Halting the Rural Race to the Bottom

An Evolutionary Model of Rural Development to Analyse Neo-endogenous Policies in the EU

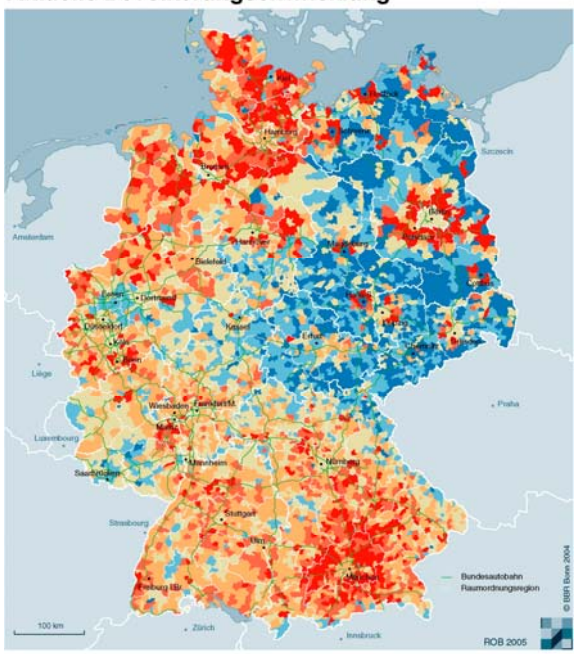
Martin Petrick

Leibniz Institute of Agricultural Development in Central and Eastern Europe
Halle (Saale), Germany

Outline

1 Divergent Development of Rural Regions in Germany
2 Policy Trends in European Rural Development
3 Rural Development as a Dynamic Coordination Game
4 Implications for Empirical Analysis
5 Conclusions

Aktuelle Bevölkerungsentwicklung

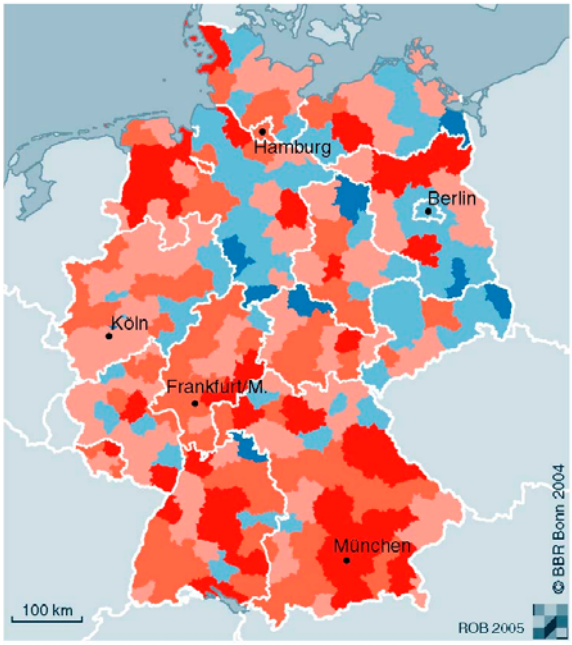


Bevölkerungsentwicklung 1997 bis 2003 in %

	bis unter -5,0
-5,0	bis unter -1,5
-1,5	bis unter 1,5
1,5	bis unter 5,0
5,0	bis unter 7,5
7,5	und mehr

Quelle: BBR (2005): Raumordnungsbericht 2005. Berichte Bd. 21, Bonn. Seite 31

Veränderung des Bruttoinlandsproduktes



Jährliche durchschnittliche reale Wachstumsrate des Bruttoinlandsproduktes zu Marktpreisen 1996 bis 2002 in %

	bis unter -1
-1	bis unter 0
0	bis unter 1
1	bis unter 2
2	und mehr

Quelle: BBR (2005): Raumordnungsbericht 2005. Berichte Bd. 21, Bonn. Seite 157

Oldenburger Münsterland vs. NW-Sachsen

DIE ZEIT, 09.07.2009 Nr. 29 - 09. Juli 2009
http://www.zeit.de/2009/29/Oldenburger-Muensterland

LANDWIRTSCHAFT

Feld, Wald und Wachstum

Dem Oldenburger Münsterland geht es bestens. Warum? Eine Reise durch eine Boomregion

VON KERSTIN BUND

Ein Masthähnchen stirbt jung im Oldenbur
keine 40 Tage lang in diesem westlichen Z
trinkt, und es wächst, bis es rund 2000 Gra
es zum Beispiel in Visbek, wo die Gebr. St
betreibt. Das Letzte, was das Tier sieht, ist
das Federvieh kopfüber mit den Füßen an
fortträgt in Richtung Elektrobad, rattert ras


