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SFB 649 „Ökonomisches Risiko“

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# The Slow Death of East Germany

or: Regional Labor Markets, Network Externalities  
and Migration: The Case of East Germany

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<http://www.wiwi.hu-berlin.de/wpol/>



# Structure of the Talk

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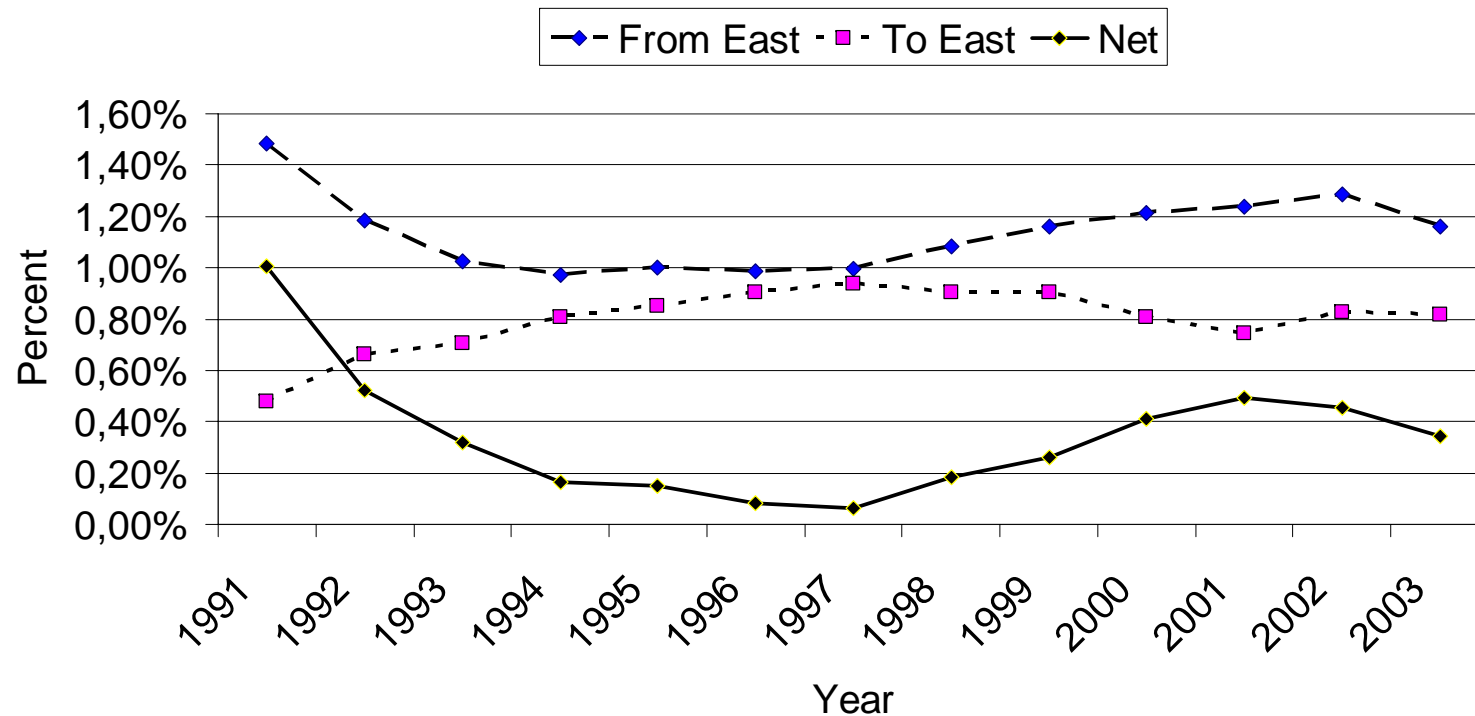
- Migration out of East Germany: high and accelerating
  - Everyone
  - 18-29 year old
- Myth and Facts about East and West
- A model of regional labor markets, network externalities and migration
- Conclusions



# Migration: Aggregate Data



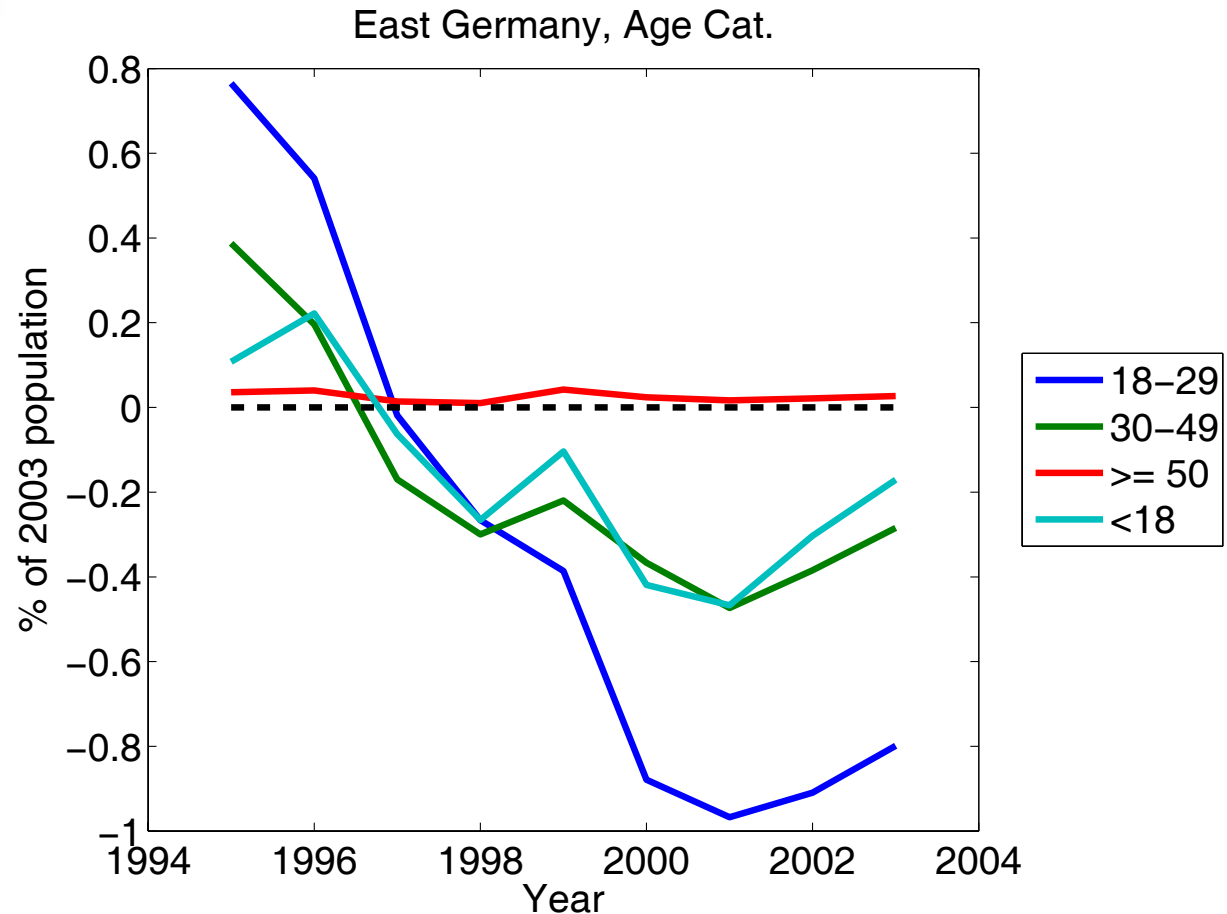
Migration from East to West Germany  
(in % Population East Germany with Berlin, 2004)





# Migration: Aggregate Data

All migration:

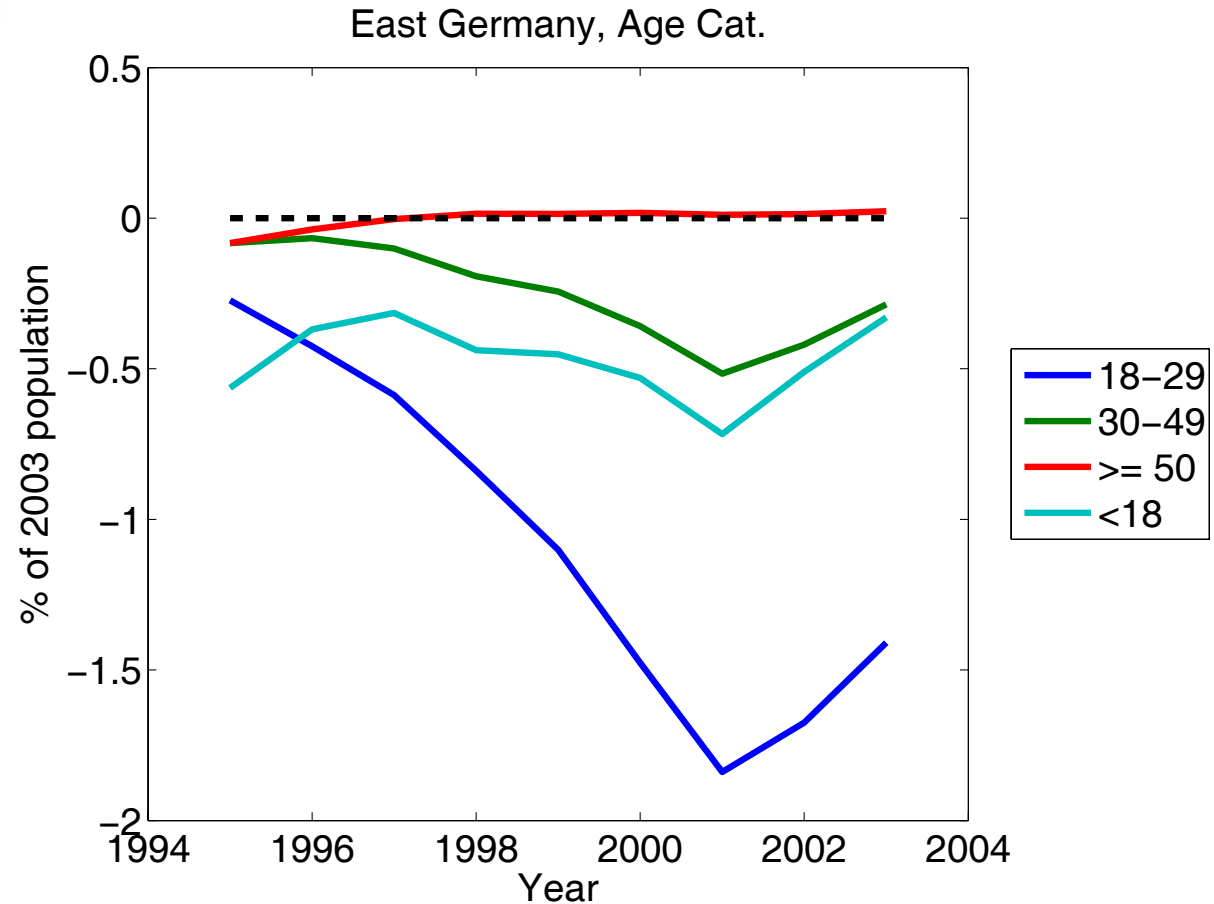




# Migration: Aggregate Data



Only inner-German migration:





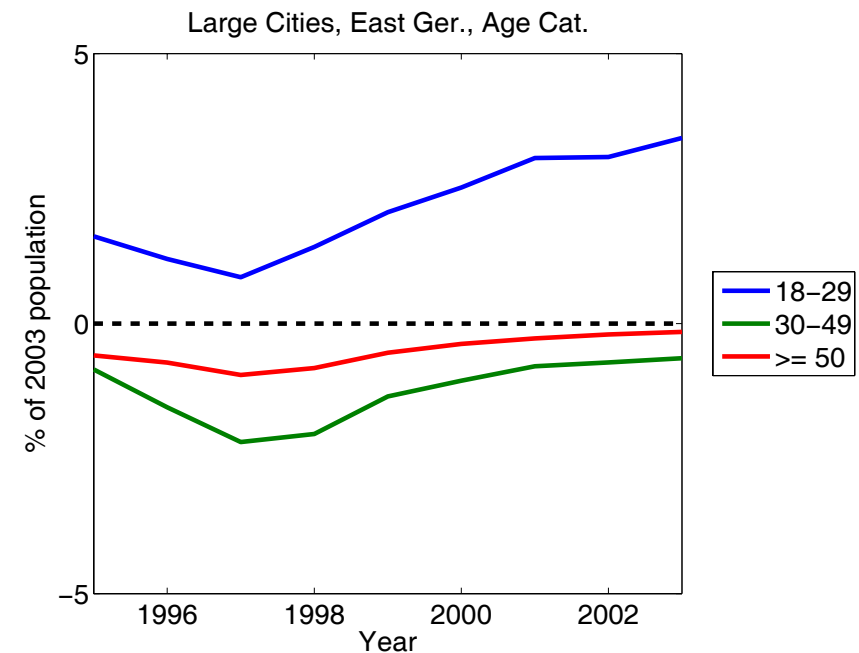
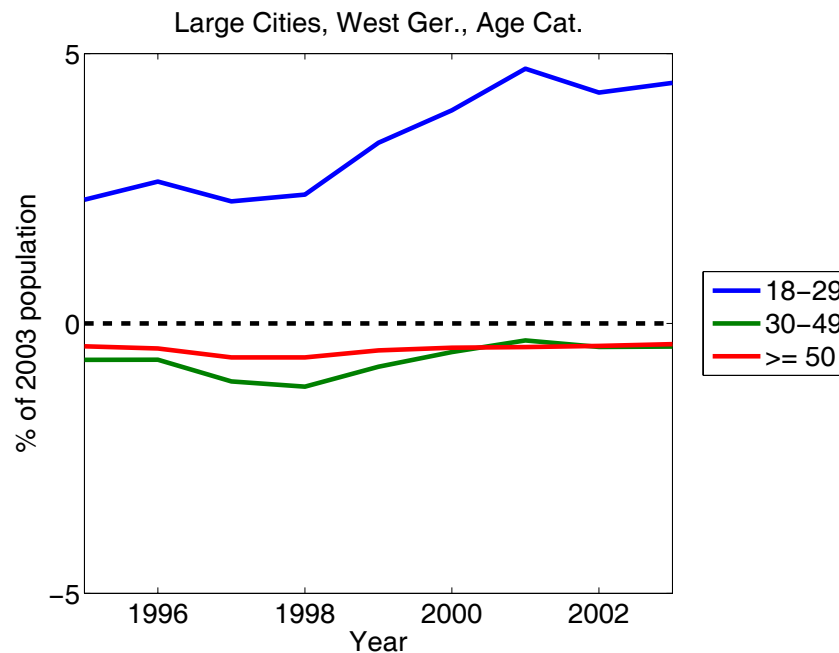
# Migration: Aggregate Data



