

Growth and decline in Hungarian regions 1998-2005: related variety, unrelated variety, and variety of ownership

Balázs Lengyel^{a,b} and Izabella Szakálné Kanó^c

^a Centre for Economic and Regional Studies, Hungarian Academy of Sciences

^b International Business School Budapest

^c Faculty of Economics and Business Administration, University of Szeged

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Motivation

- Related variety as indicator of local inter-firm learning, based on technological proximity.
Frenken et al., 2007 - Regional Studies
- Decomposition into high-tech and medium-tech manufacturing vs. knowledge intensive services.
Hartog et al., 2012 - Industry and Innovation
Mammeli et al., 2012 - Papers in Evolutionary Economic Geography

Motivation

- Related variety in a regional transformation context.

Related variety might affect declining and rising regions differently.

- Related variety decomposition in a dual economy context.

Relatedness among foreign investments might contribute less to regional economic dynamics than relatedness among domestic firms.

Outline

1. Hungarian regional growth during post-socialism
2. Data: company balance sheets
3. Method: related variety
4. Results
 - Related variety in growing and declining regions
 - Related variety within domestic and foreign sets.
5. Conclusion

Patterns of Hungarian regional growth

- Post-socialism: transition from planned into market economy.
- Previously specialized industrial regions -with rigid industry structure- failed.
- FDI became a major dynamising factor
 - Only in relatively developed regions with absorptive capacity.
- A dual economic structure prevails
 - Gap between foreign and domestic firms.

Questions

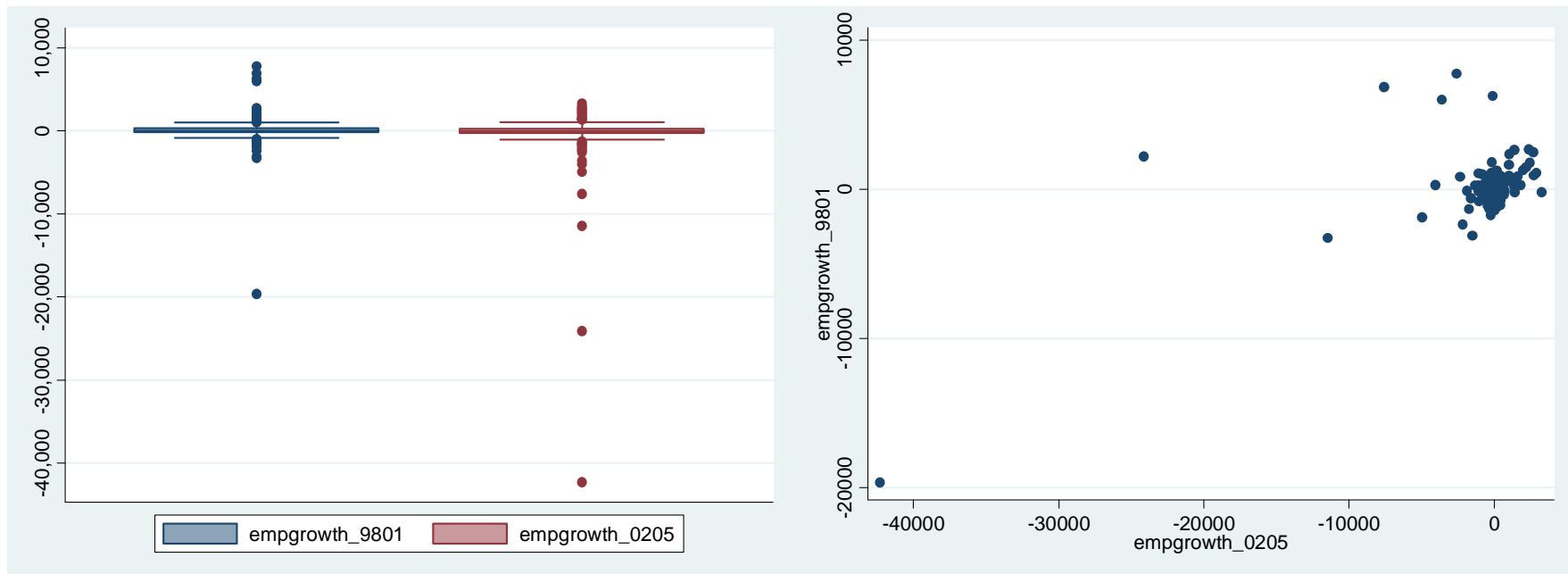
- Is there a difference between declining and rising regions in terms of the effect of related variety?
- Does relatedness among domestic or among foreign firms contribute more to regional employment growth?