Mitteldeutschland

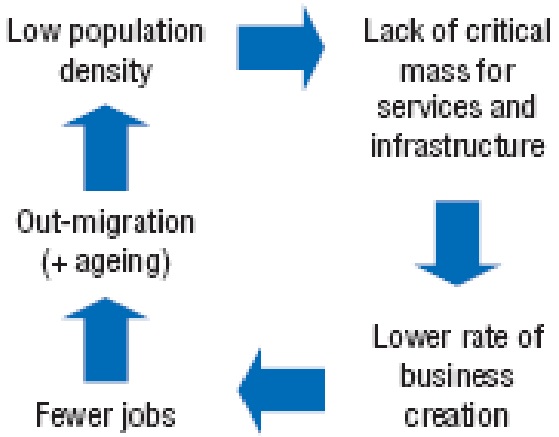
Ein Dorf ist auf dem Rückzug

Immer mehr Menschen ziehen fort: In Steinbach fürchten die Menschen, dass ihr Heimatort weggerissen wird

INFRASTRUKTUR

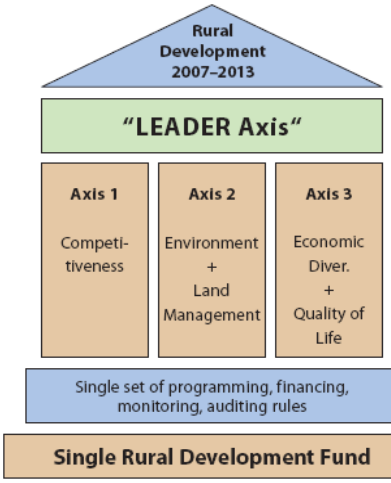
„Nicht alles überall"

Rural race to the bottom



OECD 2006, The New Rural Paradigm, p. 32.

EU Policies for Rural Development 2007-13



"LEADER Maintreaming" an important innovation in EU rural development

Source: EU Commission.

7 LEADER principles

1. Principle of territory
2. Bottom-up approach, Animation & Training
3. Forming partnerships in the Local Action Group (LAG) as recipients of EU funding
4. Innovation
5. Participation of private, social & public actors
6. Network formation, cooperation among regions
7. Complementary local funding & local management

Source: EU Commission.

Focus of LEADER projects

- Valorisation of natural & cultural resources
- Improvement of quality of life
- Enhancing local value added
- Knowledge & new technologies to improve rural competitiveness

Source: EU Commission.

Neo-endogenous rural development

- Development along a **bottom-up trajectory**, localities can effect change in their favour, need not become victims of broad, exogenous, political and economic forces
- **Intervention** in the form of rural policies, 'neo' stressing the influence of the **extralocal**

Christopher Ray 2006, Handbook of Rural Studies, p. 278.

- Neither laissez-faire nor strongly interventionist

➢ **"Governmentally-induced spontaneous order"**

Planning vs. Spontaneous Order

„Es ist daher paradox …, wenn heute oft gesagt wird, daß wir die moderne Gesellschaft bewußt planen, weil sie so komplex geworden ist.

In Wirklichkeit können wir eine Ordnung von solcher Komplexität nur dann erhalten, wenn wir sie **nicht nach der Methode des „Planens“**, d.h. nicht durch Befehle handhaben,

sondern auf die Bildung einer **auf allgemeinen Regeln beruhenden spontanen Ordnung** abzielen.“

F.A. von Hayek 1969, Freiburger Studien, S. 42f.

Challenges for Economic Analysis of Neo-endogenous Rural Development Policies

- Simultaneity of local collective (in-)action & central government stimulation
- Role of external animation to overcome inefficient structures & conventions
- Path dependency created by initial conditions, e.g., social capital, previous positive experience, cultural background

➢ **Required**: a dynamic model of rural development that can identify effects of LEADER-type policies

My contribution

- Analysis of neo-endogenous rural development policy using evolutionary game theory
- Motivate econometric analysis of regional dynamics based on this foundation

Evolutionary game theory

- Models of multiple equilibria
- Historical contingency of outcomes (=path dependency)
- Local homogeneity coexists with global heterogeneity
- Can explain persistence of Pareto-inferior outcomes

Sam Bowles (2004): Microeconomics: Behavior, Institutions, and Evolution, New York.

An evolutionary, rural coordination game

Three modelling steps:

1. Static one-shot coordination game as analytic narrative
2. Introducing dynamics using evolutionary game theory
3. Extending the model by nesting a collective action game in the evolutionary population game

Step 1: The rural coordination game

	Immobile invest locally	Immobile abstain to invest
Mobile stay in rural area	$\underline{y}, \underline{y}$	w_r, w_r
Mobile move to urban area	$w_u, 0$	$\underline{w_u}, \underline{w_r}$

With $y > w_u > w_r > 0$.

y is the (equal) net payoff of an endogenous rural project carried out jointly by Immobile and Mobile, and w_u, w_r are the urban and rural net wage rates, respectively. Nash-equilibria marked by underbar.

