

daten als entscheidender faktor

stefan thurner



MEDICAL UNIVERSITY
OF VIENNA



COMPLEXITY
SCIENCE
HUB
VIENNA



SANTA FE INSTITUTE



IIASA

globale urbanisierungsrate

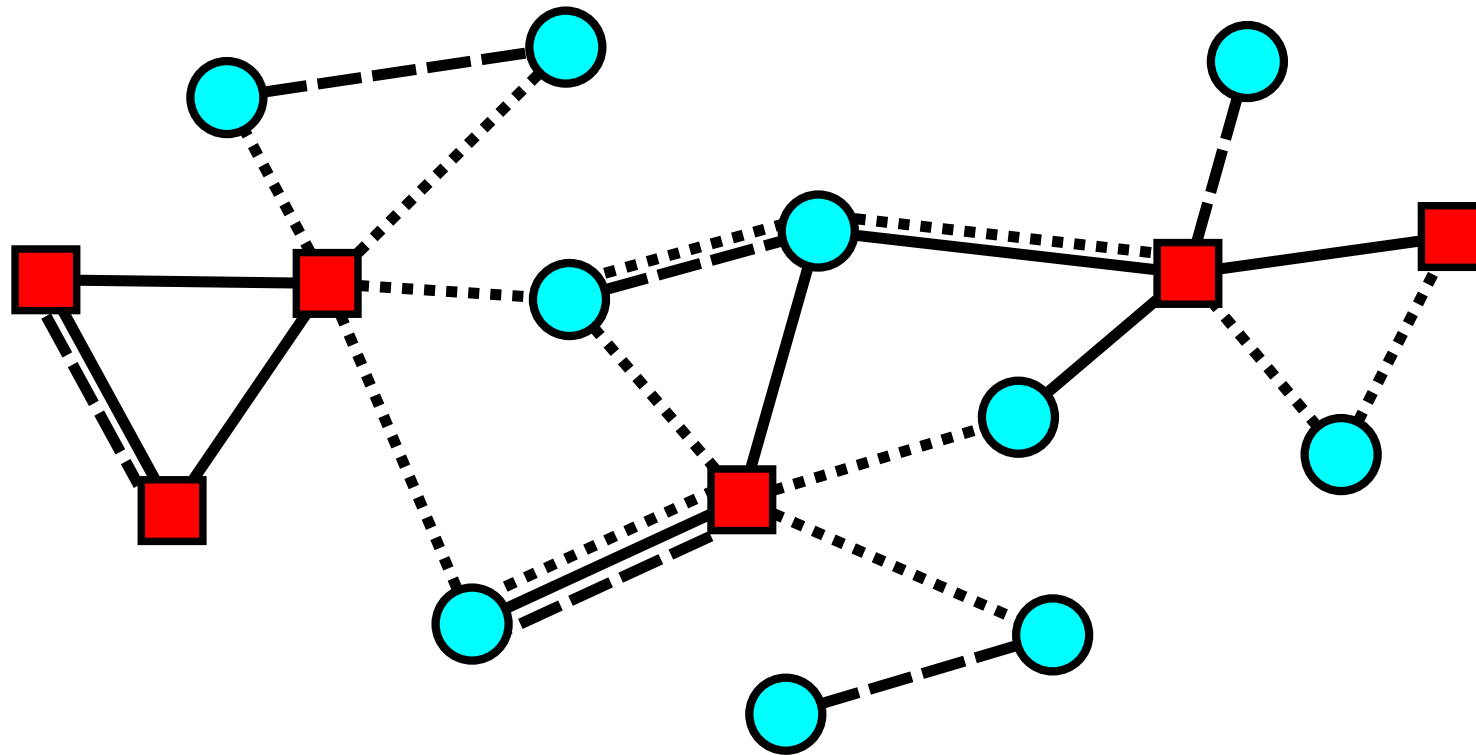
1900: 2%

2050: 80%

→ 30-50 megastädte

planen oder “werden lassen” ?

kann man komplexe systeme planen?



- nodes i characterized by states, $\sigma_i^\beta(t)$
- links multiplex network, $M_{ij}^\alpha(t)$

wer was planen will — braucht fähigkeiten

daten sinnvoll erfassen und zusammenführen

daten zur verfügung stellen

daten in modelle einfließen lassen

modelle bauen und interpretieren können

planen heisst ...