Data

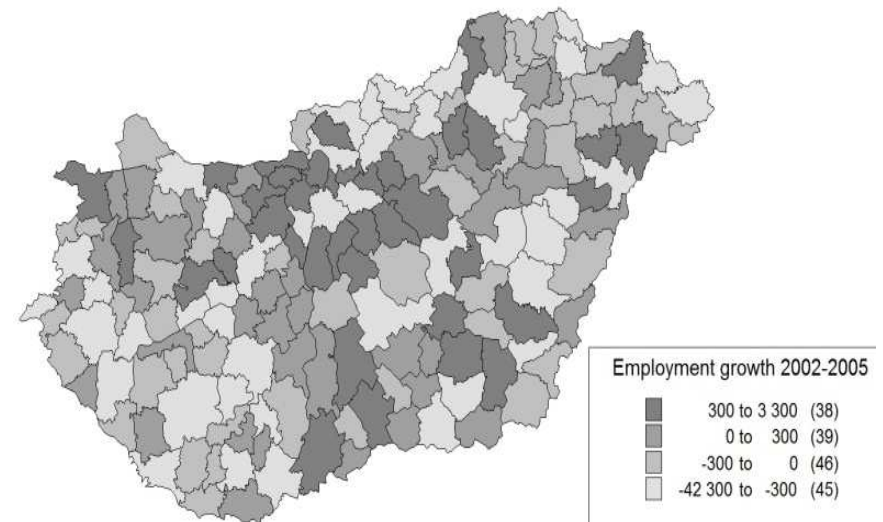
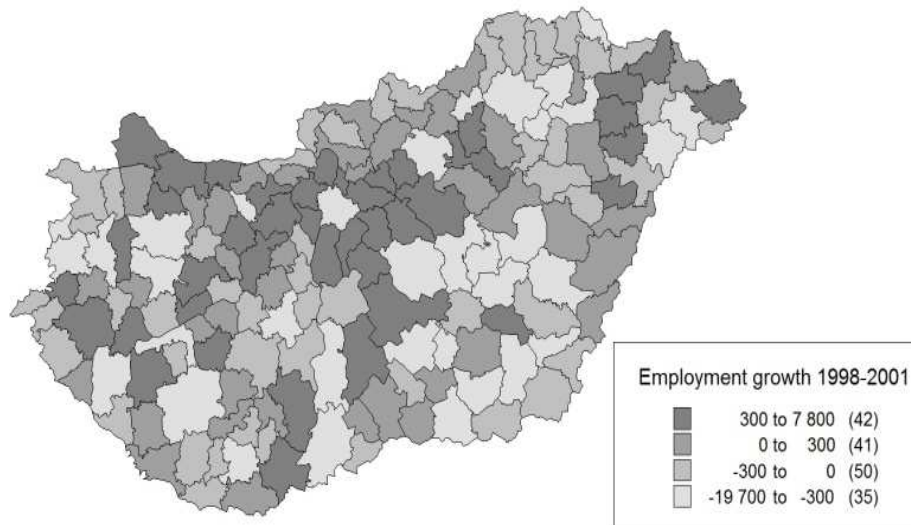
- Balance sheets of Hungarian firms, 1998-2005
- Number of employees at the end of term
- Industry: NACE 4 codes
- Location: 168 subregions (NUTS 4 level)
- Ownership: foreign if 10% of stocks are in foreign hands

	1998	2002
Employment in the data	1,781,466	2,092,942
Share in economically active population	42%	48%
Domestic employment	1,196,222	1,563,175
Foreign employment	585,244	529,767
Number of firms	112,075	298,031
Number of domestic firms	93,736	272,111
Number of foreign firms	18,339	25,920