## Large Cities, all migration

West

East





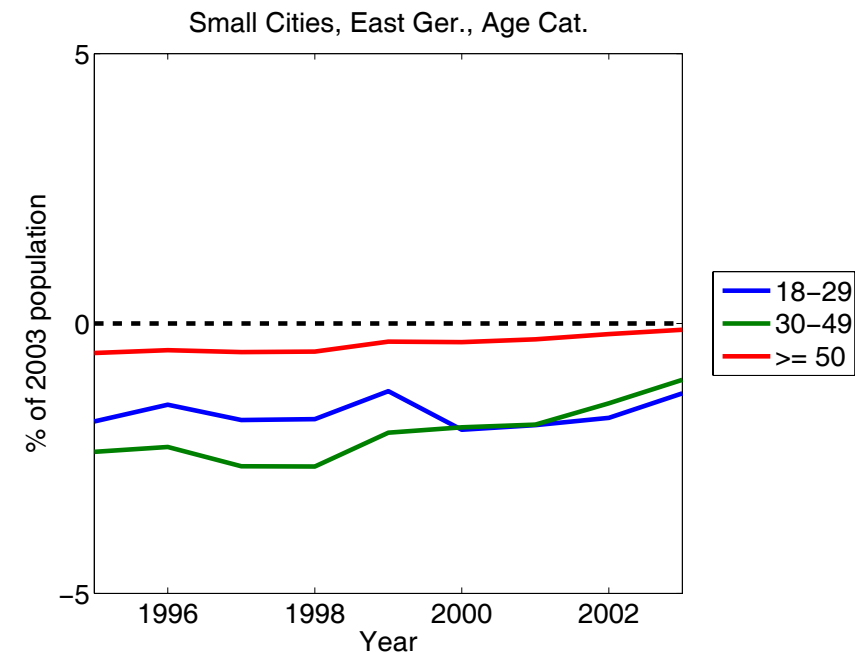
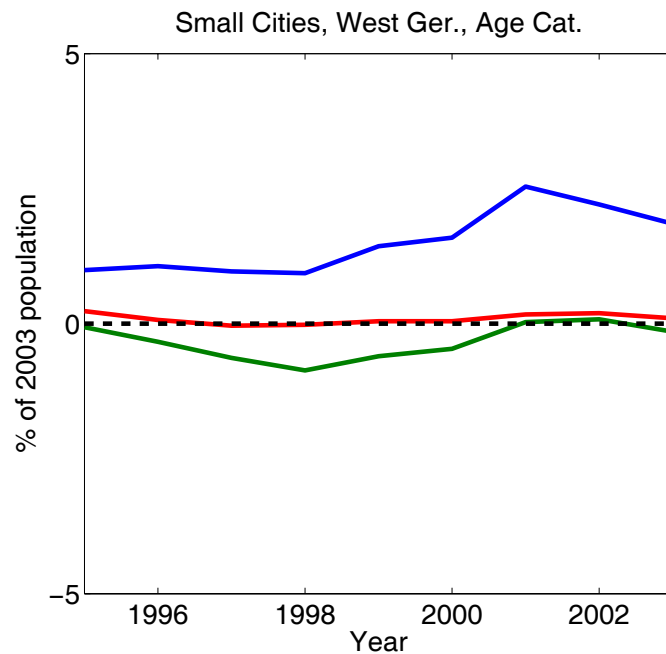
# Migration: Aggregate Data



West

Small Cities

East





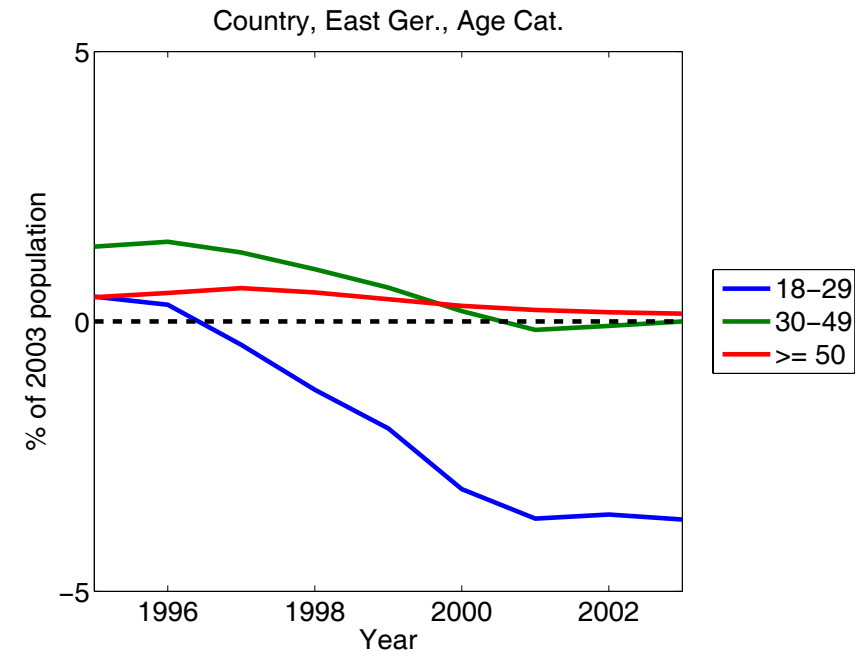
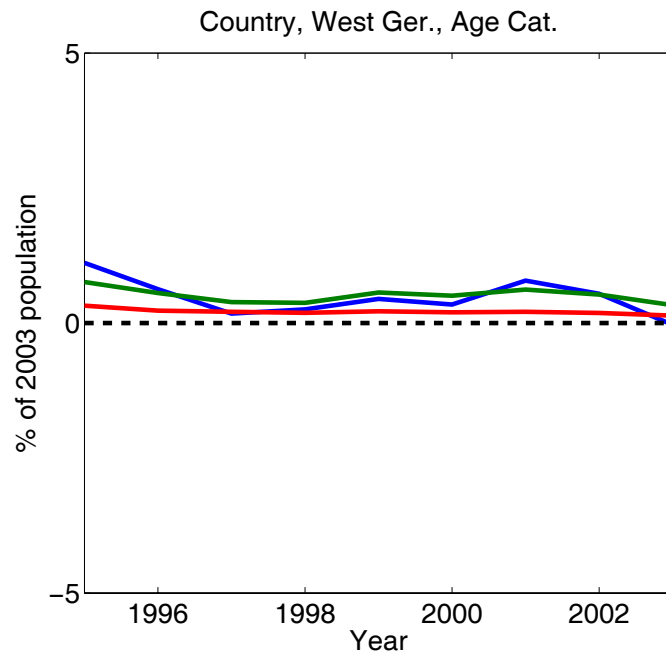
# Migration: Aggregate Data



West

Country Side

East



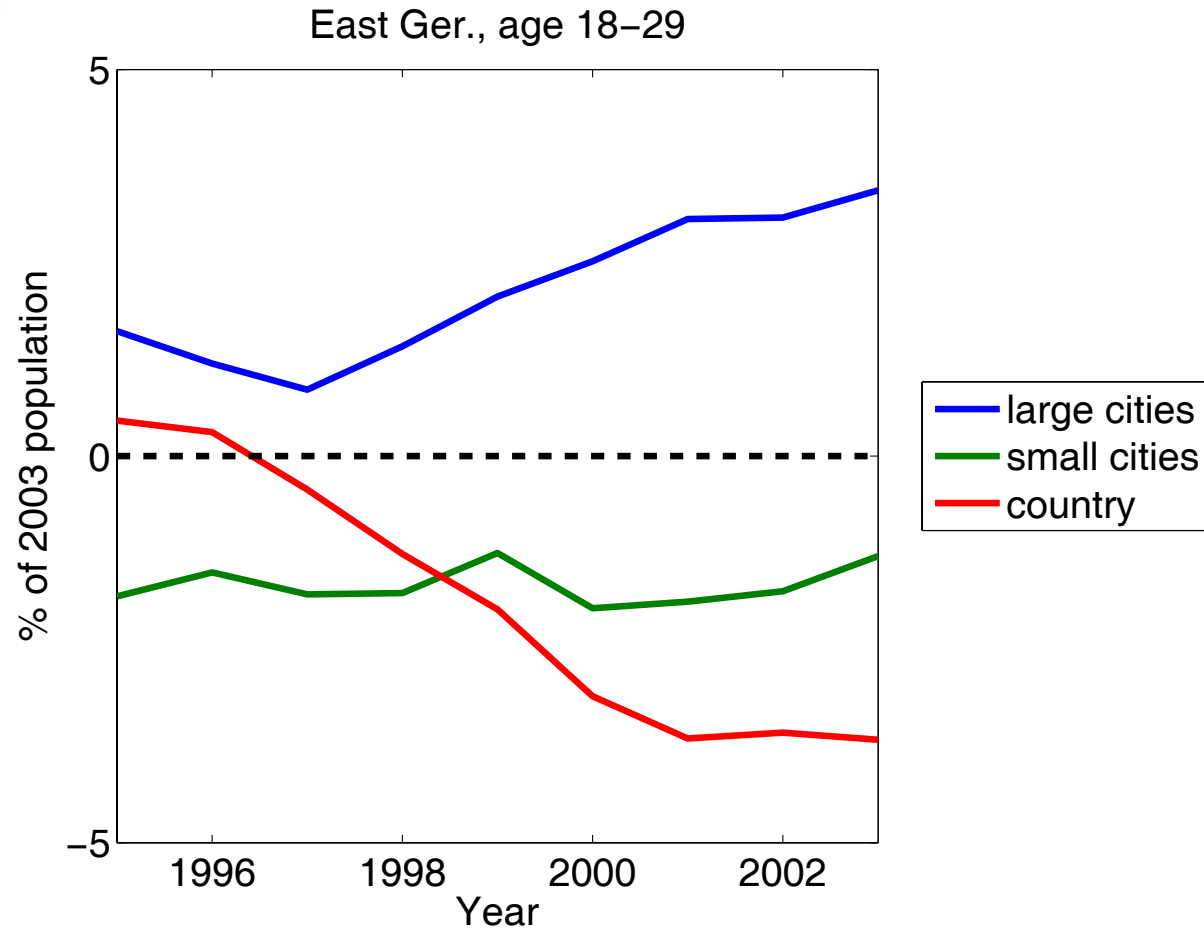




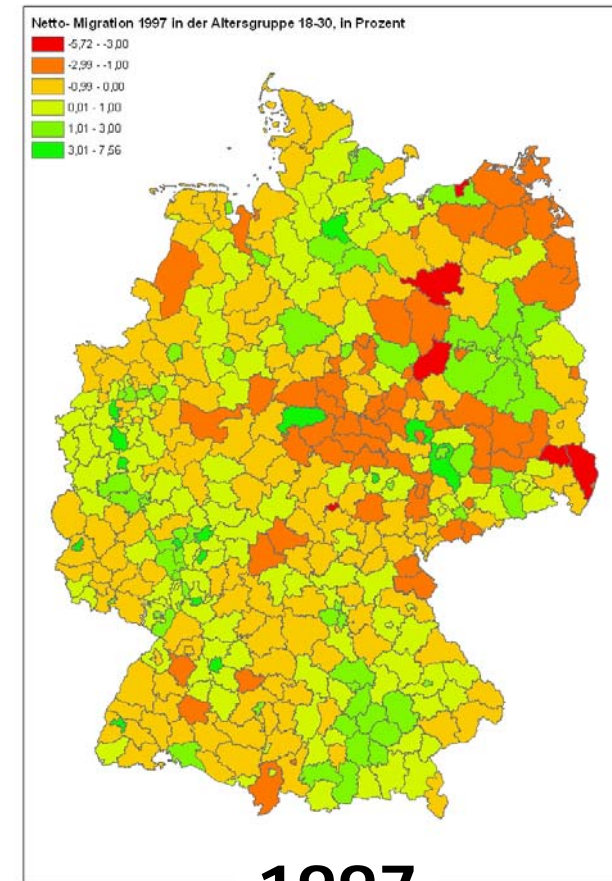
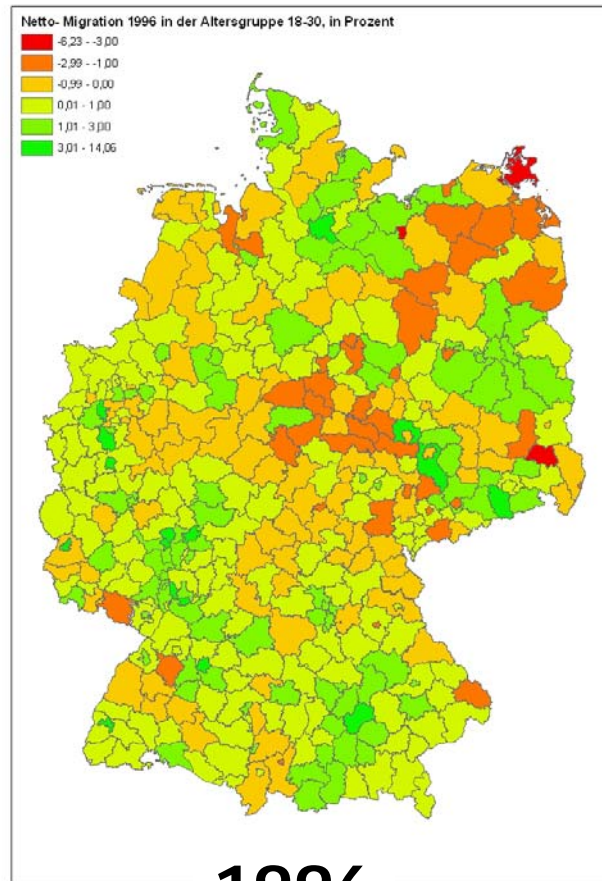
# Migration: Aggregate Data