... digitale kopie einer komplexen wirklichkeit machen

komplexe systeme kollabieren

komplexe systeme sind intrinsisch instabil

statistik der komplexen systeme sind **potenz gesetze**

viele grosse outlier – outliers sind normal

→ non-managable

wesentliche aufgabe von planung

vermeidung von katastrophen

schaffen von resilienz

atter

systeme werden komplexer

städte

wirtschaft

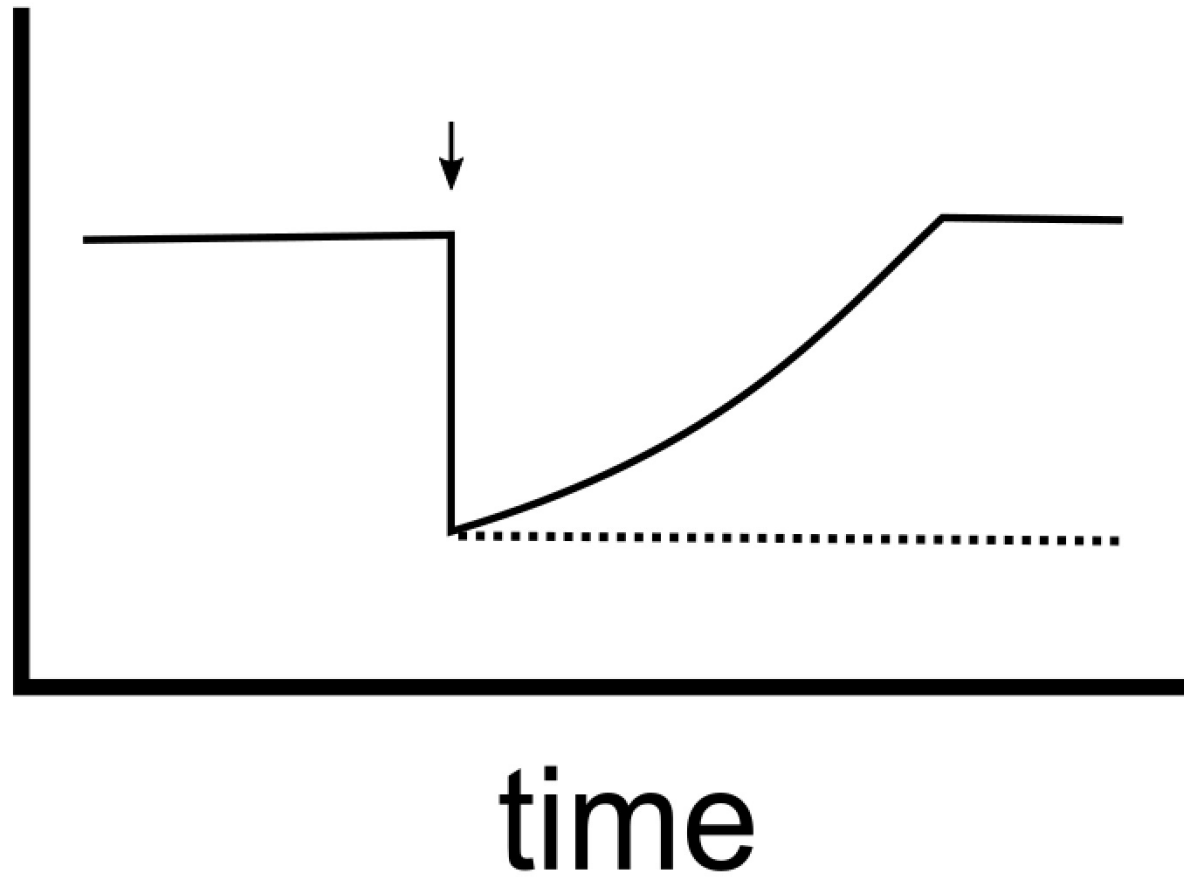
gesundheitssysteme

kommunikation und soziale interaktionen

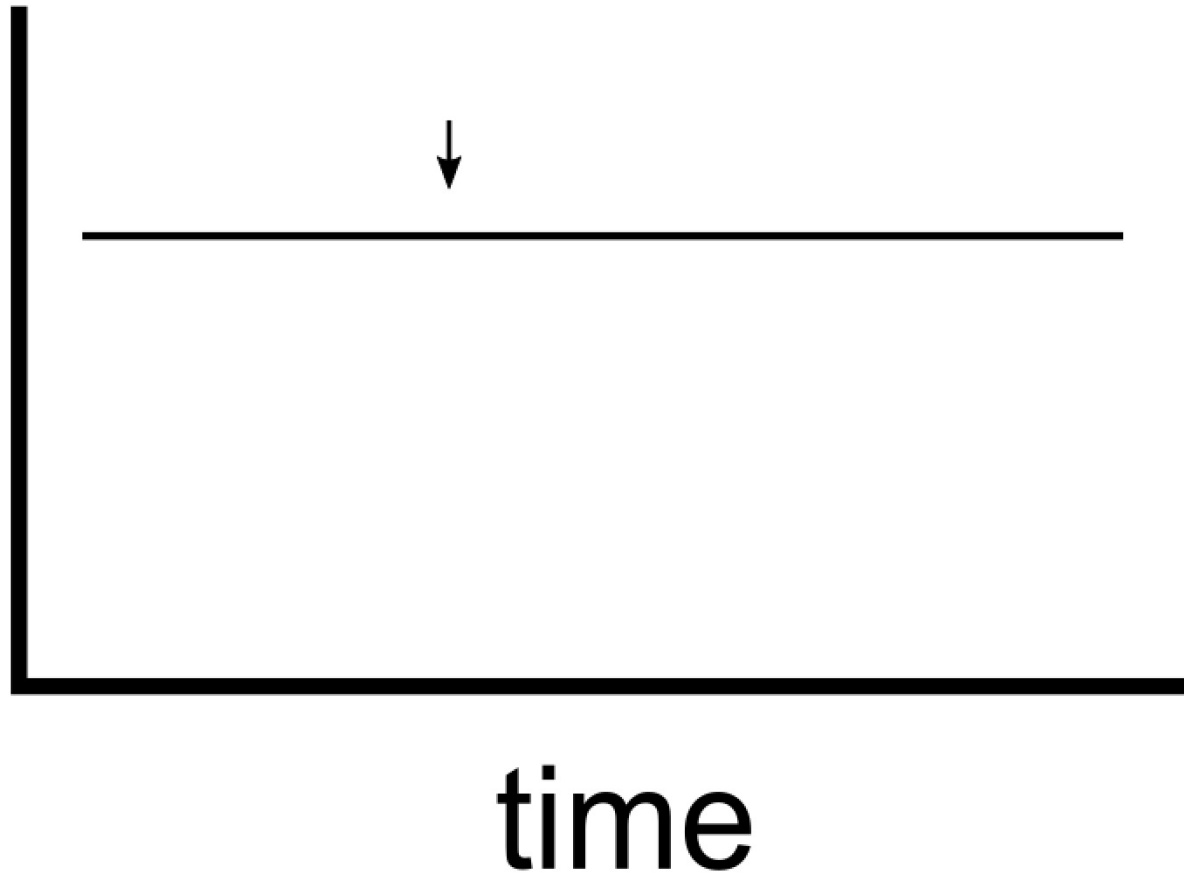
produkte und erzeugungsabläufe, ...