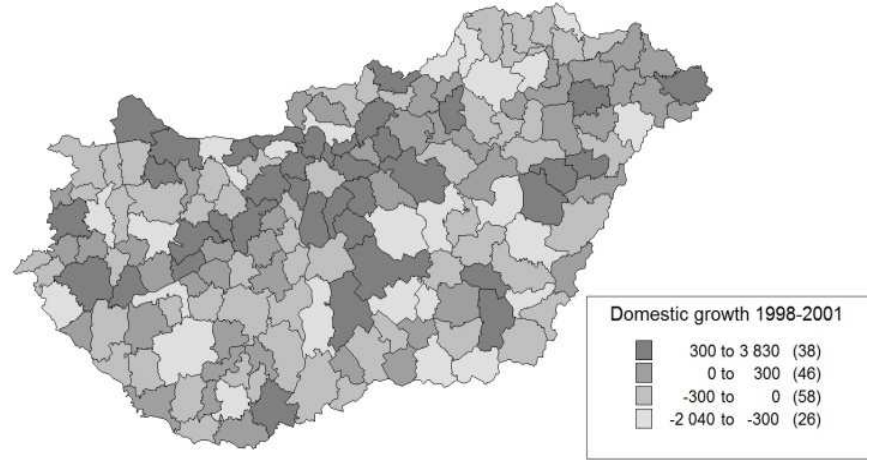
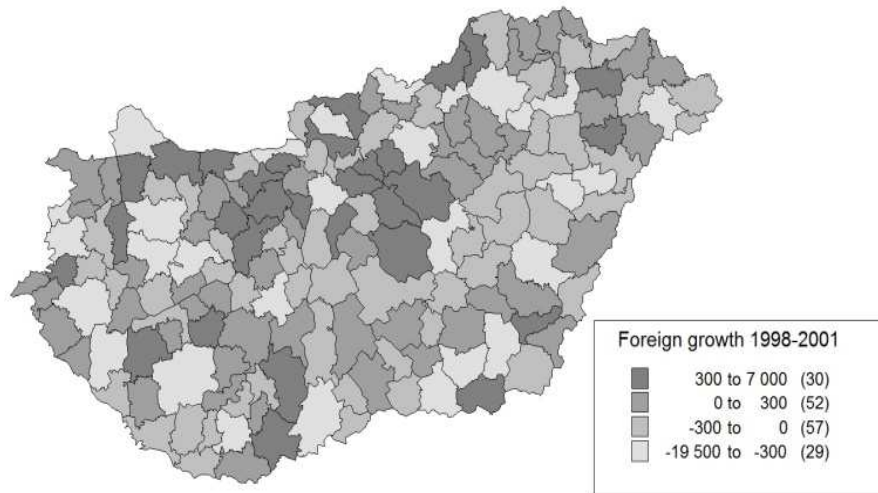
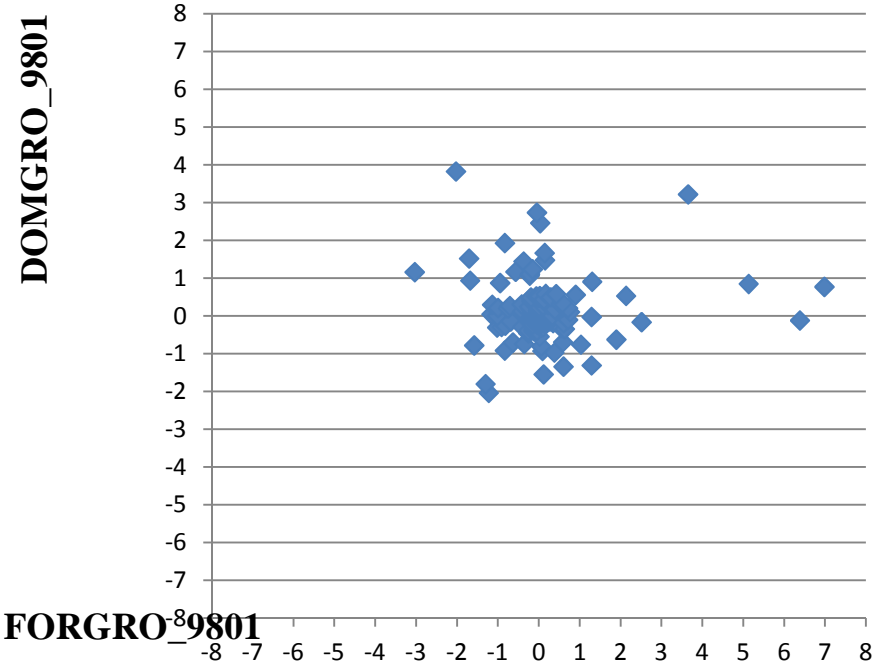
Employment growth, 1998-2001 and 2002-2005