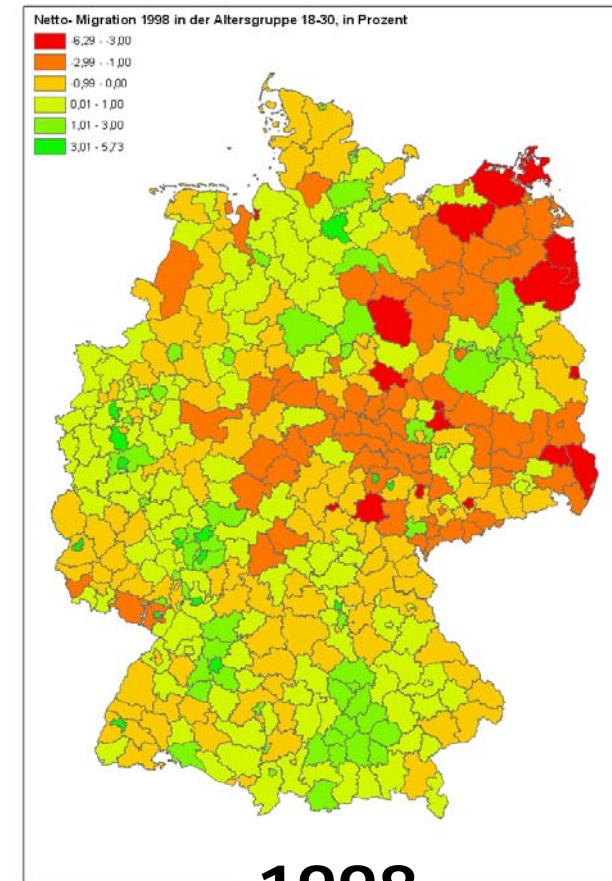
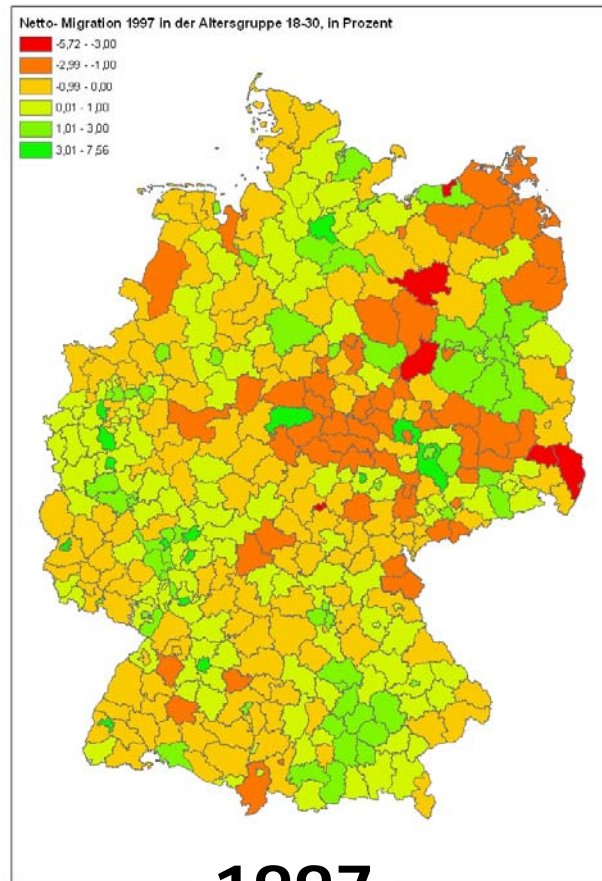
18-29  
year old,  
East  
Germany,  
per  
annum



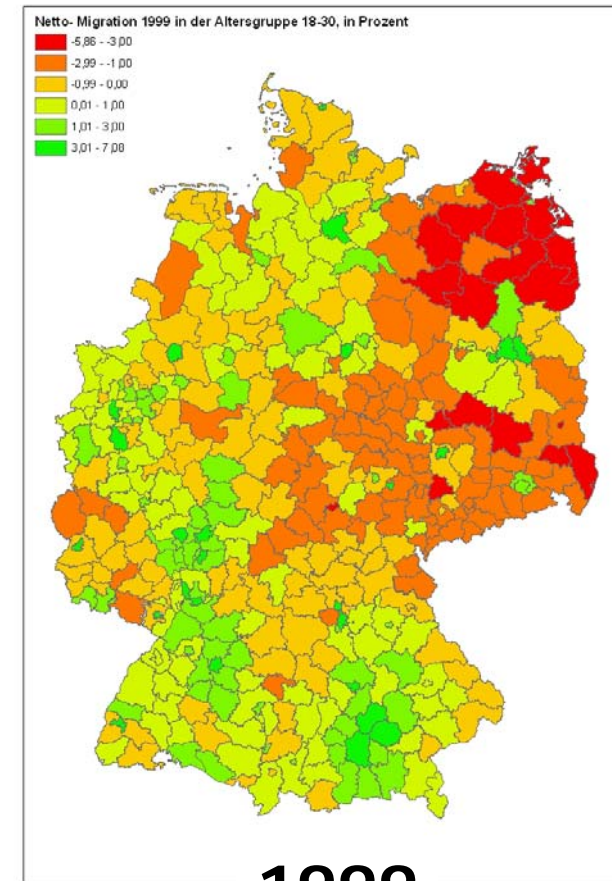
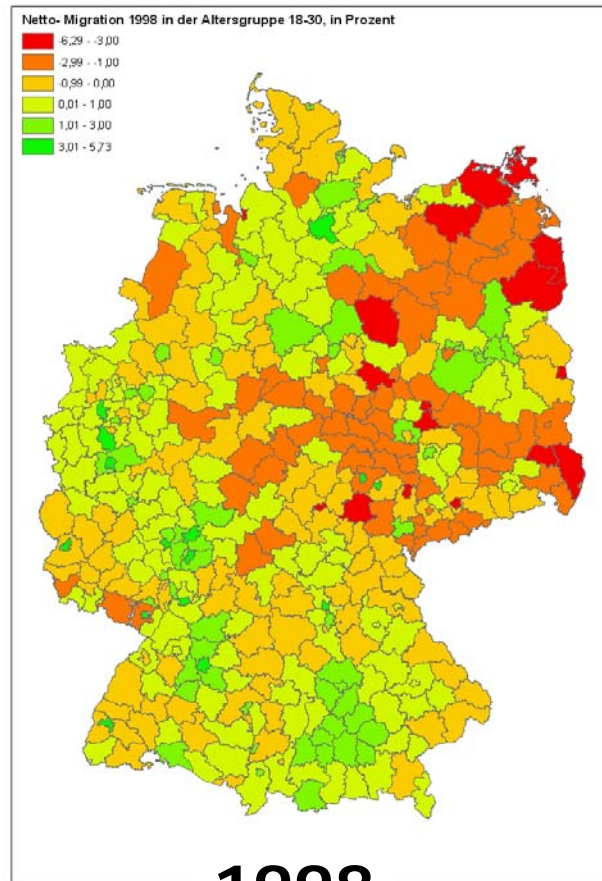
# $\sigma_t$ 18-29 years old: net migration



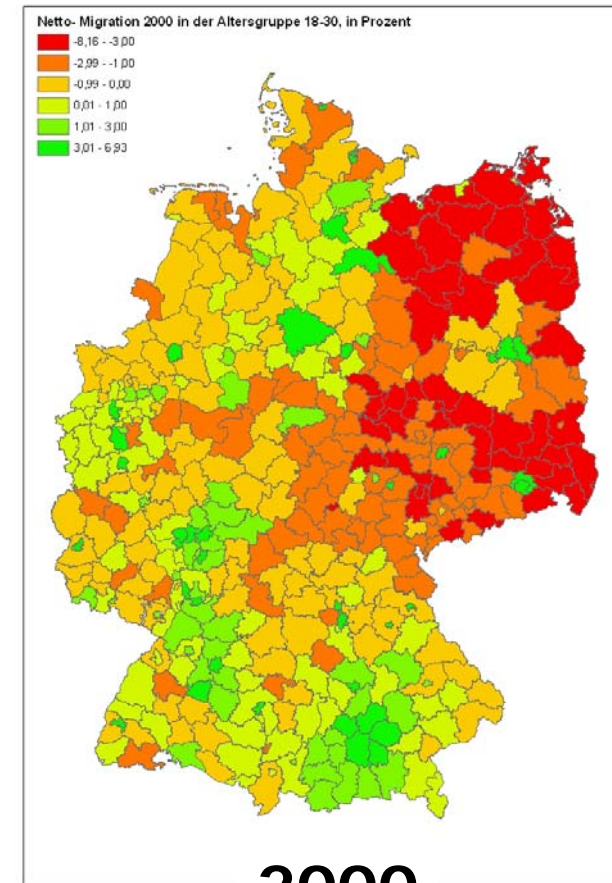
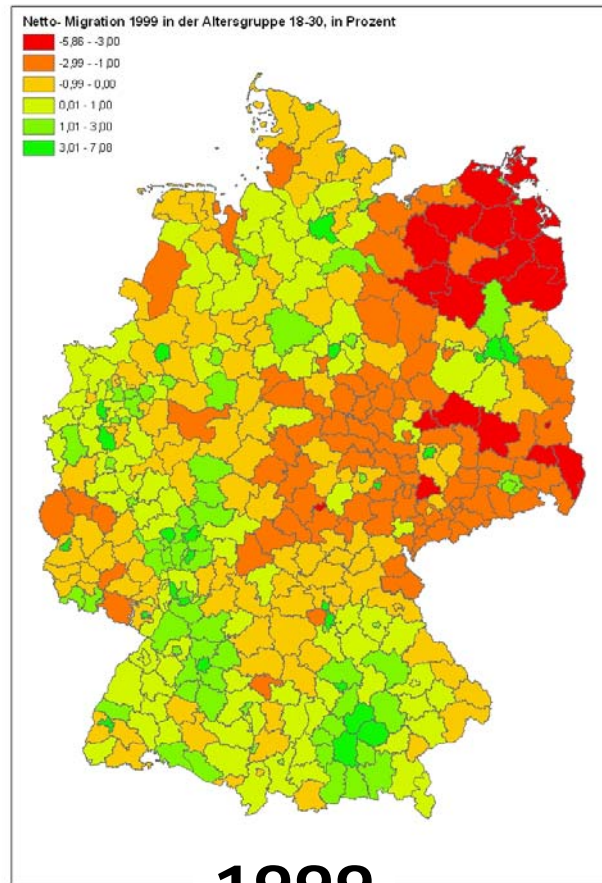
# $\sigma_t$ 18-29 years old: net migration



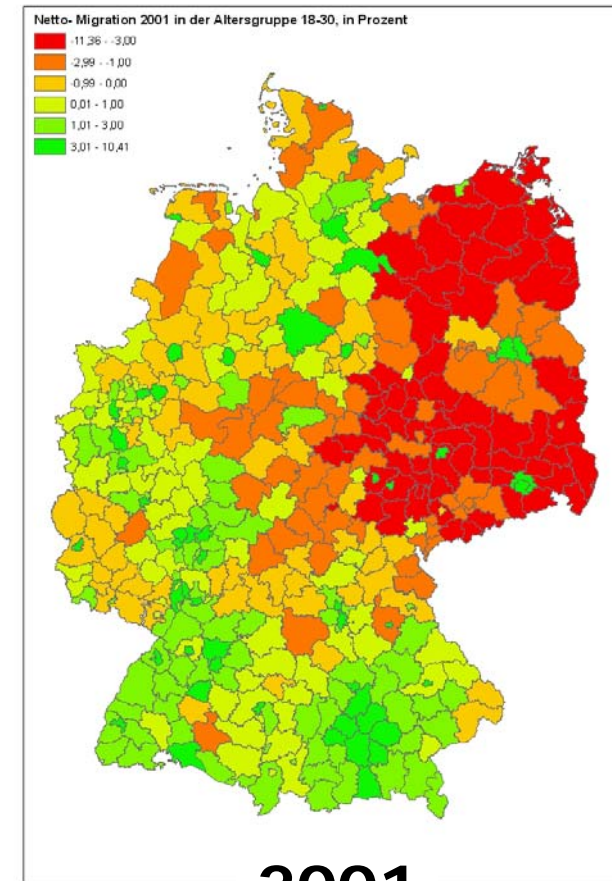
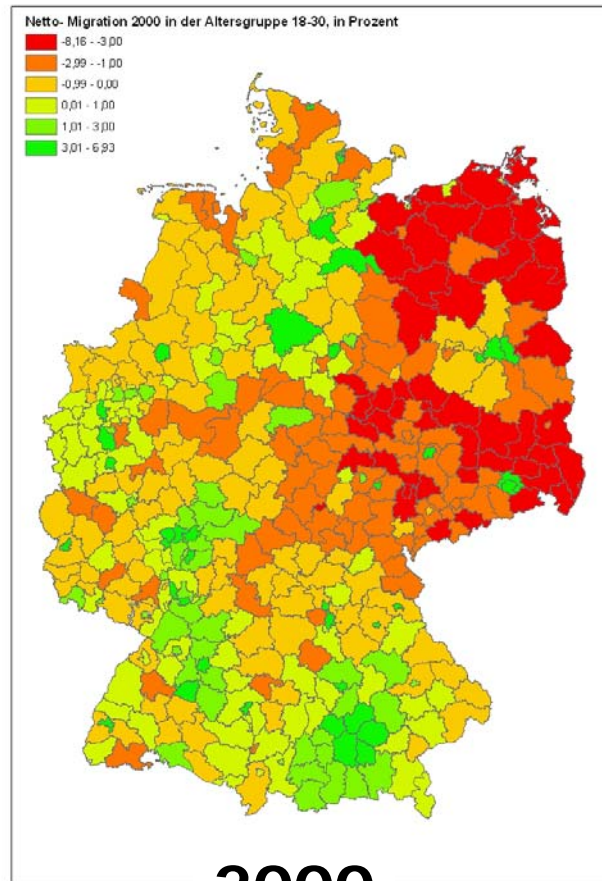
# $\sigma_t$ 18-29 years old: net migration