werden sie auch **resilienter** und effizienter?

resilience



robustness



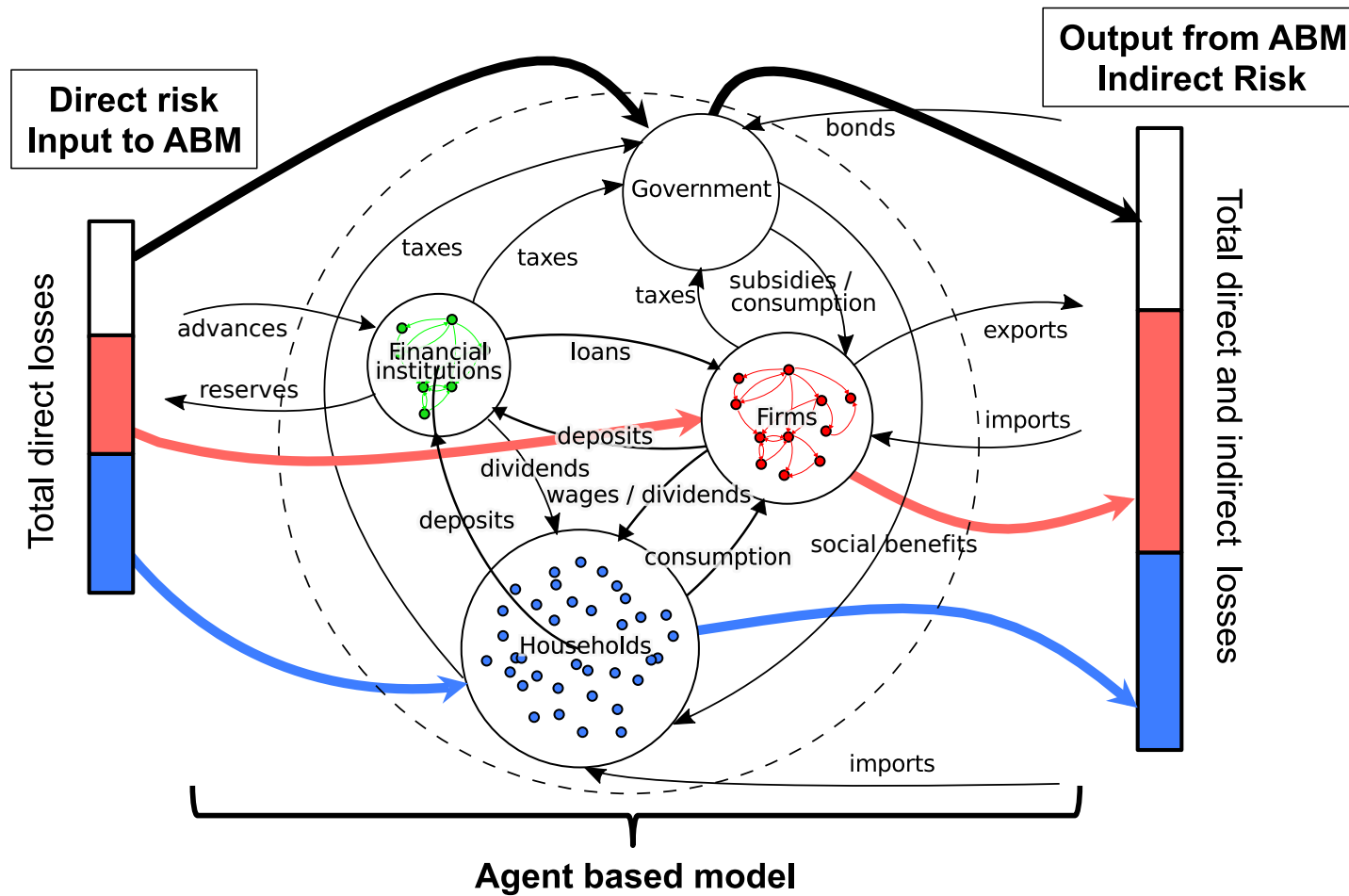
3 Beispiele

1 wie resilient ist österreich?