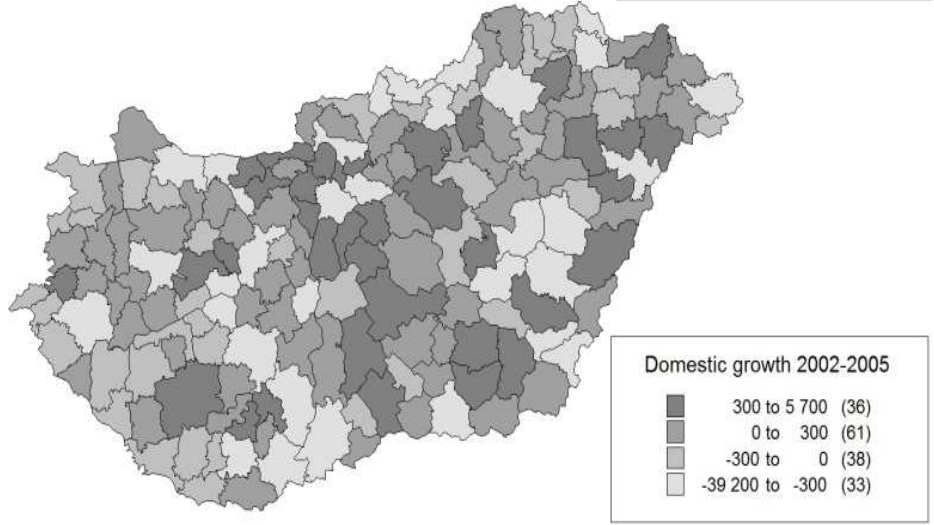
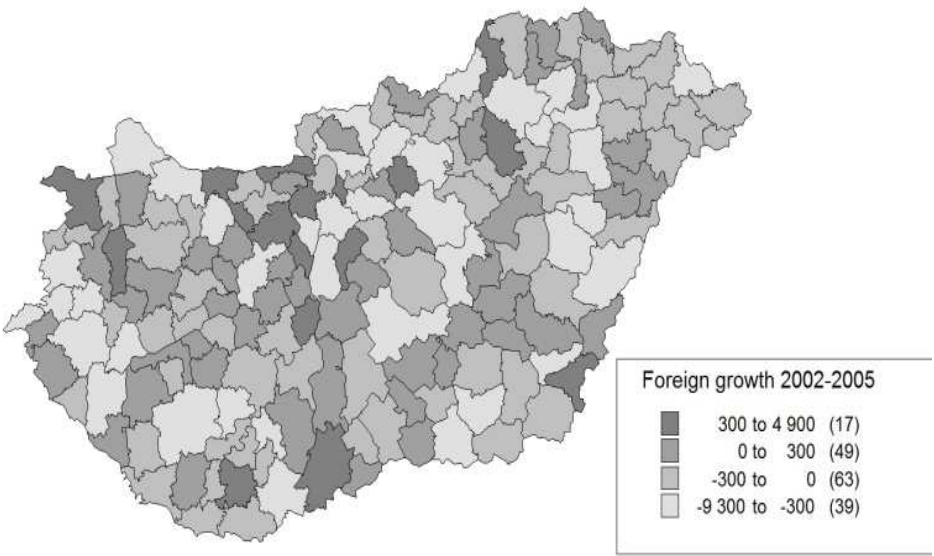
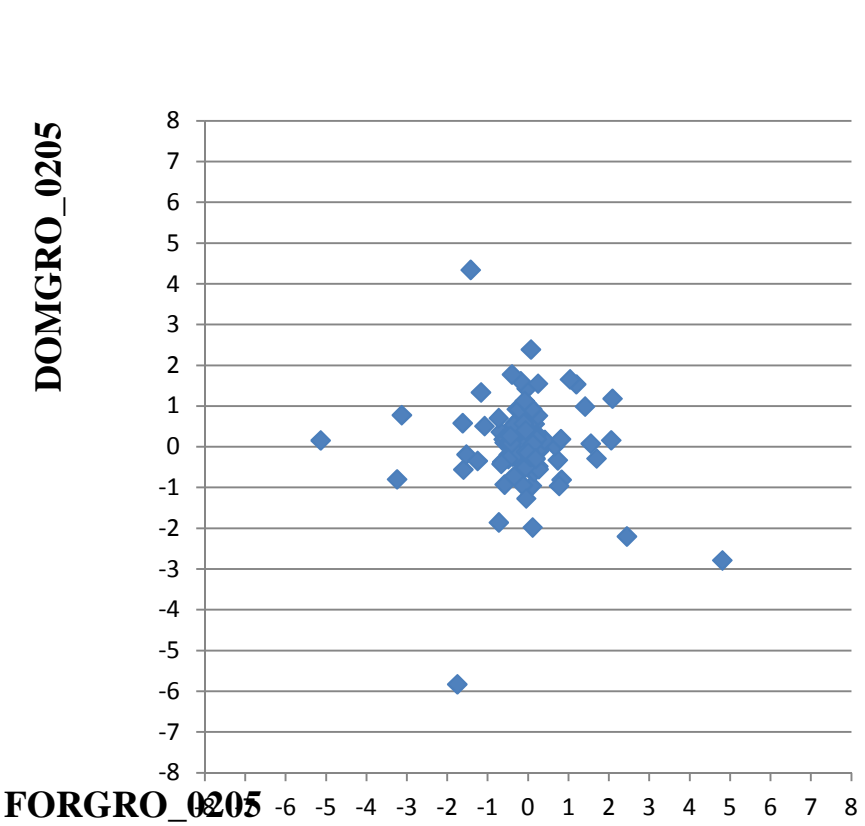
Spatial dimension of employment growth



