4.55

Source: own calculations

How was growth realized?

Chart 7

DECOMPOSITION OF THE AVERAGE ANNUAL GROWTH RATE OF GDP BETWEEN 2008 AND 2012



	BGR	CZE	EST	HUN	LVA	LTU	POL	ROM	SVK	SVN
con. ΔlnK	2.67	1.40	1.54	0.69	1.26	2.01	2.90	2.53	1.85	0.64
con. ΔlnL	–1.07	–0.33	–1.19	–0.41	–3.16	–0.79	0.54	–0.01	0.23	–0.25
con. ΔlnMFP	–0.93	–0.78	–1.35	–1.26	–0.71	–1.71	–0.11	–2.20	–0.08	–1.47
ΔlnY	0.67	0.30	–1.00	–0.98	–2.61	–0.49	3.33	0.32	2.00	–1.07

Conclusion

Growth characteristics of CEE countries:

- Economic growth is driven by accumulation of capital
- Growth of labor force and MFP only have a moderate impact on growth
- Three different time periods only differ by levels of factor contributions, but not their priority

The very low initial ratio of capital to GDP, coupled with investment rates higher than those of developed countries, offered considerable potential for capital accumulation and hence, rapid economic growth.