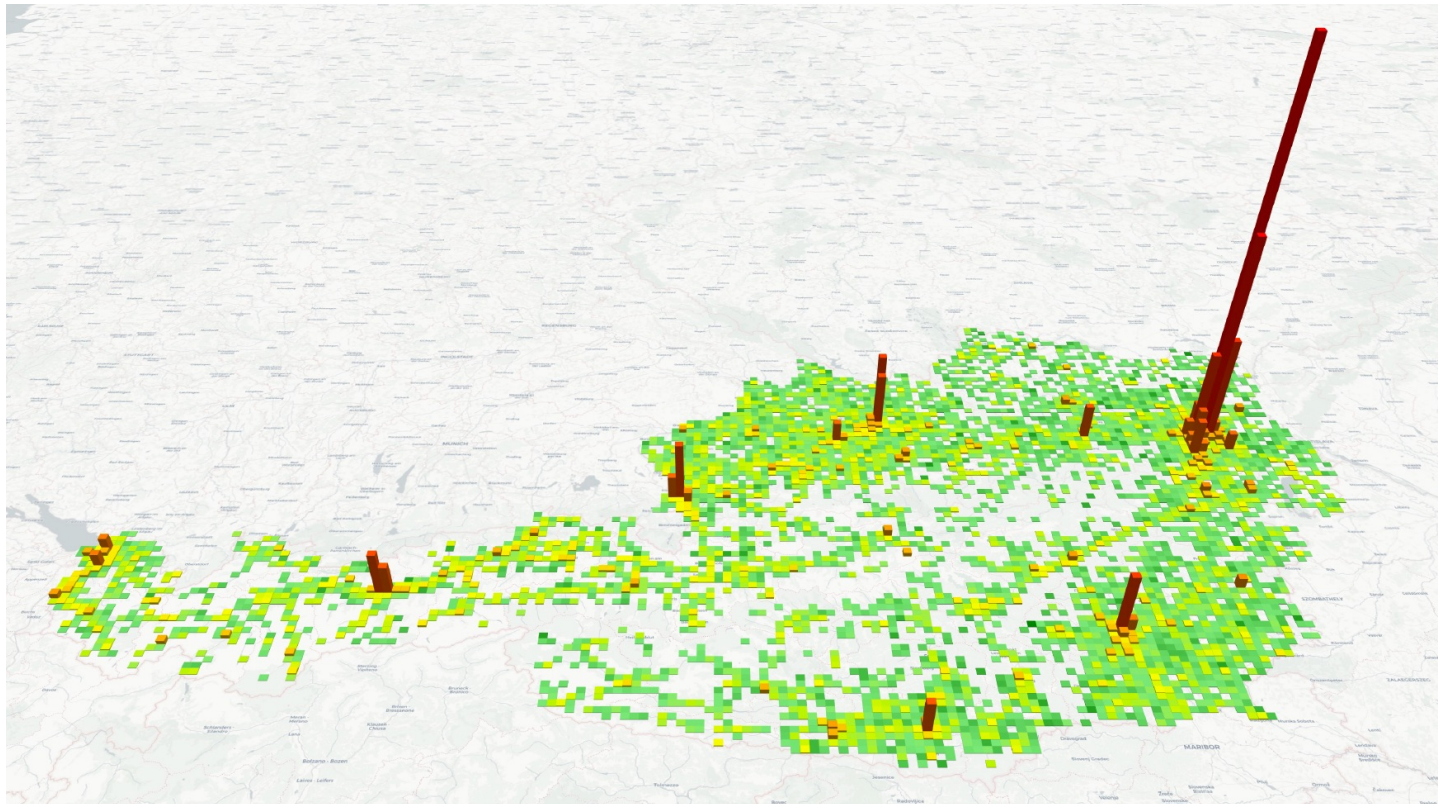
1:1 modell der österr wirtschaft

- 10 million households
- 200.000 companies (70.000 balance sheet histories)
- 500 banks
- 1000s of government agents