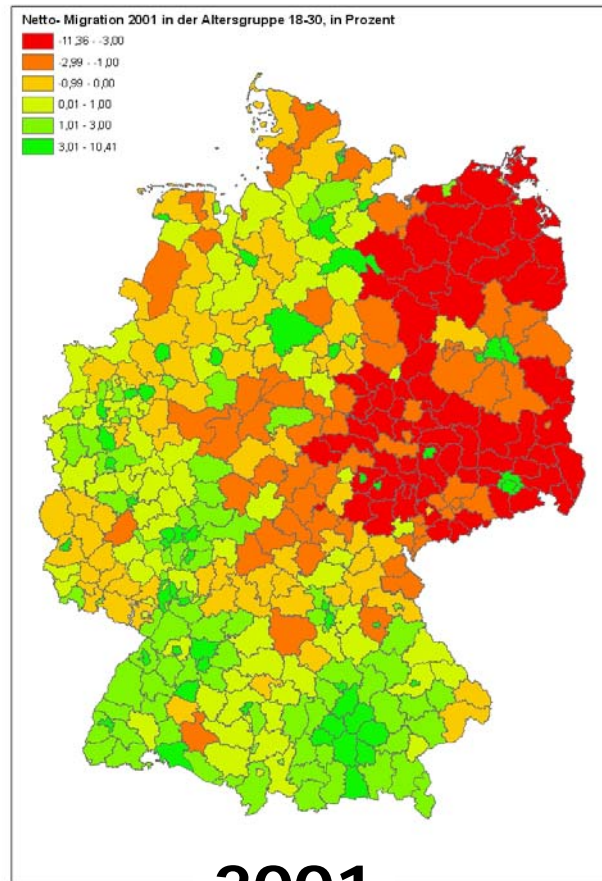
# $\sigma_t$ 18-29 years old: net migration



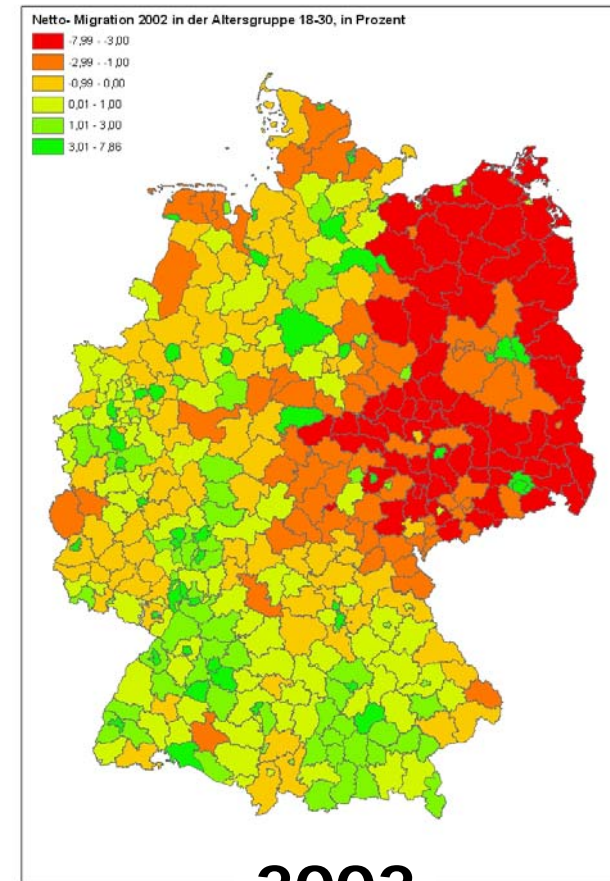
# $\sigma_t$ 18-29 years old: net migration



# $\sigma_t$ 18-29 years old: net migration

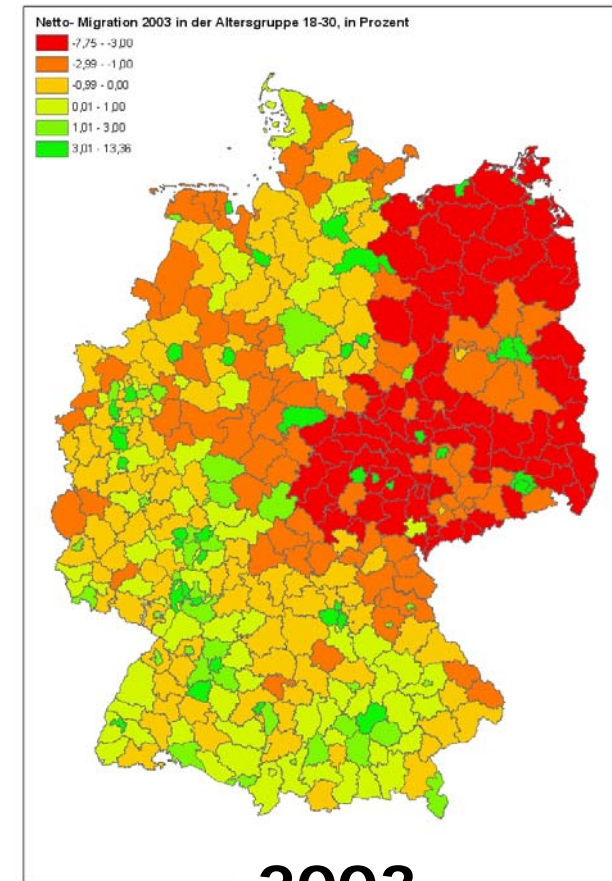
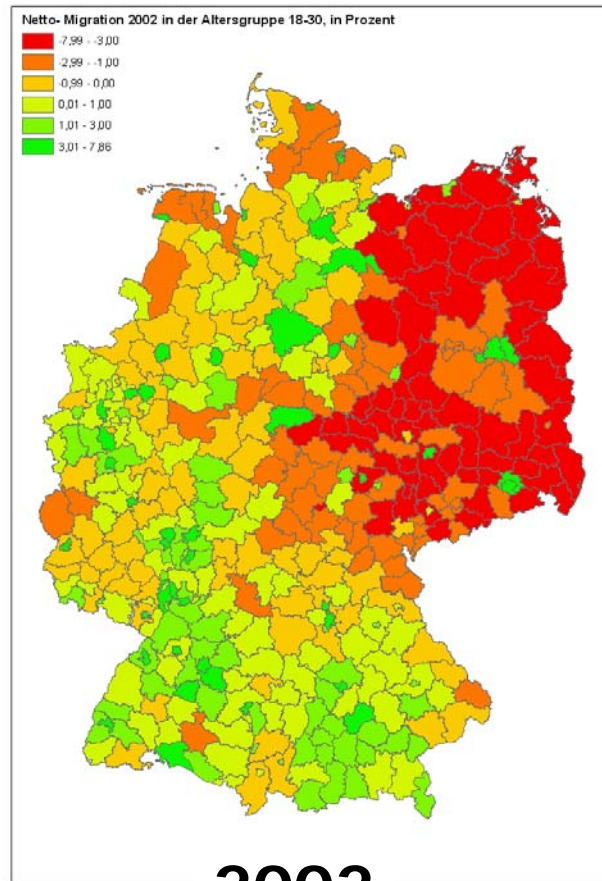


2001



2002

# $\sigma_t$ 18-29 years old: net migration

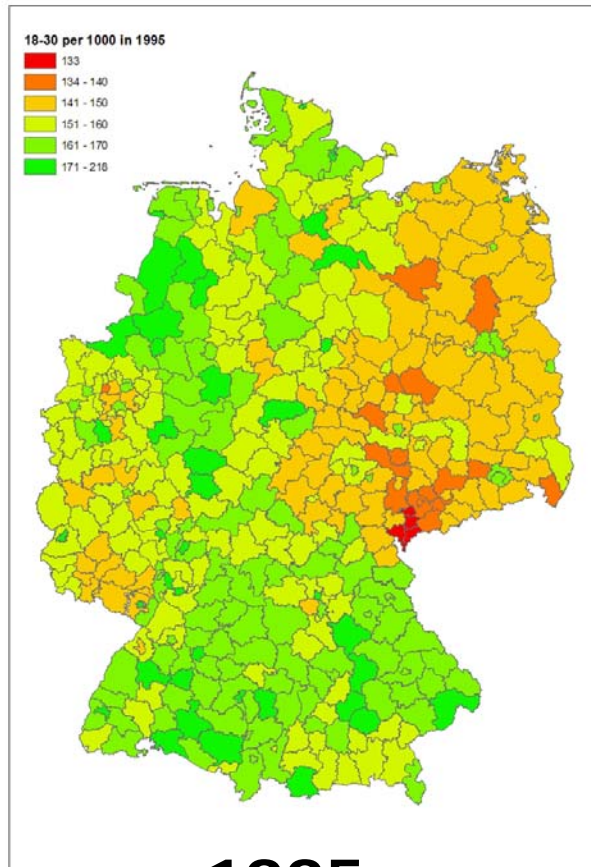


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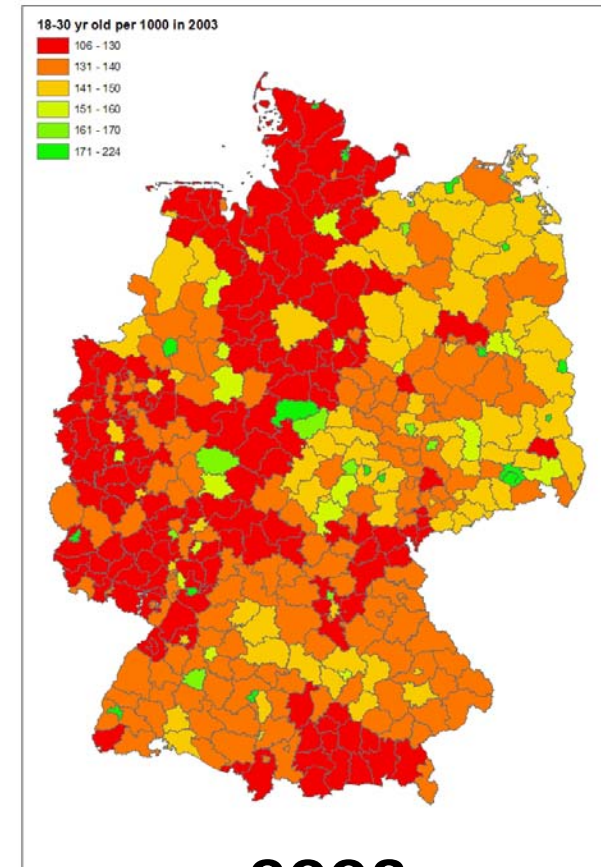


$\sigma_t$ 

# 18-30 years old: per 1000



1995

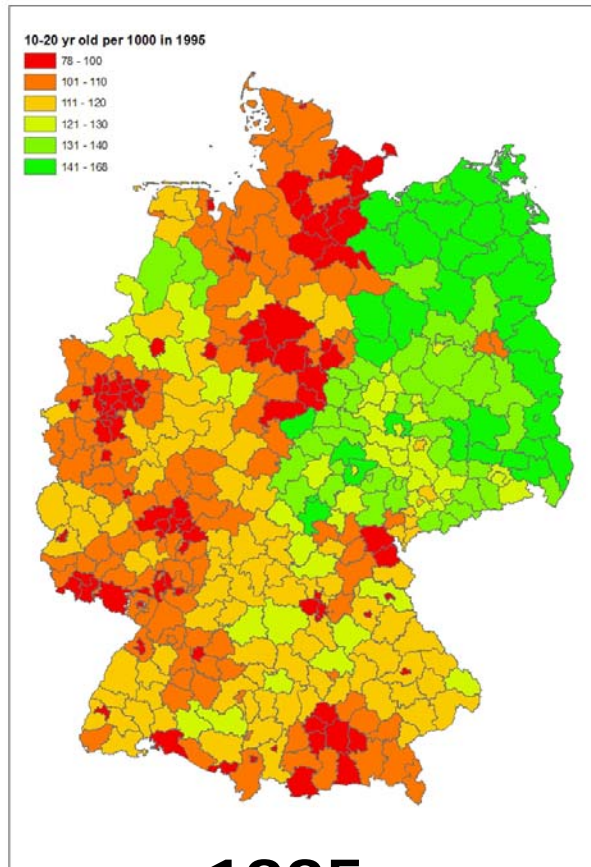


2003

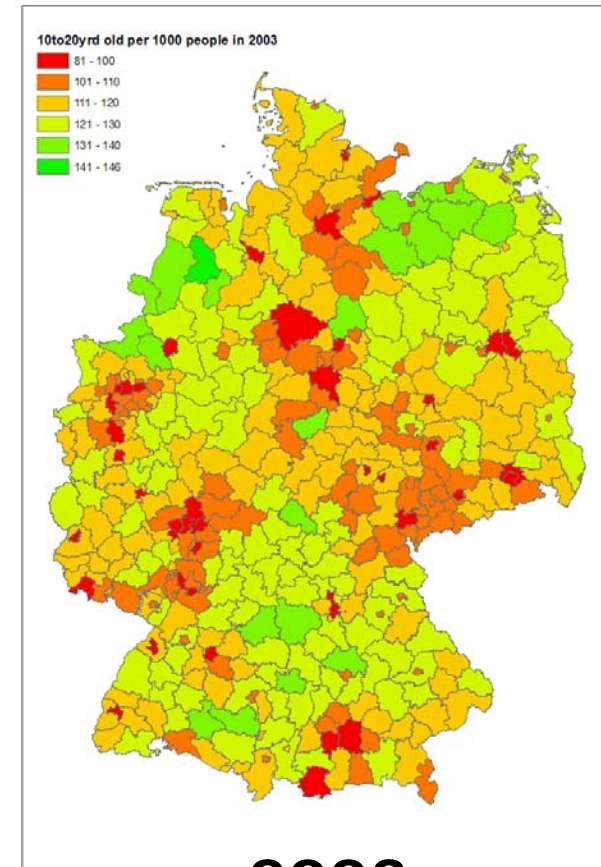
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Prof. **Harald Uhlig**, [uhlig@wiwi.hu-berlin.de](mailto:uhlig@wiwi.hu-berlin.de), [www.wiwi.hu-berlin.de/wpol/](http://www.wiwi.hu-berlin.de/wpol/)

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# 10-20 years old: per 1000



1995



2003

# $\sigma_t$ Ratio 18-30 in 03 to 10-20 in 95



## Analysis:

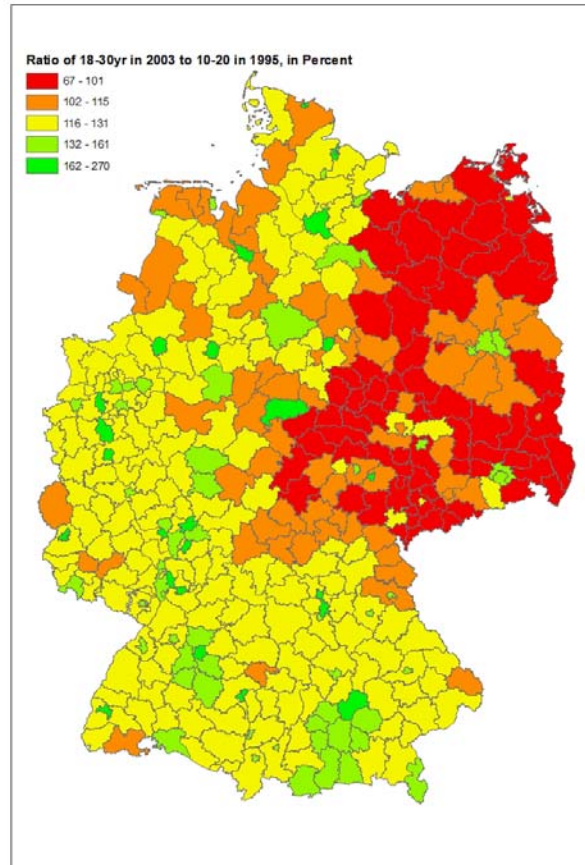
Ratio of  
18-30 in 2003 to  
10-20 in 1995

Red: low

Green: high

## Result:

Low in East  
Germany



$\sigma_t$

# Population Change 95-03



## Analysis:

Change in total  
Population 95-  
03.