Domestic versus Foreign growth, 1998-2001



Domestic versus Foreign growth, 2002-2005



Methodology – related variety

P_i – share of employment in NACE4 categories in the region

P_g - share of employment in NACE2 categories in the region

$$V = \sum_{g=1}^G \sum_{i \in S_g} p_i \log_2 \left(\frac{1}{p_i} \right)$$

$$V = UV + RV$$

$$UV = \sum_{g=1}^G P_g \log_2 \left(\frac{1}{P_g} \right)$$

$$RV = \sum_{g=1}^G P_g H_g$$

$$H_g = \sum_{i \in S_g} \frac{p_i}{P_g} \log_2 \left(\frac{1}{p_i/P_g} \right)$$

Methodology – ownership extension

P_{oi} – share of employment in domestic (d) or foreign (f) NACE4 categories in the region

P_{og} - share of employment in domestic (d) or foreign (f) NACE2 categories in the region

$$V = \sum_{o=f,d} \sum_{g=1}^G \sum_{i \in S_g} p_{oi} \log_2 \left(\frac{1}{p_{oi}} \right)$$

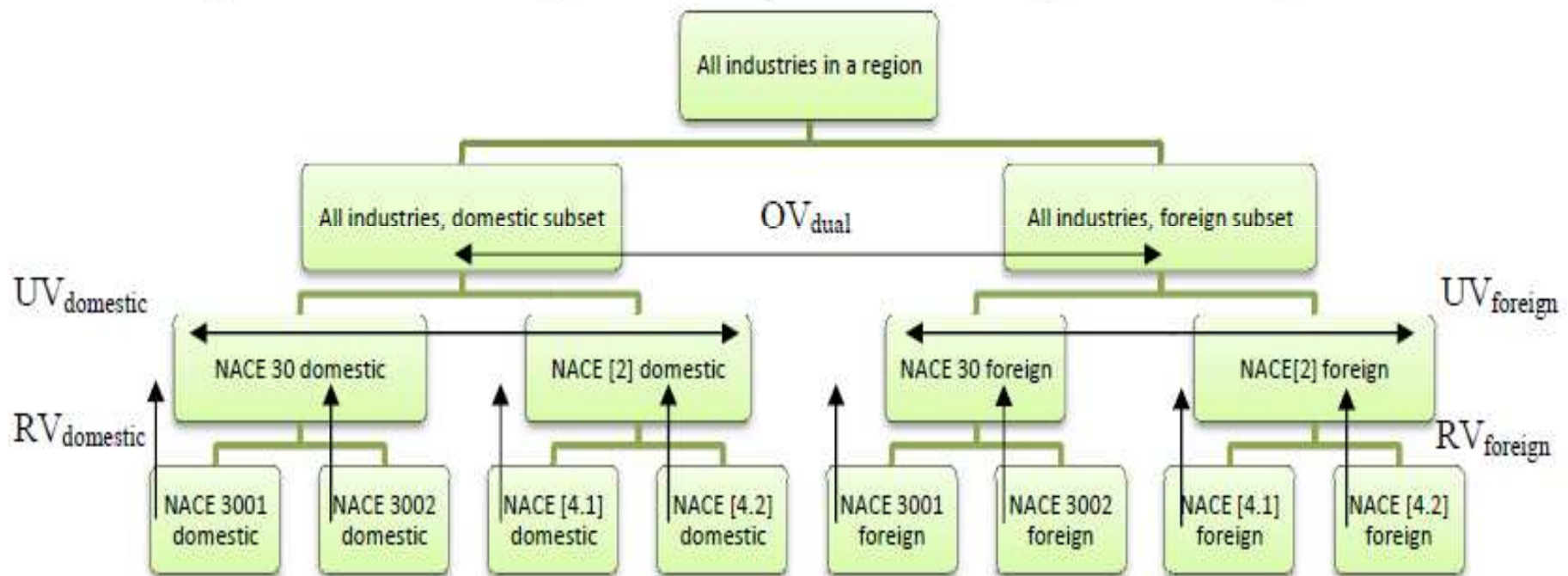
$$V = OV_{dual} + UV_{dual} + RV_{dual}$$

$$OV_{dual} = \sum_{o=f,d} P_o \log_2 \left(\frac{1}{P_o} \right)$$

$$UV_{F,D} = \sum_{o=f,d} P_o \sum_{g=1}^G \frac{P_{og}}{P_o} \log_2 \left(\frac{1}{P_{og}/P_o} \right)$$