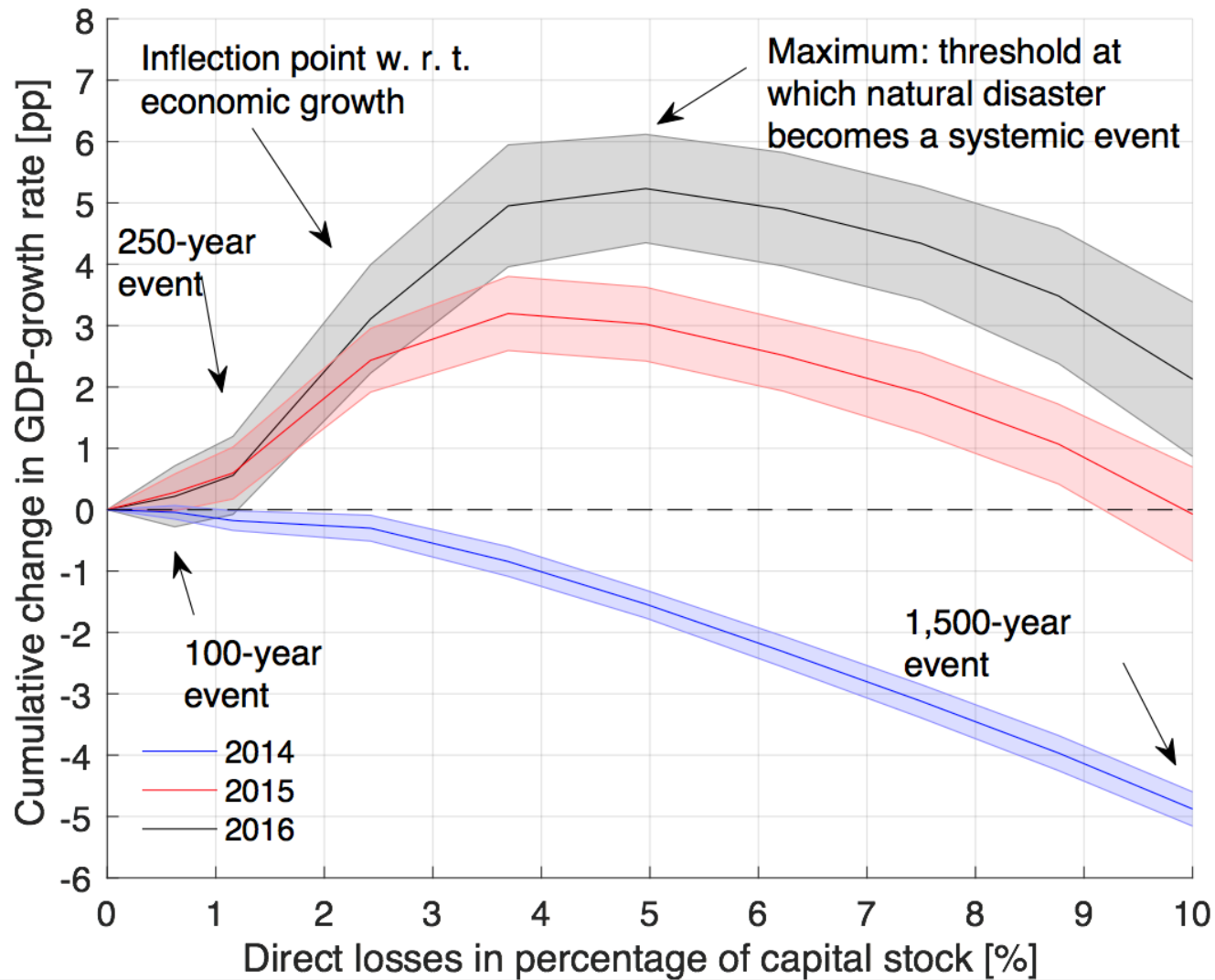
1:1 ABMs

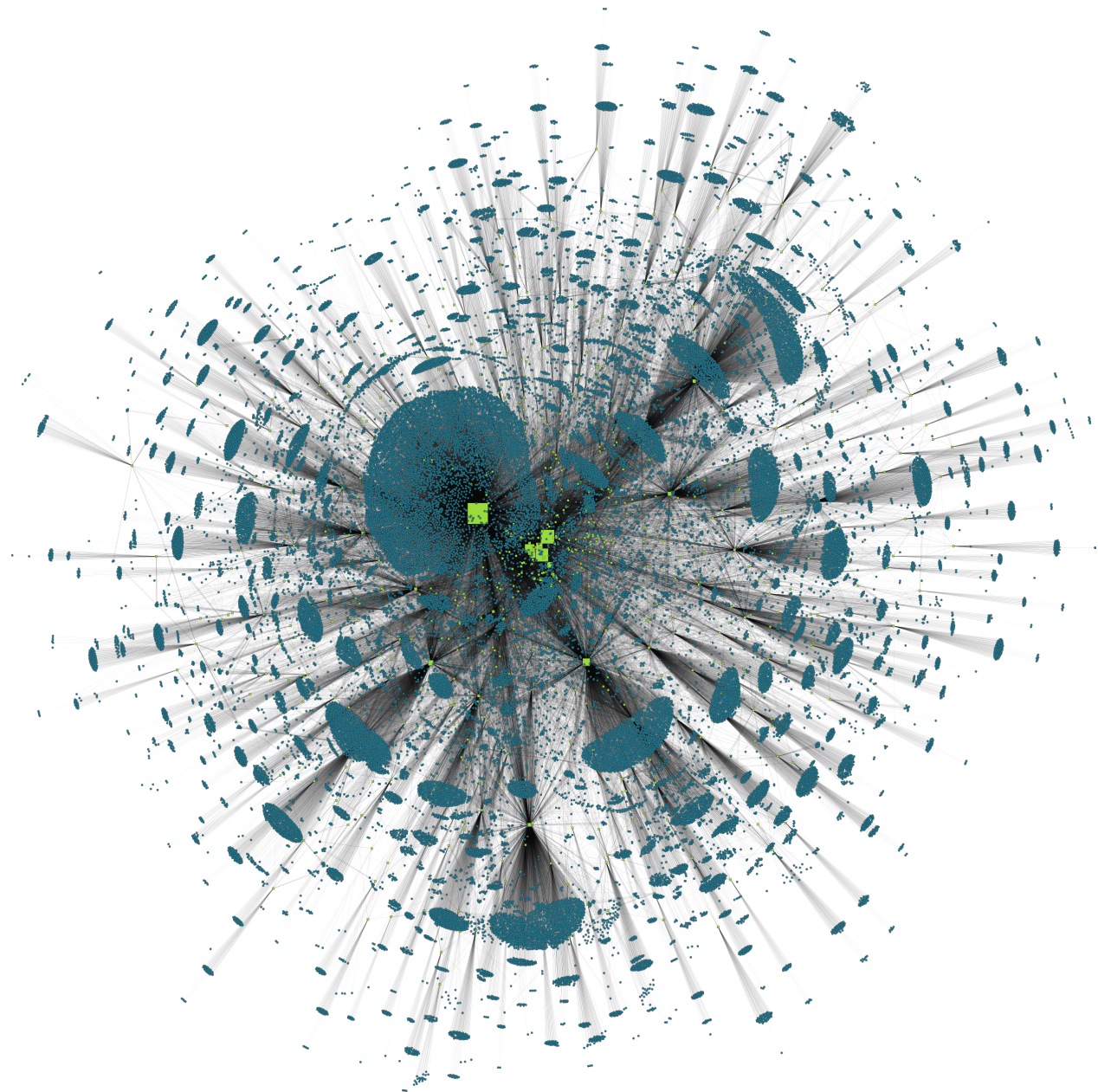


1:1 ABMs in