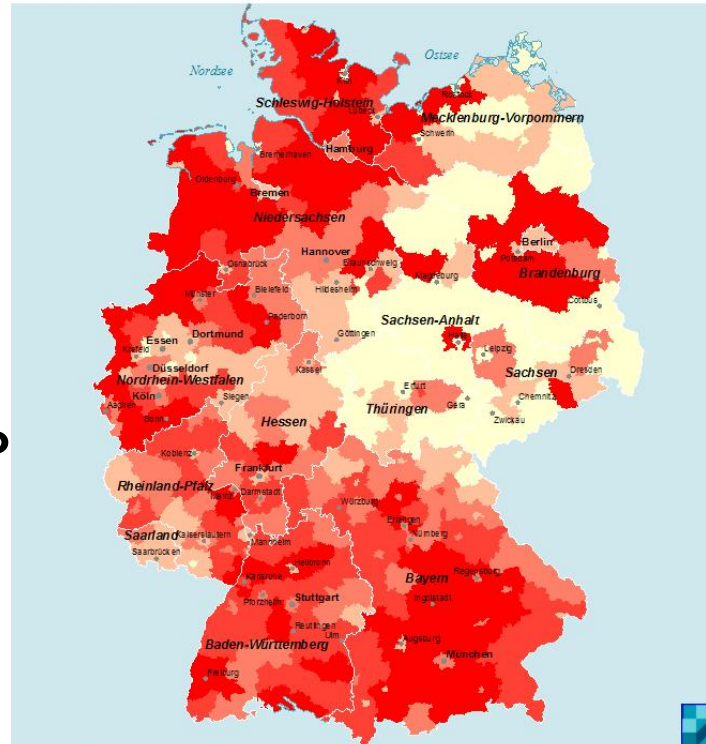
White: < -4.4%

Red: > +5%

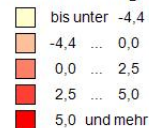
## Result:

Low in East  
Germany, except  
extended cities.

Bevölkerungsentwicklung



Entwicklung der Zahl der Einwohner in %



Kreise und kreisfreie Städte  
Zeitbezug 1995/2003  
Datengrundlage: Fortschreibung des  
Bevölkerungsstandes des Bundes und der  
Länder; Eurostat Regio Datenbank

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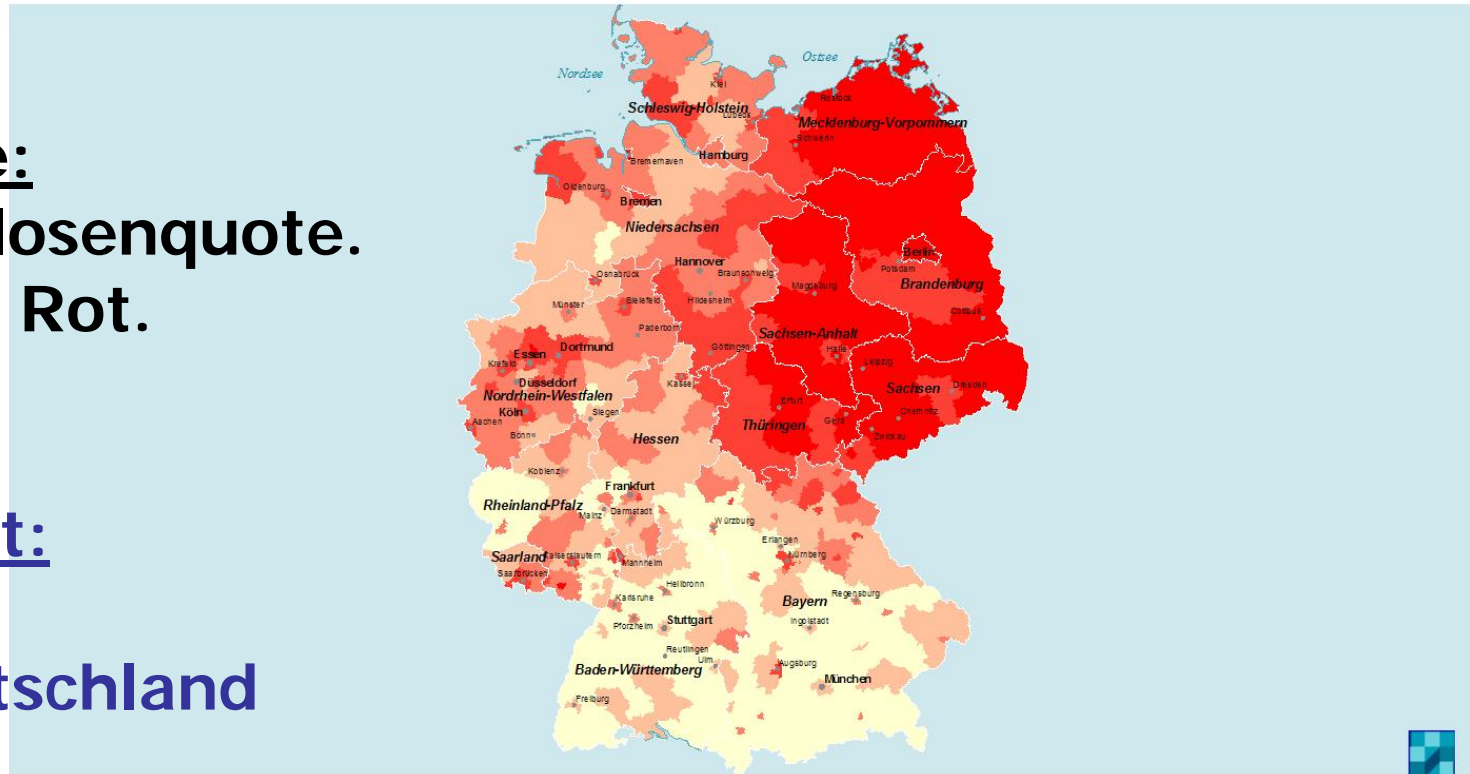
# St Myth and Facts about East and West



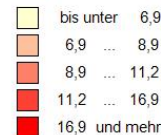
Arbeitslosenquote

**Analyse:**  
**Arbeitslosenquote.**  
**Hoch in Rot.**

**Resultat:**  
**Hoch in**  
**Ostdeutschland**



Anteil der Arbeitslosen an den Erwerbspersonen in %



Kreise und kreisfreie Städte  
Zeitbezug 2004  
Datengrundlage: Arbeitsmarktstatistik der Bundesagentur für Arbeit; Eurostat Regio  
Datenbank

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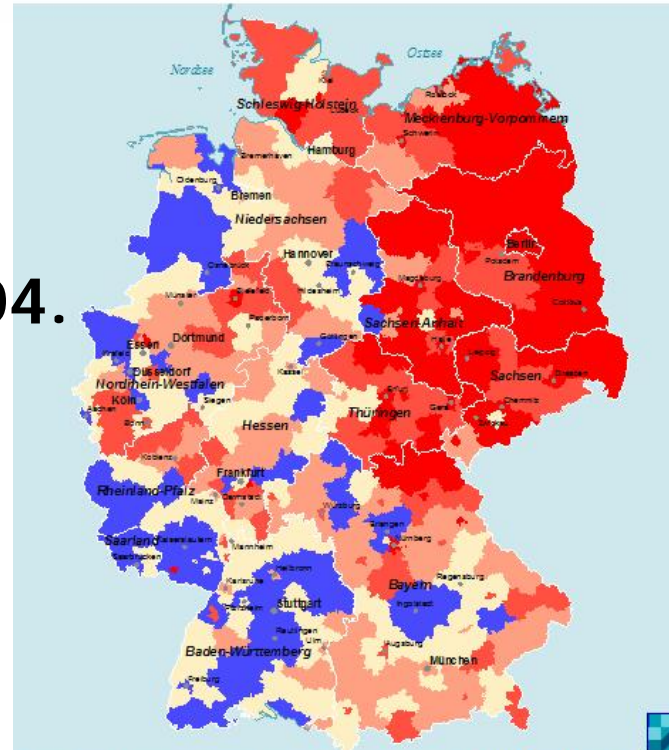
# St Myth and Facts about East and West



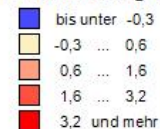
**Analyse:**  
**Arbeitslosen-**  
**entwicklung, 95-04.**  
**Steigend in Rot.**

**Resultat:**  
**Steigend in**  
**Ostdeutschland**

Arbeitslosenquote



Entwicklung der Arbeitslosenquote in %-Punkten



Kreise und kreisfreie Städte  
Zeitbezug 1995/2004  
Datengrundlage: Arbeitsmarktstatistik der  
Bundesagentur für Arbeit, Eurostat Regio  
Datenbank

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# St Myth and Facts about East and West



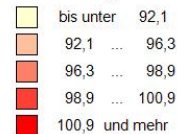
Ausbildungsplatzdichte

**Analyse:**  
**Ausbildungsplatz-**  
**Dichte.**  
**Hoch in Rot.**

**Resultat:**  
**Niedrig in**  
**Ostdeutschland**



Gesamtangebot an betrieblichen Ausbildungsplätzen je 100 Nachfrager



Kreise und kreisfreie Städte

Zeitbezug 2003

Datengrundlage: Berufsbildungsstatistik des Bundesinstituts für Berufsbildung

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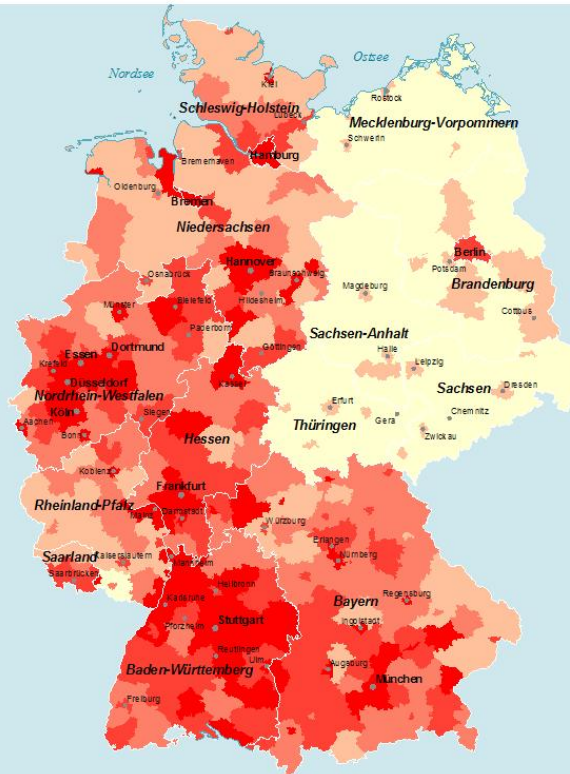
# St Myth and Facts about East and West



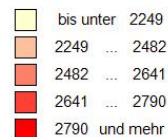
Arbeitnehmerentgelte

**Analyse:**  
**Arbeitnehmer-**  
**entgelte.**  
**Hoch in Rot.**

**Resultat:**  
**Niedrig in**  
**Ostdeutschland**



Arbeitnehmerentgelte je Arbeitnehmer in €



Kreise und kreisfreie Städte

Zeitbezug 2002

Datengrundlage: Erwerbstätigenrechnung des Bundes und der Länder

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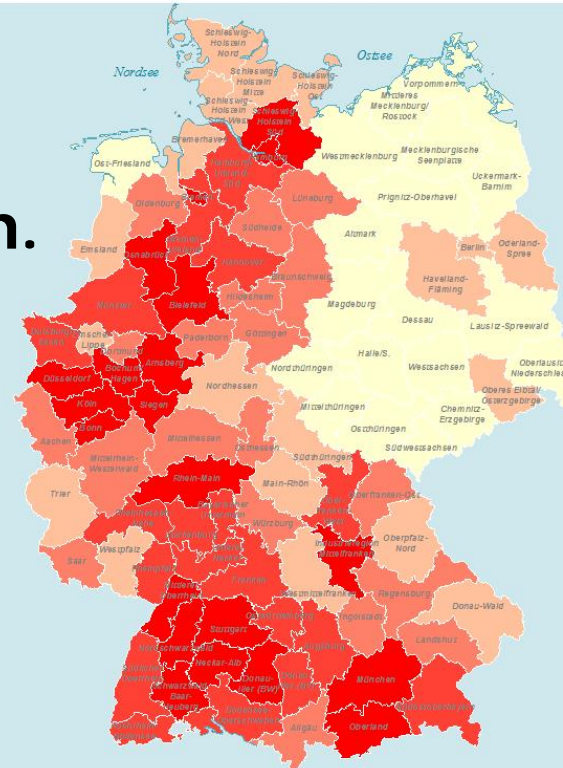
# St Myth and Facts about East and West