$$RV_{F,D} = \sum_{o=f,d} P_o \sum_{g=1}^G P_{og} \sum_{i \in S_g} \frac{p_{oi}}{P_{og}} \log_2 \left(\frac{1}{p_{oi}/P_{og}} \right)$$

Variety decomposition into Domestic and Foreign sets



Normalization

- Normalization by number of employees in the whole set in order to control for regional size differences
- UV and RV divided by number of employees in the region
- UV_d and RV_d divided by number of employees in domestic firms the region
- UV_f and RV_f divided by number of employees in foreign firms in the region

Regional employment growth

	1998-2001						2002-2005					
	All subregion		growth > 0		growth < 0		All subregion		growth > 0		growth < 0	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6						
UNRELVAR	19430.95 (1.67) ***	- 57507.46 (-4.06) ***	27008.08 (2.59) **	41101.21 (3.81) ***	- 15961.41 (-3.8) ***	71633.18 (2.75) ***						
RELVAR	- 2118.18 (-14.05) ***	7797.33 (5.29) ***	- 2147.83 (-36.76) ***	- 961.36 (-18.14) ***	1009.03 (6.52) ***	- 966.38 (-15.13) ***						
Constant	29.28 (0.15)	1313.78 (5.13) ***	- 703.36 (-5.55) ***	- 1294.29 (-3.31) ***	892.84 (5.68) ***	- 2757.44 (3.56) ***						
Adjusted R-square	0.54	0.26	0.94	0.67	0.35	0.72						
N	168	83	85	168	77	91						