combination with external shocks

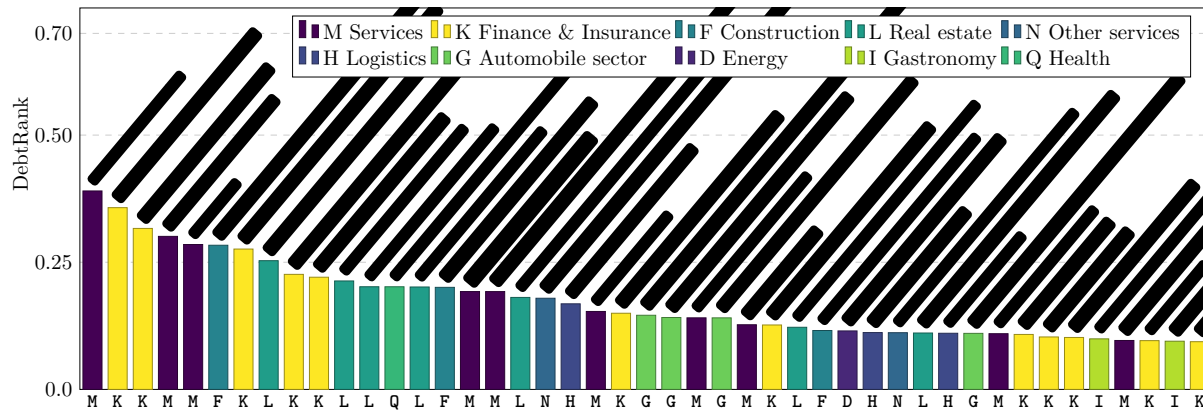
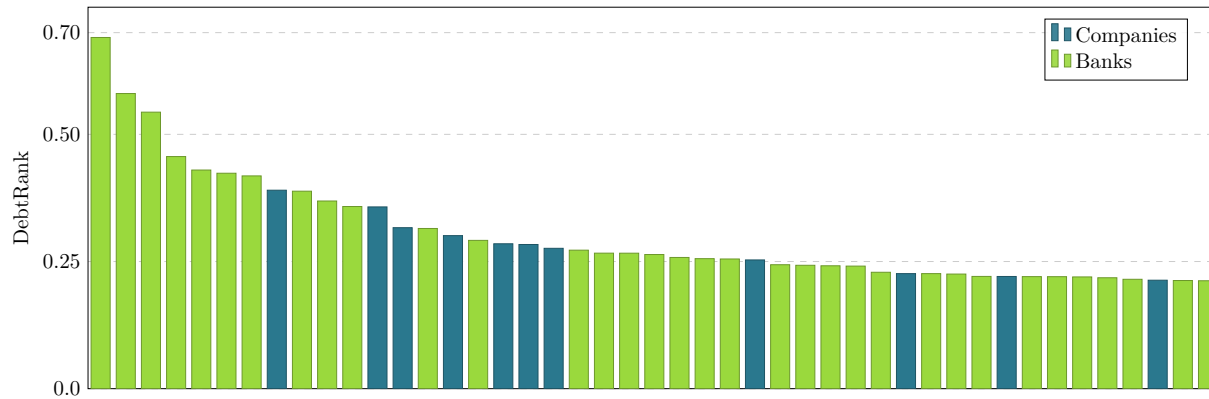


