

## Dynamical models in regional economics economic structure and analytic tool

Ingrid Kubin, WU – Vienna University of Economics & Business Pasquale Commendatore – University of Naples Iryna Sushko – National Academy of Sciences of Ukraine P. Commendatore and I. Kubin: "Some dynamical models in regional economics"

I.Kubin: Basic mechanisms in the New Economic Geography

P. Commendatore: Analytic structure of a representative model

I. Sushko: Dynamic analysis of models in regional economics"

How does the spatial distribution of economic activity look like in the long-run?

- Equally distributed among regions
- Agglomerated in one region
- Unevenly distributed over regions



## Spatial distribution of economic activity: Explanation patterns

- Solow growth model
- Heckscher-Ohlin model of international trade
- New Economic Geography model

Explanation patterns: Solow growth model in a multi-country setting

Factor endowments: labour, capital, technical knowledge – growing

Connection between countries: not much, sometimes technological spill-overs No commodity trade and no factor mobility

Differences between countries: growth rate of population and technical knowledge "savings rate" for physical and human capital distance to steady state

Consequence: countries grow at specific rates; con-/divergence

Explanation patterns: Heckscher Ohlin model of international trade

**Factor endowments:** 

labour, capital – given



Sectors:

agriculture and

manufacturing

Connection between countries: commodity trade but no factor mobility

Differences between countries: factor endowment

Consequence of deeper integration: specialization in production

according to factor endowment

Factor endowments: labour, capital – given



Sectors: agriculture and manufacturing

Connection between countries: commodity trade and factor mobility

Differences between countries: no differences

**Consequence of deeper integration:** Self-reinforcing agglomeration processes

(in most NEG models via factor mobility)

Decisive factor: Extent of commodity and factor market integration

Krugman's cookbook Main ingredients of the New Economic Geography

1. Dixit Stiglitz monopolistic competition with iso-elastic demand functions

Pricing to the market

Price setting: Constant mark-ups on

(constant) marginal costs including transport cost

Profits are higher in the bigger market

2. Iceberg trade cost:



Location of firm matters

Firms are selling to all markets, but

profits are higher if local market is bigger

3. Factor mobility:

according to differentials in factor remuneration

Core-periphery model: workers and expenditure move footloose capital model: firm and capital move simultaneously but not expenditure (owners of capital do not move)

footloose entrepreneur model: firm, capital and expenditure move

Krugman's story: Self reinforcing agglomeration processes (footloose entrepreneur model)

## Pivotal: Size of local market for a single firm

Depends on overall market size in the region

number of firms in region

Thought experiment: one firm moves from region 2 to region 1

**Overall size of the market in 1 increases – market size effect** 

Number of firms in region 1 increases as well – competition effect

Market size effect: fosters agglomeration

Competition effect: fosters equal regional factor distribution











Where do dynamic processes play a role????

Monopolistic competition: instantaneous equilibrium

Shipping of goods: instantaneous

Factor mobility: gradual over time, adaptive process

Analytical core: dynamic equation for factor mobility

Multiple equilibria; stability properties, basin of attraction



Analytic question 1: uniqueness of fixed points

usually in economics: focus on UNIQUE fixed points

in NEG: multiplicity of fixed points is important!

therefore: investigation of basin of attraction necessary

Analytic question 2: stability of fixed points

usually in economics: focus on STABLE fixed points

in NEG: unstable fixed points are important as well!

therefore:careful specification of boundary conditions necessary(piece-wise defined models)

Important, because dynamic phenomena are different

factor mobility and production process involves delay

Not captured in continuous time modelling; captured in discrete time modelling

 Three options:
 continuous time with delay (differential equation with delay)

 continuous time
 discrete time

piece-wise defined non-linear difference equations

- cyclical and complex attractors
- coexisting attractors
- complex basin of attraction

**Multiregional context** 

## Analytic structure

piece-wise defined non-linear difference equations

- cyclical and complex attractors
- coexisting attractors
- complex basin of attraction



Commedatore, Kubin, Sushko: Wada basins in NEG model with 3 regions

		2006: Chaos in the core periphery model. Journal of Eco-
	Reformulation of	nomic Behavior and Organization
P.Commedatore,	central NEG models	2007: Chaotic Footloose Capital. Nonlinear Dynamics,
M.Currie, I.Kubin	in discrete time	Psychology, and Life Sciences.
	Dynamic properties	2008: Footloose Entrepreneurs, Taxes and Subsidies.
		Spatial Economic Analysis 3 (1): 115-141
		2013: Taxation, Public Expenditures and Agglomeration.
P.Commedatore, I.Kubin	Tax policy and re- gional dynamics	Economica Politica 3 357-386.
		Forthcoming: Source versus residence: A comparison from
		a new economic geography perspective. Papers in Re-
		gional Science.