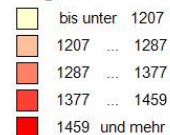
Haushaltseinkommen

**Analyse:**  
**Haushaltseinkommen.**  
**Hoch in Rot.**

**Resultat:**  
**Niedrig in**  
**Ostdeutschland**



Verfügbares Einkommen der Haushalte in € je Einwohner



Raumordnungsregionen  
Zeitbezug 2002  
Datengrundlage: Arbeitskreis Volkswirtschaftliche Gesamtrechnung der Länder

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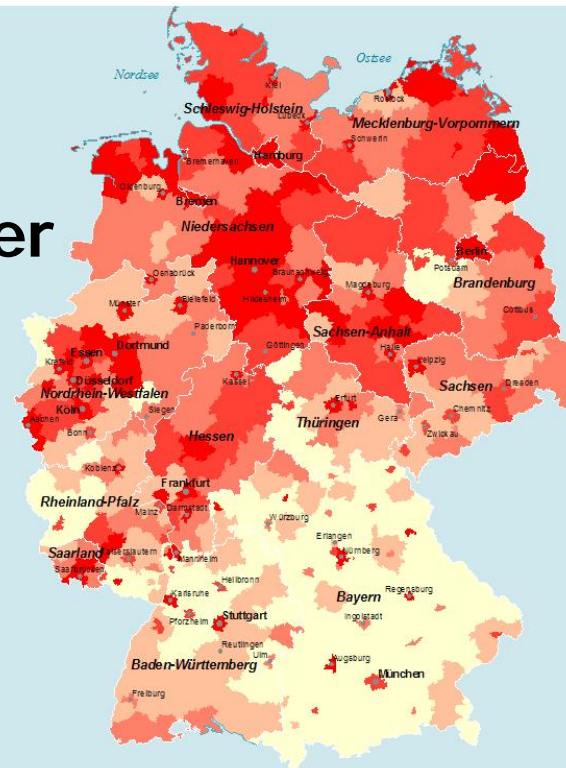
# St Myth and Facts about East and West



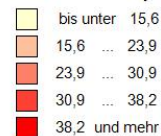
Sozialhilfeempfänger

**Analyse:**  
**Sozialhilfe- Empfänger**  
**2003.**  
**Hoher Anteil in Rot.**

**Resultat:**  
**Ostdeutschland =**  
**Norddeutschland.**



Sozialhilfeempfänger je 1.000 Einwohner



Kreise und kreisfreie Städte

Zeitbezug 2003

Datengrundlage: Sozialhilfestatistik des Bundes und der Länder

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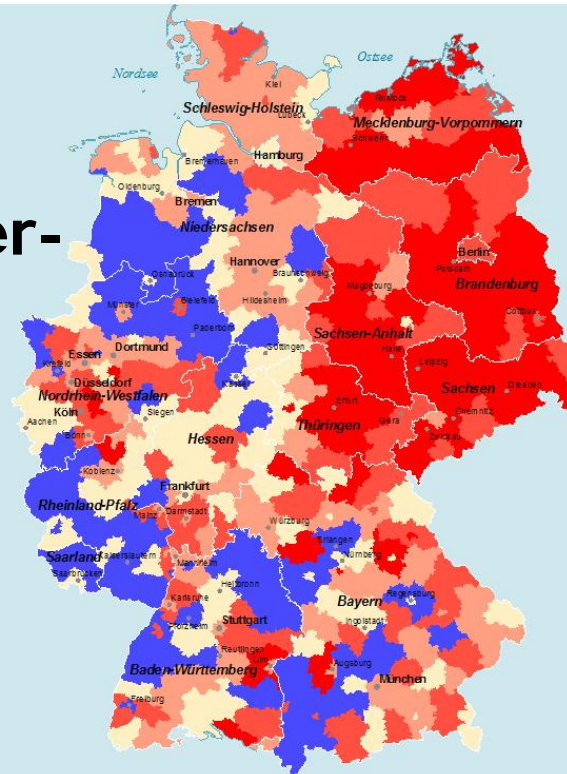
# St Myth and Facts about East and West



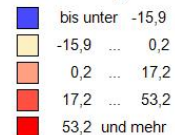
Sozialhilfeempfänger

**Analyse:**  
**Sozialhilfe-Empfänger-**  
**Entwicklung.**  
**Mehr: in Rot.**

**Resultat:**  
**Mehr in**  
**Ostdeutschland**



Entwicklung der Zahl der Sozialhilfeempfänger in %



Kreise und kreisfreie Städte  
Zeitbezug 1995/2003  
Datengrundlage: Sozialhilfestatistik des Bundes und der Länder

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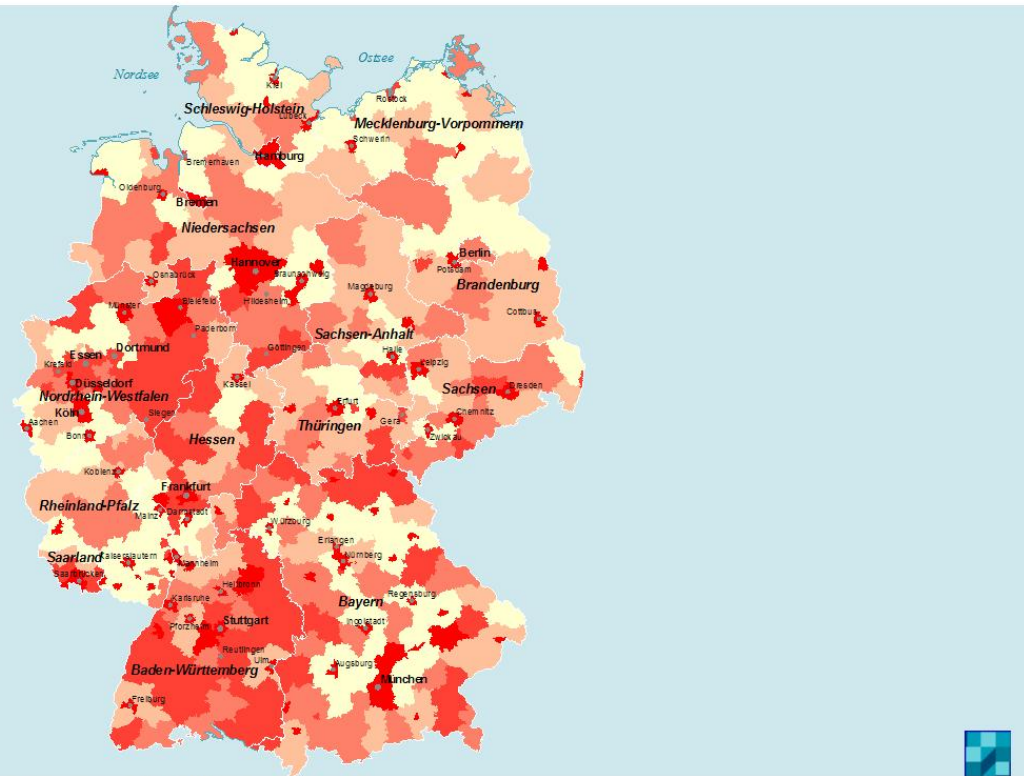
# St Myth and Facts about East and West



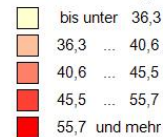
Beschäftigtenquote

**Analyse:**  
**Beschäftigten-Quote**  
**2003.**  
**Hoch in Rot.**

**Resultat:**  
**Etwas niedriger in**  
**Ostdeutschland**



SV Beschäftigte je 100 Einwohner im erwerbsfähigen Alter



Kreise und kreisfreie Städte  
Zeitbezug 2003

Datengrundlage: Beschäftigtenstatistik der Bundesagentur für Arbeit

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Prof. **Harald Uhlig**, [uhlig@wiwi.hu-berlin.de](mailto:uhlig@wiwi.hu-berlin.de), [www.wiwi.hu-berlin.de/wpol/](http://www.wiwi.hu-berlin.de/wpol/)

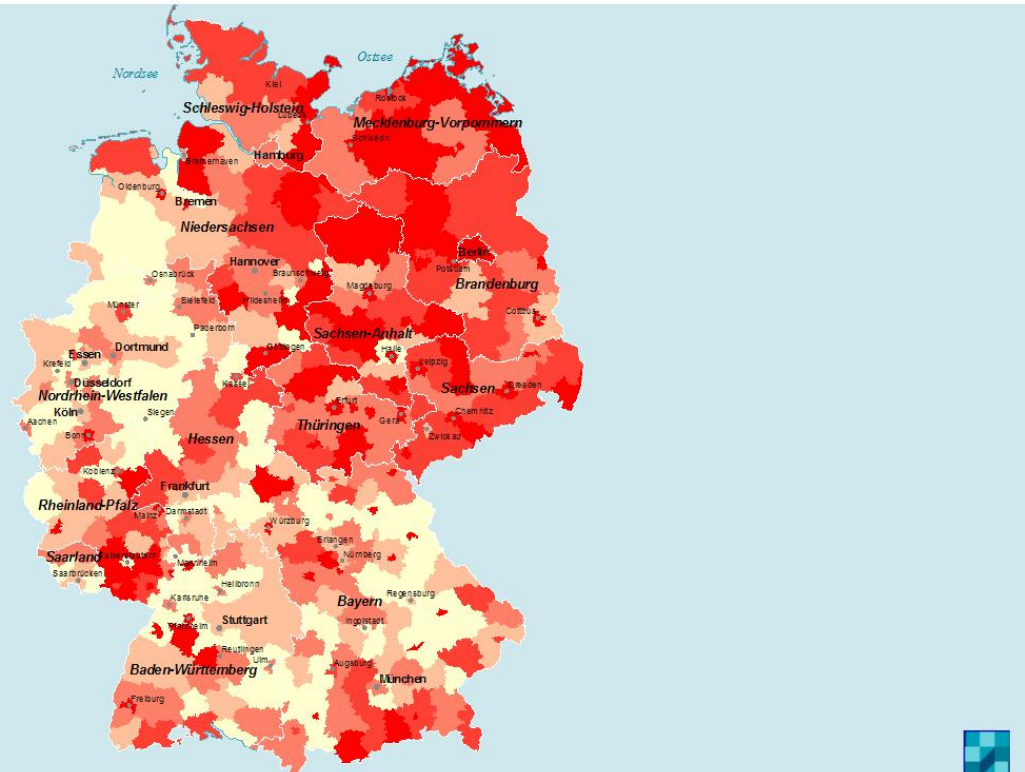
# St Myth and Facts about East and West



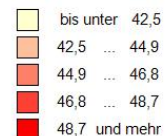
Anteil weibliche Beschäftigte

**Analyse:**  
Anteil weibliche  
Beschäftigte.  
Hoher Anteil in Rot.

**Resultat:**  
Hoch in  
Ostdeutschland



Anteil der weiblichen SV Beschäftigten an den SV Beschäftigten in %



Kreise und kreisfreie Städte  
Zeitbezug 2003  
Datengrundlage: Beschäftigtenstatistik der Bundesagentur für Arbeit

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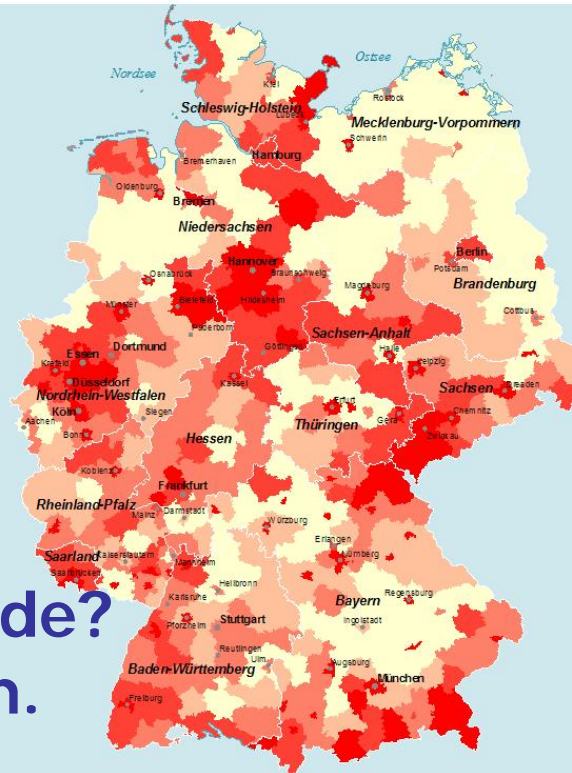
# St Myth and Facts about East and West



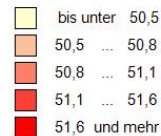
Frauenanteil

**Analyse:**  
**Frauenanteil.**  
**Rot: > 51.6,**  
**Weiß: < 50.5**

**Resultat:**  
**Ost-West-Unterschiede?**  
**Land vs. Stadt? Kaum.**



Anteil der Frauen an den Einwohnern in %



Kreise und kreisfreie Städte

Zeitbezug 2003

Datengrundlage: Fortschreibung des Bevölkerungsstandes des Bundes und der Länder; Eurostat Regio Datenbank

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# $\sigma_t$ Myth and Facts about East and West



## Analyse:

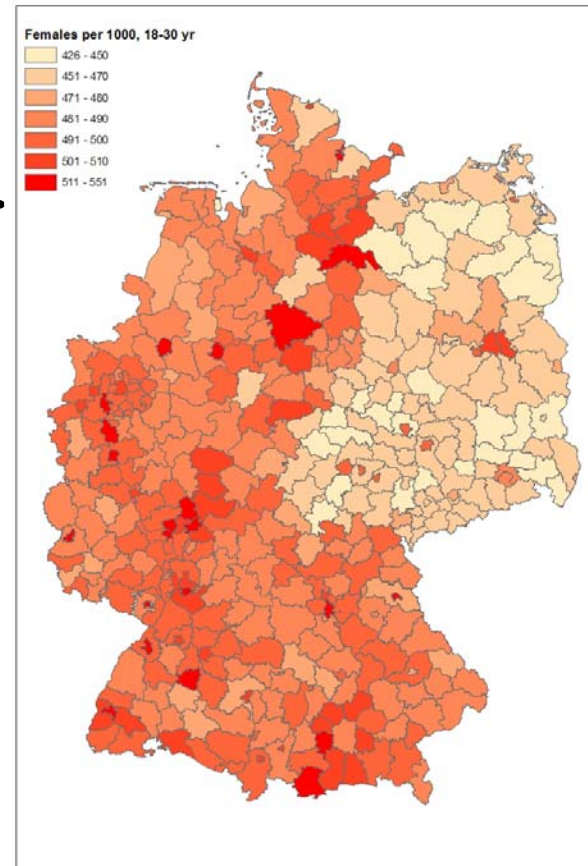
Frauenanteil, 18-30.