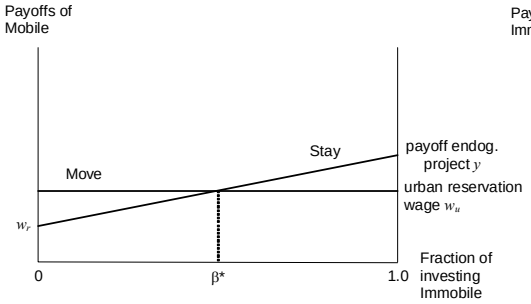
Step 2: Making the game evolutionary

- Interaction of 2 subpopulations (species), each with 2 strategies (phenotypes), paired once per period
- Limited cognitive capacities of agents, trial-and-error learning
- Periodical updating of strategies ("selection") based on successful phenotypes of previous period
- Idiosyncratic deviation from best-response possible, innovation
- Equilibria reached via "Evolutionary Stable Strategies" (ESS)
- Multiple equilibria, some may be Pareto-inferior

Dixit/Skeath 2001, Bowles 2004

Expected payoffs in the evolutionary game

Mobile

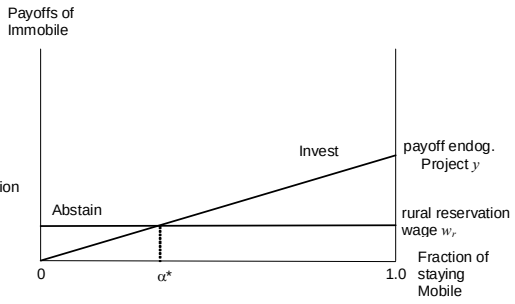


Benefit for staying Mobile: $B_{ms} = w_r + \beta y$

Benefit for moving Mobile: $B_{mm} = w_u$

Tipping point: $\beta^* = \frac{w_u - w_r}{y}$

Immobile

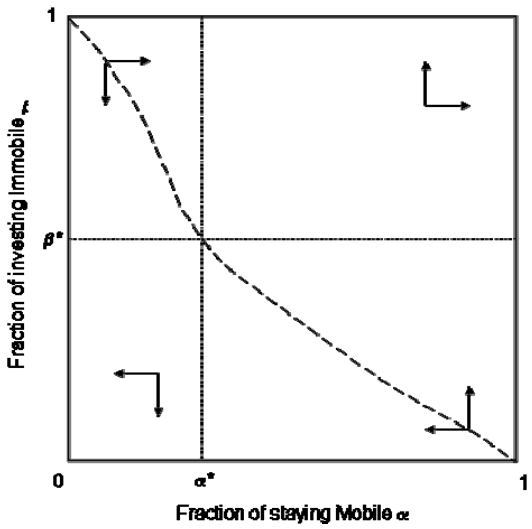


Benefit for investing Immobile: $B_{ii} = \alpha y$

Benefit for abstaining Immobile: $B_{ia} = w_r$

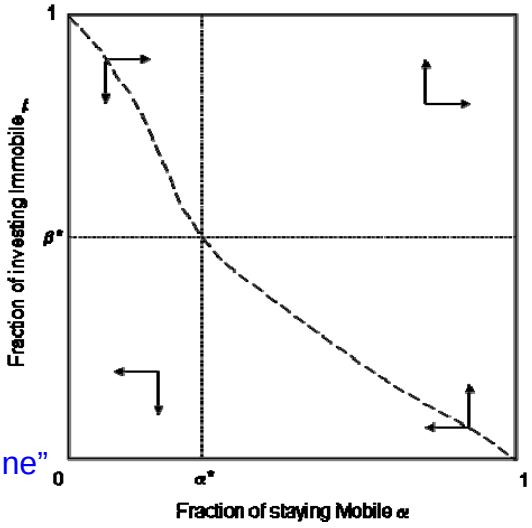
Tipping point: $\alpha^* = \frac{w_r}{y}$