	Productive	2008. Productive Public Expenditure in a New Economic
	public expend-	Geography Model. Economie Internationale
	itures and re-	2009. Footloose capital and productive public services.
P.Commedatore,	gional dynam- ics (North –	2010. R&D Public Expenditure, Knowledge Spillovers
I.Kubin, C.Petraglia		and Agglomeration: Comparative Statics and Dynamics.
		In: Nonlinear Dynamics in Economics, Finance and the
	South discrep-	Social Sciences., Hrsg. Bischi, G.I., Chiarella, C., Gar-
	ancy)	dini, L.
		2010: Grafeneder-Weissteiner, T., "Essays on agglome-
A.Fürnkranz-		ration and demographic change", PhD Thesis.
Prskawetz.	Agglomeration in ageing societies	2013: Grafeneder-Weissteiner T, Prettner, K.: Agglome-
T Grafonodor-		ration and demographic change, Journal of Ur-
		ban Economics, 74:1-11
weissteiner, I.Kubin,		2015: Coping with inefficiencies in a New Economic Ge-
K.Prettner, S.Wrzaczek		ography modle: The unintended consequences of policy
		interventions. Mathematical Social Sciences 76 146-157

		2011: Border Collision Bifurcations in a Footloose Capi-
		tal Model with First Nature Firms Computational Eco-
	First nature	nomics 38 (3): 349-366.
A.Agilari,	asvmmetries.	2014: Expectations and industry location: a discrete time
P.Commedatore,	Expectation	dynamical analysis. Decisions in Economics and Fi-
I.Foroni, I.Kubin		nance 37 3-26.
	formation	2015: Agglomeration dynamics and first nature asymme-
		tries. Mathematics and Computers in Simulation 108 81-
		98.
	South African	2008: Linkages in South African Economic Develop-
O.Schwank	Economic De-	ment: Industrialisation without Diversification? (PhD the-
	velopment	sis)

		2013: A Three-Region New Economic Geography Model
		in Discrete Time: Preliminary Results on Global Dynam-
		ics. In: Global Analysis of Dynamic Models in Economics
		and Finance - Hrsg. Bischi, G.I.; Chiarella, C.; Sushko,
		I., 159-184. Heidelberg: Springer Verlag
		2014: Regional integration, international liberalisation
P.Commedatore,		and the dynamics of industrial agglomeration. Journal of
V.Filosofo.	Dvnamics in	Economic Dynamics and Control 48 265-287.
T Grafeneder.	multiregional	2015: Typical bifurcation scenario in a three region iden-
		tical new economic geography model. Mathematics and
weissteiner, i.Kubin,	NEG models	Computers in Simulation 108 63-80
P.Mossay, I.Sushko		2015: Towards a Multiregional NEG Framework: Com-
		paring Alternative Modelling Strategies. In: Complexity
		and Geographical Economics: Topics and Tools, Hrsg.
		Commendatore, Kayam, Kubin, 13-50. Springer
		Forthcoming: Dynamic agglomeration patterns in a two-
		country new economic geography model with four re-
		gions. Chaos, Solitions and Fractals.

	Multi-regional NEG models: trade agreements, transit traffic
C. Hammer	Empirical estimation of gravity equations (based on NEG models)
R.Basile, L. de Benedictis, P.Comendatore, I.Kubin	Network analysis of interregional trade and NEG explanation patterns

Last, but not least: our book

Comemndatore, Pasquale, Kayam, Saime, Kubin, Ingrid, Hrsg. 2015. Complexity and

Geographical Economics. Heidelberg: Springer International Publishing