resilienz punkt

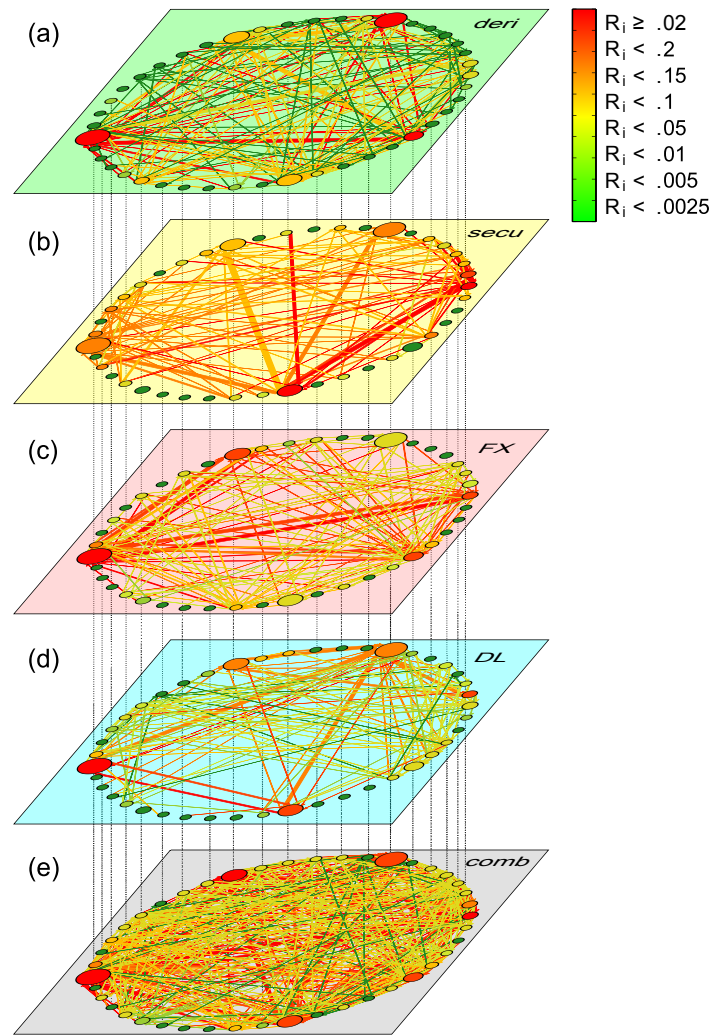




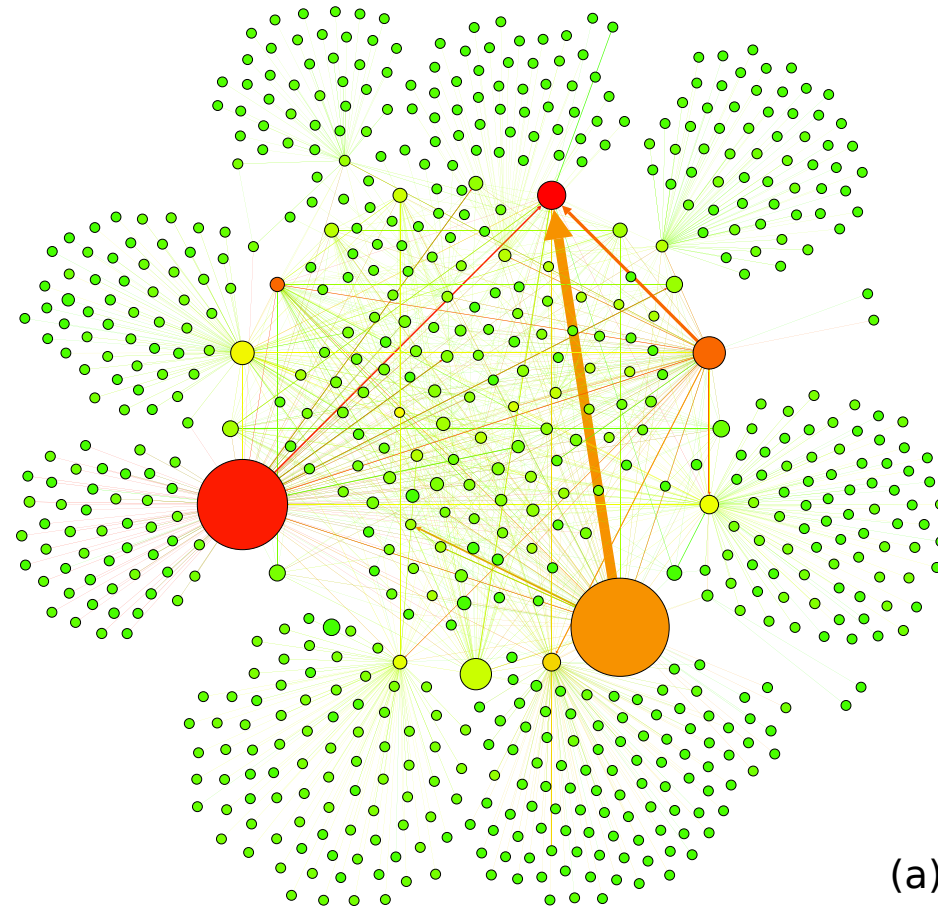
systemisches risiko im finanzsektor



2 wie resilient ist der finanzmarkt?