State space in the evolutionary game



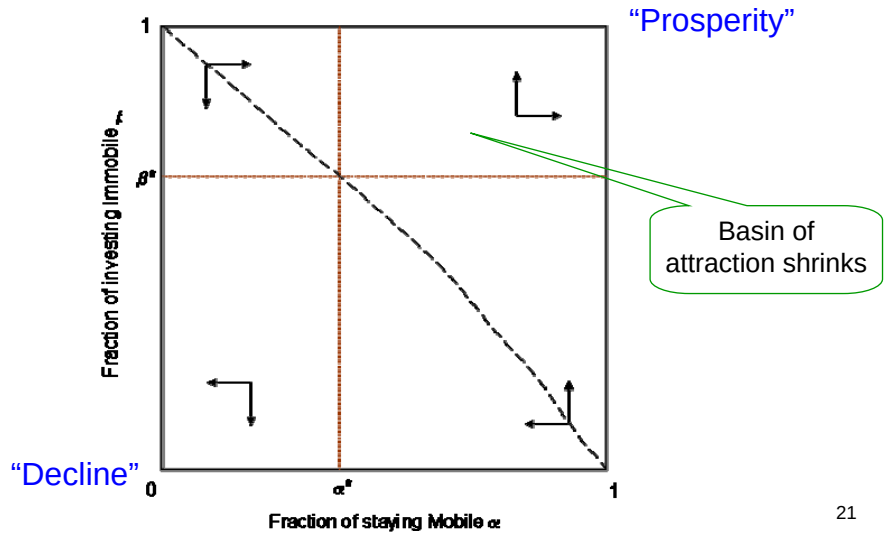
State space in the evolutionary game

"Prosperity"



"Decline"

Less favoured regions



Implications of the evolutionary game

- For successful rural development, α^* & β^* must be small, i.e., investing-staying ("prosperity") equilibrium is robust
- Determining factors:
  - Initial conditions (+/-)
  - Innovation rate (+/-)
  - Pay-off to endogenous project (+)
  - Urban wage (-)
  - Rural wage (+ via Mobile, - via Immobile)
  - Relative share of subpopulations (- if unequal)

Two ways to introduce regime change:

a) Stochastic idiosyncratic play, leads to statements about "long-term evolutionary universals" (not followed here)

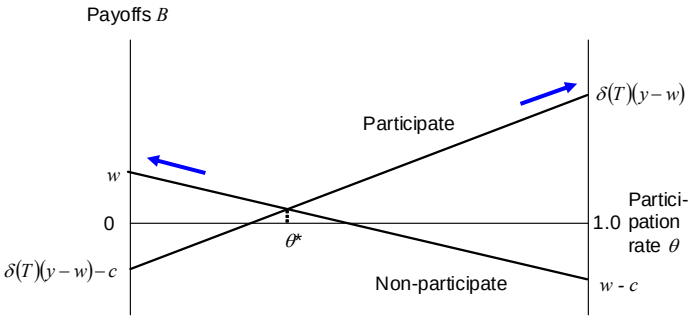
b) Intentional collective action (detailed in the following)

- Endogenise idiosyncratic play
- Introduce capacity to look forward

Step 3: Collective action

- Possibility to induce collective non-best response play in a single period (inspired by Bowles 2004)
- Individual propensity to engage (δ) influenced by
  - External financial stimulus T (e.g., LEADER-type policy)
  - Size of gains to be had from coordination (difference btw joint project and reservation wage, y - w)
  - Social costs of free-riding c, expressed by number of participating peers θ (conformism effect)
- Benefit from participation: $B_p = \delta(T)(y - w_x) - (1 - \theta)c$
- Benefit from non-participation: $B_n = w_x - \theta c$

The collective action game



Benefit from participation for moving Mobile (abstaining Immobile): $B_p = \delta(T)(y - w_x) - (1-\theta)c$

Benefit from non-participation: $B_n = w_x - \theta c \quad x \in \{u, r\}$

Collective action successful if more than θ^* participate: $\theta^* = \frac{1}{2} - \frac{\delta(T)(y-w)-w}{2c}$

Implications of collective action game

- Collective action a self-reinforcing process once critical value is passed
- Determining factors of low θ^* (successful change of regime):
  - Individual propensity to participate (+)
  - Level of financial support through policy (+)
  - Pay-off to endogenous project vs reservation wage (+)

Growth econometrics

- Basic growth regression: $\log\left[\frac{Y_t}{Y_0}\right] = \beta \log Y_0 + \varepsilon$
- Y_t GDP per worker at time t, Y_0 initial GDP per worker, $\beta<0$ convergence parameter
- To be estimated on a dataset of regions

Implications for econometric analysis

- Rejection of absolute convergence hypothesis
- Existence of bipolar divergence, or convergence clubs
- Policies may or may not move regions from downward to upward trajectory
- Growth equation to be augmented by additional variables outlined above
- Threshold regression (Bruce Hansen 2000, Econometrica)
- Panel data econometrics

Conclusions

- Theoretical workhorse for analysing rural development
- Rural outcomes cannot be planned or engineered, initial conditions matter
- “Spontaneous rural order” may lead to Pareto-inferior outcomes
- Organisational principles involving government (“intervention”) & local collective action (“bottom-up”)
- Econometric implementation & tests yet to be carried out