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Regional employment growth, dual economy model, 1998-2001 and 2002-2005

	1998-2001			2002-2005		
	All subregion	growth > 0	growth < 0	All subregion	growth > 0	growth < 0
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
OV-dual	19614.39 (1.81) *	8332.24 (0.58)	-9346.73 (-1.15)	12051.32 (1.05)	13899.92 (2.99) ***	8064.06 (0.4)
UNRELVAR_D	109761.1 (0.99)	-598158.8 (-3.30) ***	357033.7 (2.31) **	343752.2 (2.09) **	-224388.4 (-3.49) ***	639616.5 (1.81) *
RELVAR_D	-217226.3 (-6.51) ***	762333.8 (3.45) ***	-393576.6 (-5.98) ***	-244804 (-17.56) ***	180434.1 (3.85) ***	-247582.4 (-13.92) ***
UNRELVAR_F	118.57 (0.18)	252.24 (0.31)	109.79 (0.2)	184.90 (0.25)	30.58 (0.08)	313.62 (0.28)
RELVAR_F	-3.73 (-0.00)	-1330.43 (-0.57)	13485.4 (2.78) ***	-112.73 (-0.42)	41.79 (0.5)	1049.47 (0.59)
Constant	-197.24 (0.93)	1010.46 (3.05) ***	-530.64 (-3.75) ***	-997.81 (-2.26) **	354.47 (1.91) *	-2072.72 (-2.65) **
Adjusted R-square	0.56	0.16	0.93	0.65	0.23	0.68
N	167	83	84	167	77	90

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Domestic and foreign employment growth in regions (only growth)

	Domestic growth > 0				Foreign growth > 0			
	1998-2001		2002-2005		1998-2001		2002-2005	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
OV-dual	12307.77 (1.98) *	7280.28 (1.14)	8189.539 (2.26) **	9600.39 (2.16) **	4688.786 (0.33)	5381.067 (0.37)	1211.4 (0.21)	8844.976 (1.61)
UNRELVAR_D	-312181.5 (-3.85) ***		-158275.4 (-3.45) ***			-619449.1 (-3.29) ***		-235567.5 (-2.82) ***
RELVAR_D	305722.5 (3.01) ***		205093.3 (7.42) ***			756708.3 (3.16) ***		121910.9 (1.66)
UNRELVAR_F		-186.53 (-0.47)		-111.07 (-0.25)	-838.5058 (-0.72)		-2412.697 (-1.05)	
RELVAR_F		-600.27 (-0.55)		7.65 (0.09)	-809.9376 (-0.42)		80.70932 (0.01)	
Constant	485.3697 (3.11) ***	381.43 (2.19) ***	168.6739 (1.08)	117.2 (0.58)	546.5496 (1.76) *	759.548 (2.66) ***	482.689 (1.94)	482.3078 (2.41) **
Adjusted R-square	0.15	0.01	0.39	0.02	0.01	0.1	0.02 *	0.08
N	83	83	97	97	81	81	64	61

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Conclusion

- Related variety strengthens growth in growing regions and enhances decay in declining regions.

Technological relatedness might enhance inter-firm learning in regions that could cope with economic transformation.

Relatedness accompanied with lock-in into rigid industry structures of previously specialized regions hinders transformation.

Conclusion

- Related variety among domestic companies contributes to regional employment growth while relatedness among foreign companies does not.

Multinational companies' growth is determined by global strategy.

Foreign companies might be separated from domestic learning – interaction has to be captured!

Evolutionary Economic Geography in Central and Eastern Europe

Budapest, Nov 11-15

http://econ.core.hu/eeg_in_cee.html

lengyel.balazs@krtk.mta.hu