Weiß: 42%-45%

Hell: 45%-47%

## Resultat:

Großes Ost-West  
Gefälle. Junge  
Frauen sind im  
Westen/Städten.



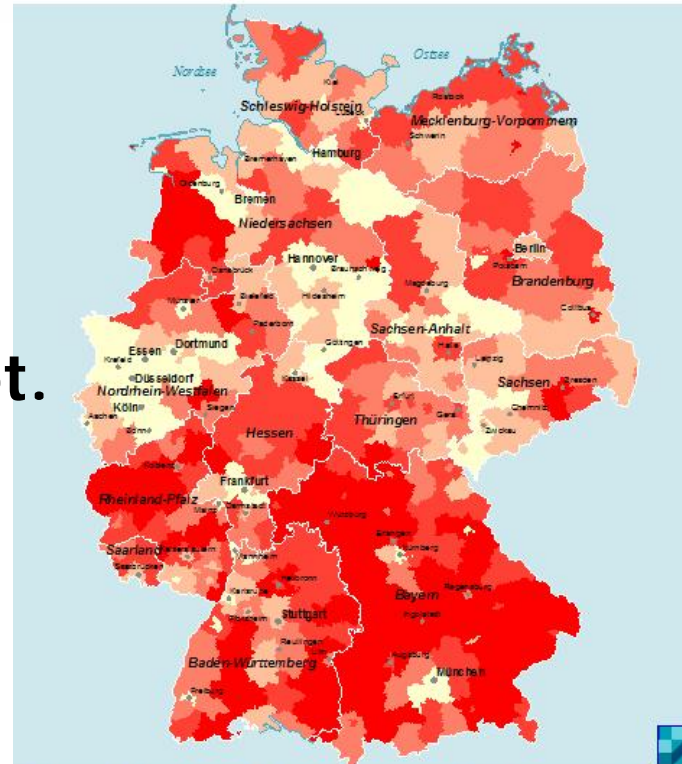
# St Myth and Facts about East and West



**Analyse:**  
**Anteil jüngere**  
**Arbeitslose.**  
**Hoher Anteil in Rot.**

**Resultat:**  
**Nicht hoch in**  
**Ostdeutschland**

Anteil jüngere Arbeitslose



Anteil der Arbeitslosen unter 25 Jahre an den Arbeitslosen in %



Kreise und kreisfreie Städte  
Zeitbezug 2004  
Datengrundlage: Arbeitsmarktstatistik der  
Bundesagentur für Arbeit

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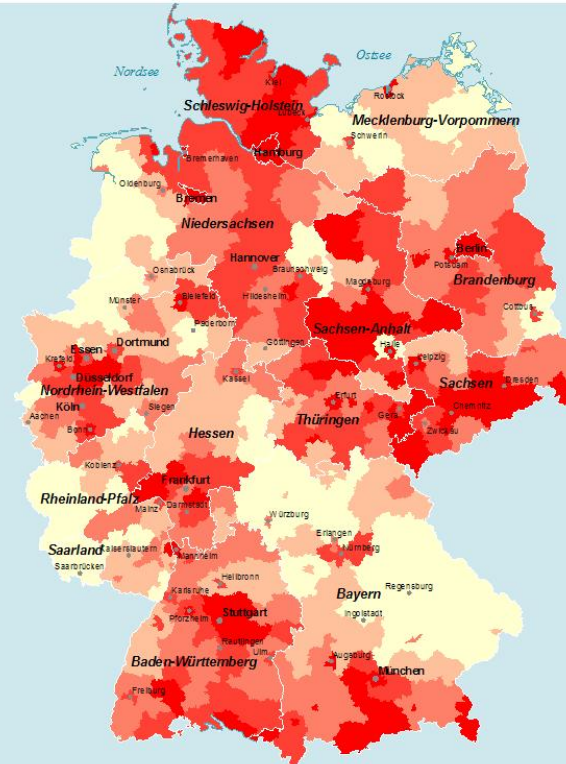
# St Myth and Facts about East and West



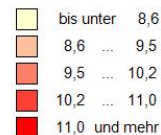
Anteil ältere Beschäftigte

**Analyse:**  
**Ältere Beschäftigte.**  
**Hoher Anteil in Rot.**

**Resultat:**  
**Eher hoch in**  
**Ostdeutschland**



Anteil der SV Beschäftigten 55 Jahre und älter an den SV Beschäftigten in %



Kreise und kreisfreie Städte  
Zeitbezug 2003

Datengrundlage: Beschäftigtenstatistik der Bundesagentur für Arbeit

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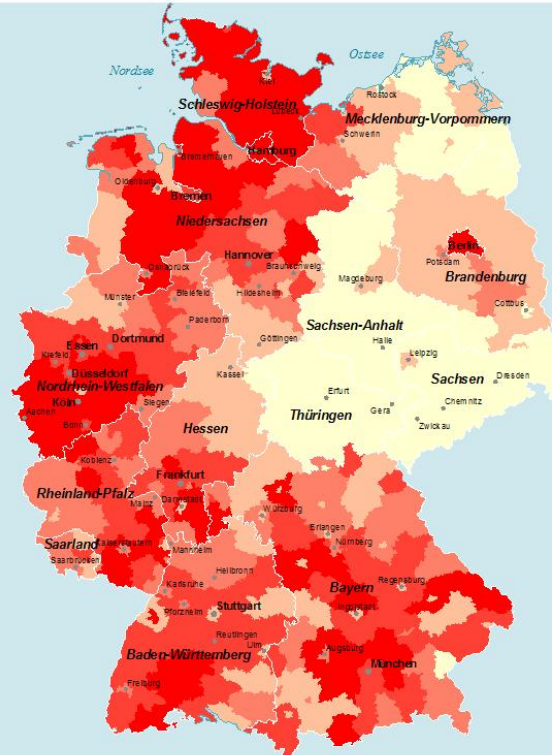
# St Myth and Facts about East and West



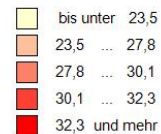
Anteil gering qualifizierte Beschäftigte

**Analyse:**  
**Gering Qualifizierte.**  
**Hoher Anteil in Rot.**

**Resultat:**  
**Niedrig in**  
**Ostdeutschland**



Anteil der SV Beschäftigten mit geringer Qualifikation an den SV Beschäftigten in %



Kreise und kreisfreie Städte

Zeitbezug 2003

Datengrundlage: Beschäftigtenstatistik der Bundesagentur für Arbeit

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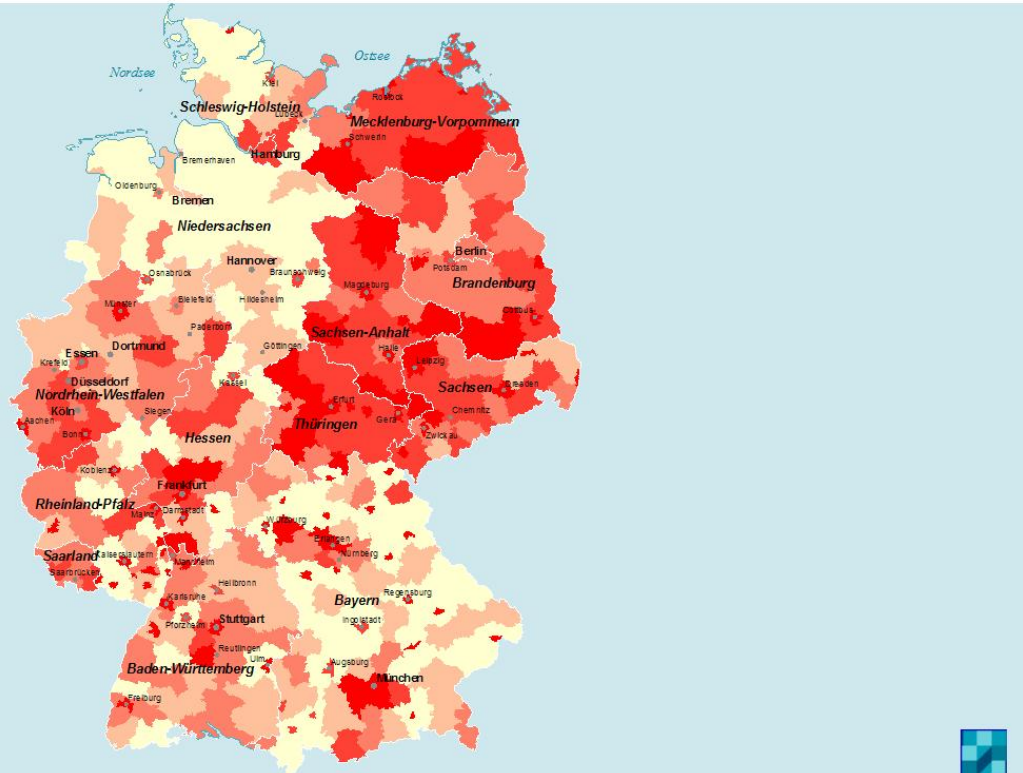
# St Myth and Facts about East and West



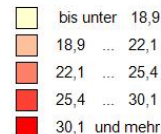
Gymnasiasten

**Analyse:**  
**Gymnasiasten.**  
**Hoch in Rot.**

**Resultat:**  
**Hoch in**  
**Ostdeutschland**



Anteil der Schüler an Gymnasien an den Schülern in %



Kreise und kreisfreie Städte  
Zeitbezug 2003  
Datengrundlage: Statistik der allgemeinbildenden Schulen des Bundes und der Länder

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$\sigma_t$



# A model.

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## ■ Question:

- Why do young workers emigrate?
- Or: how come, their job finding rates and productivity improve by moving (or commuting) west?
- Or: why is not cheaper to move firms east?

## ■ Answer:

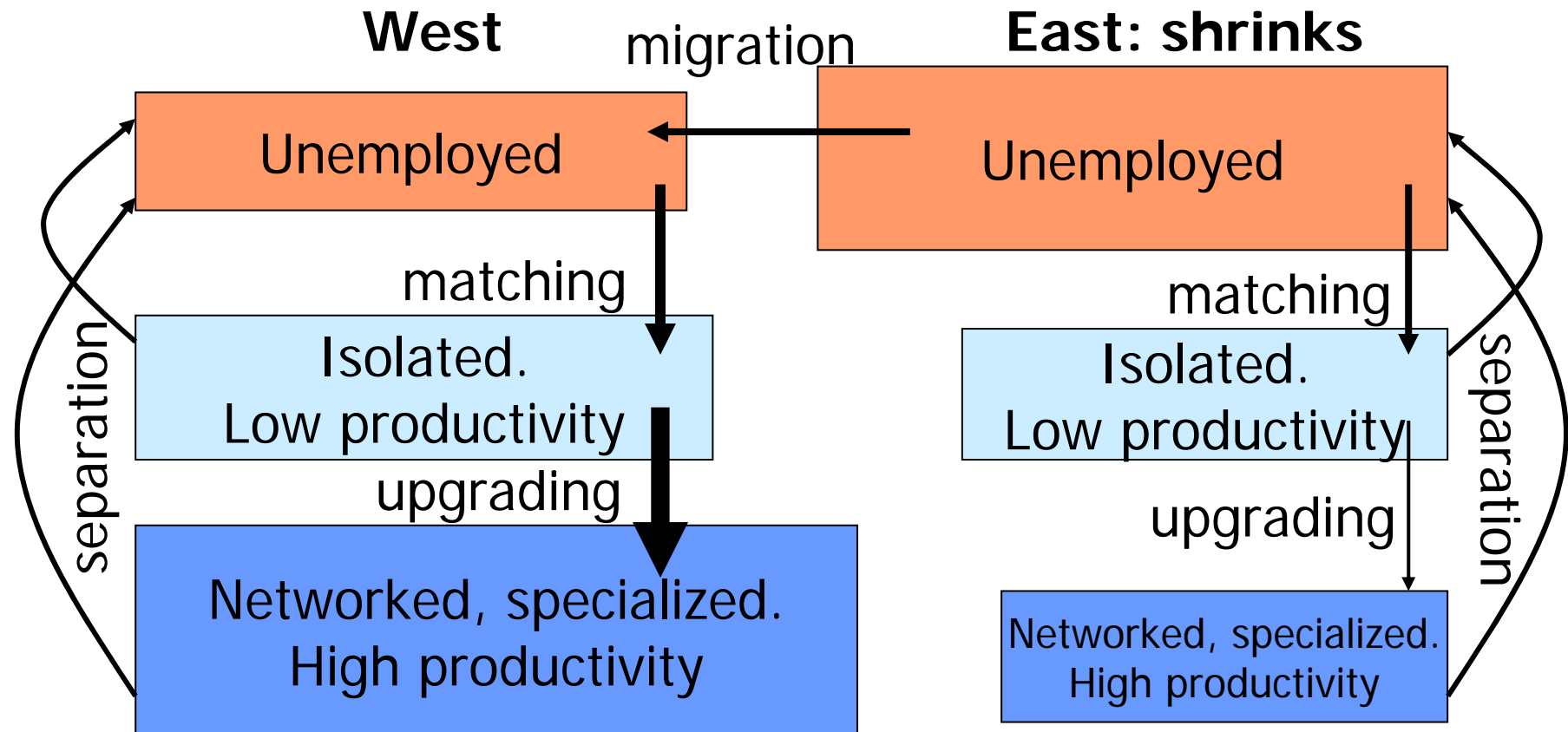
- The absence of network externalities between firms keeps productivity low in the East.
- The option of migration keeps threshold wages and unemployment high.

## ■ Analysis: A model of regional labor markets, network externalities and migration.



# A model. SFB649-DP 2006-04. AER 2006 Papers&Proc.

Start with a standard search-matching model, and extend:



## Why?

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- East and West Germany: “sudden unification”. Not many decades of “drifting apart” as US, Japan, Europe, which Barro used for comparison.
- Same laws, same language. For 18-29: same education.
- Why do firms not go East? Cheaper real estate, ...
- It could be people. Human capital? Signaling?
- It could be firms. **Network externalities.**

## The idea

- Two regions (East, West), unemployment higher in the East. Allow for migration.
- Standard labor search model: high unemployment triggers higher vacancy creation, eliminating the difference...
- ... unless workers in the East are less productive. But then, how come they migrate?
- So: firms in the East must be less productive. But “blue prints” etc. can easily be carried to the East.
- Network externalities: local. Firms join together, specializing on services and goods provided to each other. Local.

## A model

- A model of labor search, migration and network externalities.
- Partial equilibrium for “one Kreis” or “one region”. Easy to turn into two-region or multi-region model.
- Building on benchmark labor search model, Rogerson-Shimer-Wright (2005) ...
- ... allowing for migration and network externalities of firms.



## Labor Market.

- Discount rate  $r$ . Risk neutrality.
- Free entry of firms. Posting vacancy at flow cost  $rk$ .
- Matching function  $m(u, v)$ , constant ret. to scale. Matching rate  $\alpha_w (v/u)$  for workers (increasing), and  $\alpha_e = \alpha_e (v/u) = \alpha_w (v/u) / (v/u)$  for firms (decreasing).
- Exogenous separation rate  $\lambda$ .
- Nash bargaining  $\rightarrow$  Surplus sharing. Surplus  $S = S_m$  or  $S = S_n$ . Workers get  $\theta S$ .

## Migration.

- Value of being unemployed:  $U$ .
- Option of leaving at disutility  $\kappa$  and becoming unemployed at value  $\bar{U}$  in destination region (“West Germany”).
- A new  $\kappa$  from some distribution  $F(\kappa)$  is drawn with instantaneous probability  $\phi dt$ .
- Leave, if  $\kappa \leq \kappa^* = \bar{U} - U$ .
- Employed workers might leave too, if differences are large enough. I ignore that possibility.

## Network Externalities.

- Firm-worker pairs: can produce in isolation, as a single match:  $y_m$  or in a network,  $y_n > y_m$ .
- Firm-worker pairs start outside network. Instantaneous probability  $\nu dt$  of joining a network. I assume  $\nu = \nu(m/n)$ , where  $m$  is mass of non-networked pairs,  $n$  the mass of networked pairs.
- Larger networks better:  $\nu$  decreasing. For simplicity:  $\nu = \nu_h > 0$  for  $m_t/n_t \leq \psi$  and  $0 \leq \nu = \nu_l < \nu_h$  for  $m/n > \psi$  and some value  $\psi > 0$ , satisfying

$$\nu_l \psi < \lambda < \nu_h \psi \quad (1)$$

## Analysis 1. Value functions.

- Value of being unemployed:

$$rU = b + \phi\chi(\kappa^*) + \alpha_w\theta S_m \quad (2)$$

where  $\chi(\kappa^*)$  reflects migration option:

$$\begin{aligned}\chi(\kappa^*) &= F(\kappa^*) (\bar{U} - U - E[\kappa \mid \kappa \leq \kappa^*]) \\ &= \int_0^{\kappa^*} F(\kappa) d\kappa\end{aligned}$$

- Option value of migration is like increasing unemployment benefits from  $b$  to  $\tilde{b} = b + \phi\chi(\kappa^*)$

## Analysis 2. Value functions.

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- Surplus:

$$\begin{aligned}(r + \lambda + \nu)S_m &= y_m - rU + \nu S_n \\ (r + \lambda)S_n &= y_n - rU\end{aligned}$$

or

$$(r + \lambda)S_m = \tilde{y} - rU \quad (3)$$

where

$$\tilde{y} = \tilde{y}(\nu) = y_m + \frac{\nu}{r + \lambda + \nu}(y_n - y_m) \quad (4)$$

## Analysis 3. Value functions.

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- Higher networking rate  $\nu$  or higher networked productivity  $S_n$  increases surplus, even when not networked yet. Option value of becoming networked.
- Vacancy creation:

$$k = \alpha_e(1 - \theta)S_m \quad (5)$$

## Analysis 4 / Result 1. Demand and Supply.

- Together:

$$\frac{r + \lambda + \alpha_w \theta}{(1 - \theta) \alpha_e} = \frac{\tilde{y} - \tilde{b}}{k} \quad (6)$$

- Standard equation, except that  $y$  and  $b$  have been replaced by  $\tilde{y}$  and  $\tilde{b}$ .
- Fixed point problem: given  $\kappa^*$ , calculate  $\tilde{b}$ . Solve for  $v/u$  from (6). Calculate  $U$  and thus  $\kappa^* = \bar{U} - U$ .
- Unique solution for  $\phi = 0$  (no migration). Implicit function theorem  $\rightarrow$  unique solution as a differentiable function of  $\phi$ .
- Low  $\eta \rightarrow$  low  $\tilde{y} \rightarrow$  low  $v/u \rightarrow$  high migration  $\kappa^*$ .

## Migration option increases unemployment!

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- Baseline intuition: the possibility to migrate should decrease unemployment: unemployed workers can leave.
- Here: **option** to migrate “adds” to the benefit level  $b$  of being unemployed, thus increasing the value of being unemployed. This discourages job creation, and increases unemployment.



## Analysis 6. Flows.

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- $u_t$ : unemployed.  $m_t$ : employed, but not networked.  $n_t$ : networked.

$$\dot{u}_t = -(\phi F(\kappa_t^*) + \alpha_{w,t})u_t + \lambda(m_t + n_t)$$

$$\dot{m}_t = \alpha_{w,t}u_t - (\nu + \lambda)m_t$$

$$\dot{n}_t = \nu m_t - \lambda n_t$$

I am ignoring inflow of immigrants.

## Analysis 7. Flows.

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- Population:

$$\pi_t = u_t + m_t + n_t$$

shrinks, due to migration.

- Define shares in population,

$$\tilde{u}_t = \frac{u_t}{\pi_t}, \quad \tilde{m}_t = \frac{m_t}{\pi_t}, \quad \tilde{n}_t = \frac{n_t}{\pi_t}$$

## Analysis 8. Steady state.

- Steady state:

$$\frac{\dot{\pi}_t}{\pi_t} = -\phi F(\kappa^*) \tilde{u} \quad (7)$$

$$\tilde{u} \alpha_w = (1 - \tilde{u})(\lambda - \phi F(\kappa^*) \tilde{u}) \quad (8)$$

$$\nu \tilde{m} = (\lambda - \phi F(\kappa^*) \tilde{u}) \tilde{n} \quad (9)$$

$$1 = \tilde{u} + \tilde{m} + \tilde{n} \quad (10)$$

- Given  $\alpha_w$ , (8) is quadratic in  $\tilde{u}$ . One arm converges to standard solution  $\tilde{u} = \frac{\lambda}{\lambda + \alpha_w}$  for  $\phi \rightarrow 0$ . Now, (9) and (10) are linear in  $\tilde{m}$  and  $\tilde{n}$ .

## Analysis 9 / Result 2: networking rate $\eta$ .

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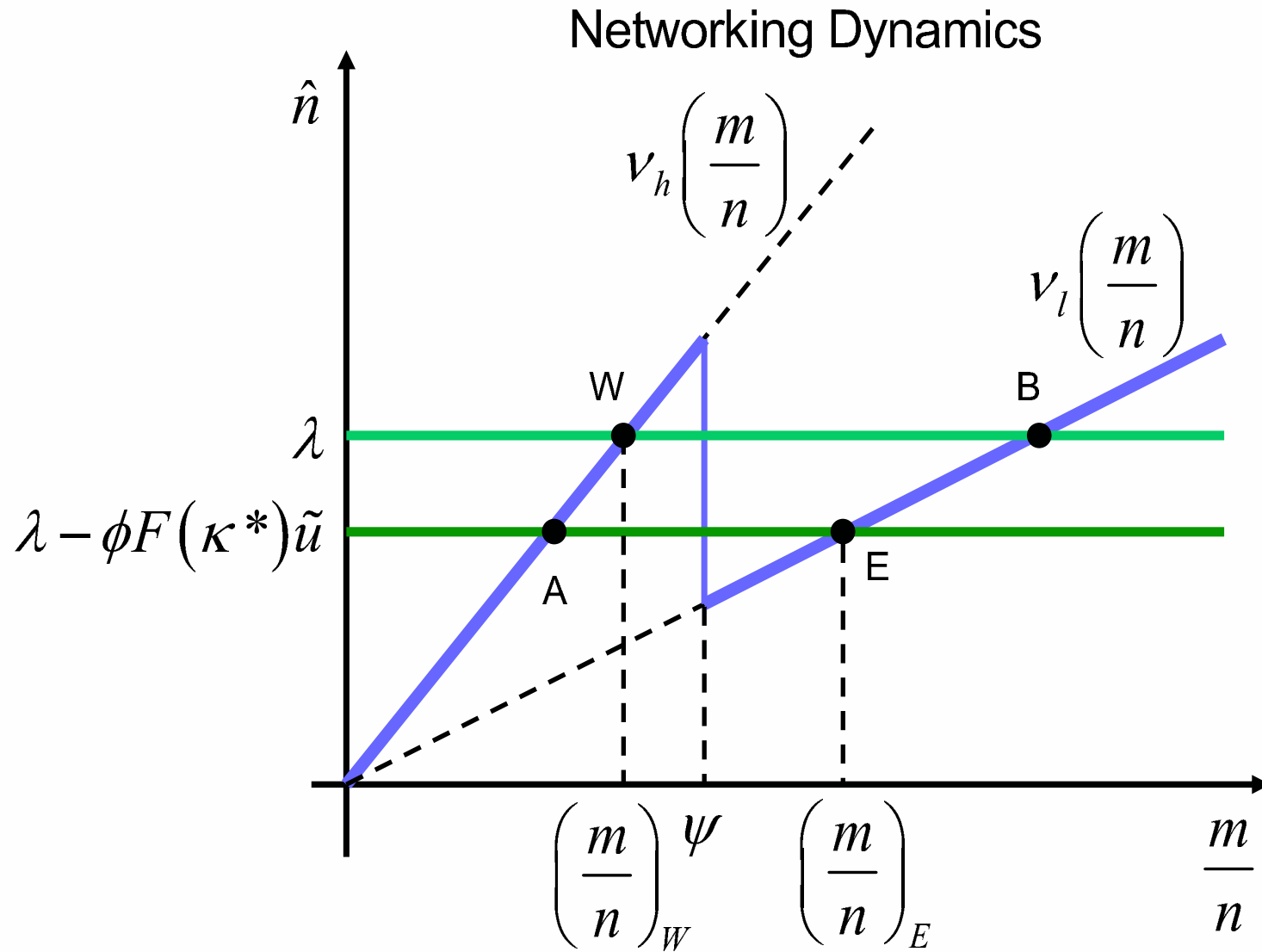
- Let  $\hat{n}_t = (d\tilde{n}_t/dt)/\tilde{n}_t$  be the rate of change in  $\tilde{n}_t$ .
- Dynamics:

$$\hat{n}_t = \nu \frac{m_t}{n_t} - (\lambda - \phi F(\kappa^*) \tilde{u}) \quad (11)$$

Steady state:  $\hat{n}_t = 0$ .

- Two equilibria:
  1. highly networked,  $\nu = \nu_h$ .
  2. weakly networked,  $\nu = \nu_l$ .

# Two equilibria



## Interpretation.

- Highly networked equilibrium: West Germany, industrial core areas, large cities. Provides benchmark  $\bar{U}$  in multiregion version of the model. No emigration,  $\kappa^* = 0$ .
- Weakly networked equilibrium: East Germany, dying region, wasteland. Higher unemployment, persistent emigration,  $\kappa^* > 0$ .
- Remark: weakly networked equilibrium may disappear with too much emigration. Reason: too few new firms, compared to existing, networked firms. Likewise, highly networked equilibrium may disappear with too much immigration.

## Policy

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- No obviously sensible policy recommendations. Need to understand the emergence of industry networks better. Structural policies may help, but the large fiscal transfers from the west to the east during the last 15 years make it doubtful, that government aid can help.

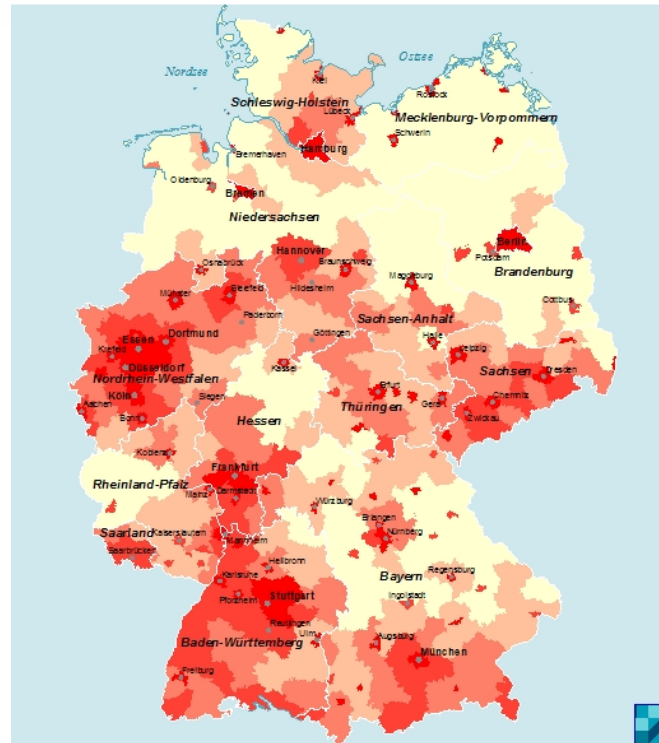
# $\sigma_t$ The Slow Death of East Germany



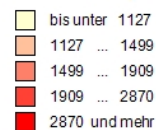
**Analyse:**  
**Siedlungsdichte.**  
**Hoch in Rot.**

**Resultat:**  
**Niedrig in**  
**Ostdeutschland.**

Siedlungsdichte



Einwohner je km<sup>2</sup> Siedlungs- und Verkehrsfläche



Kreise und kreisfreie Städte  
Zeitbezug 2000  
Datengrundlage: Flächenerhebung nach  
Art der tatsächlichen Nutzung des Bundes  
und der Länder

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# $\sigma_t$ The Slow Death of East Germany



## Conclusion:

- Labor markets are worsening in East Germany.
- Outward migration of young population is high and persistent.
- Crucial network externalities of firms are missing.
- East Germany is slowly dying.