systemic risk austria sept 2009

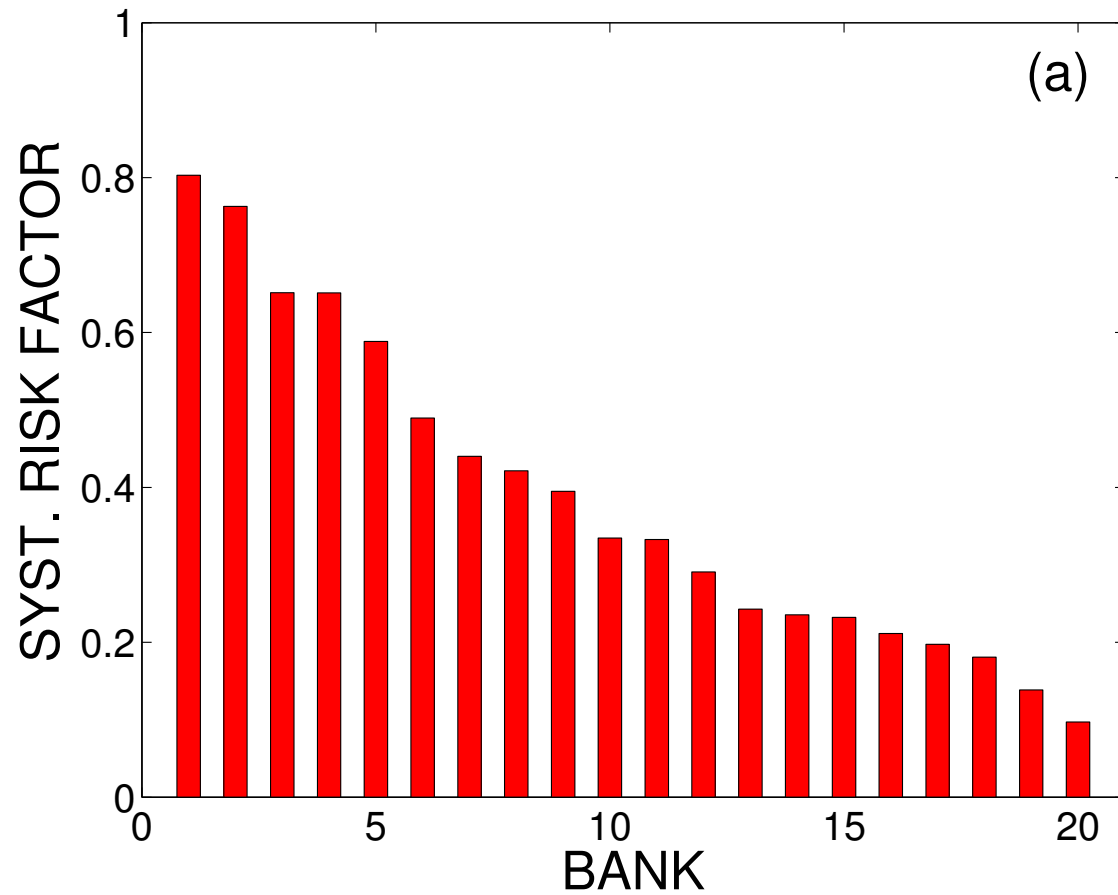


note: size is **not proportional** to systemic risk

note: **core-periphery** structure

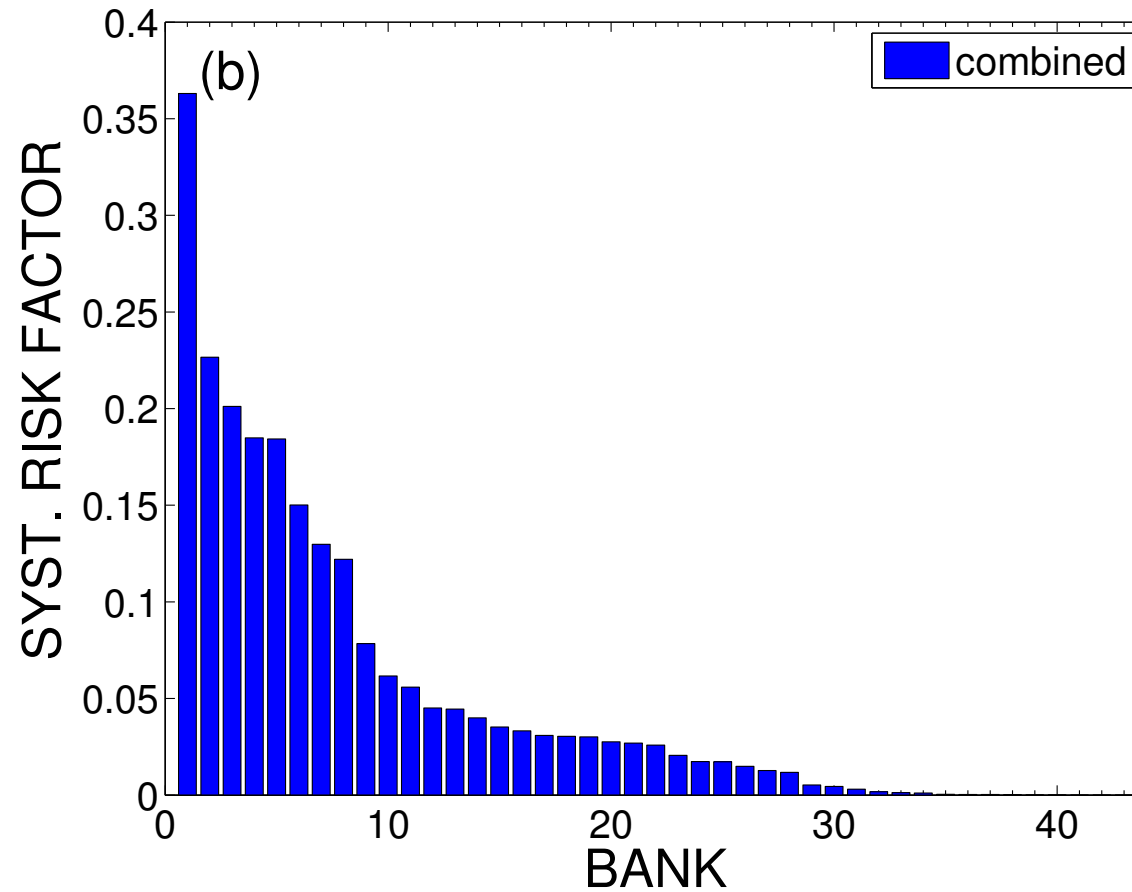
systemic risk profile

Austria



systemic risk profile

Mexico*

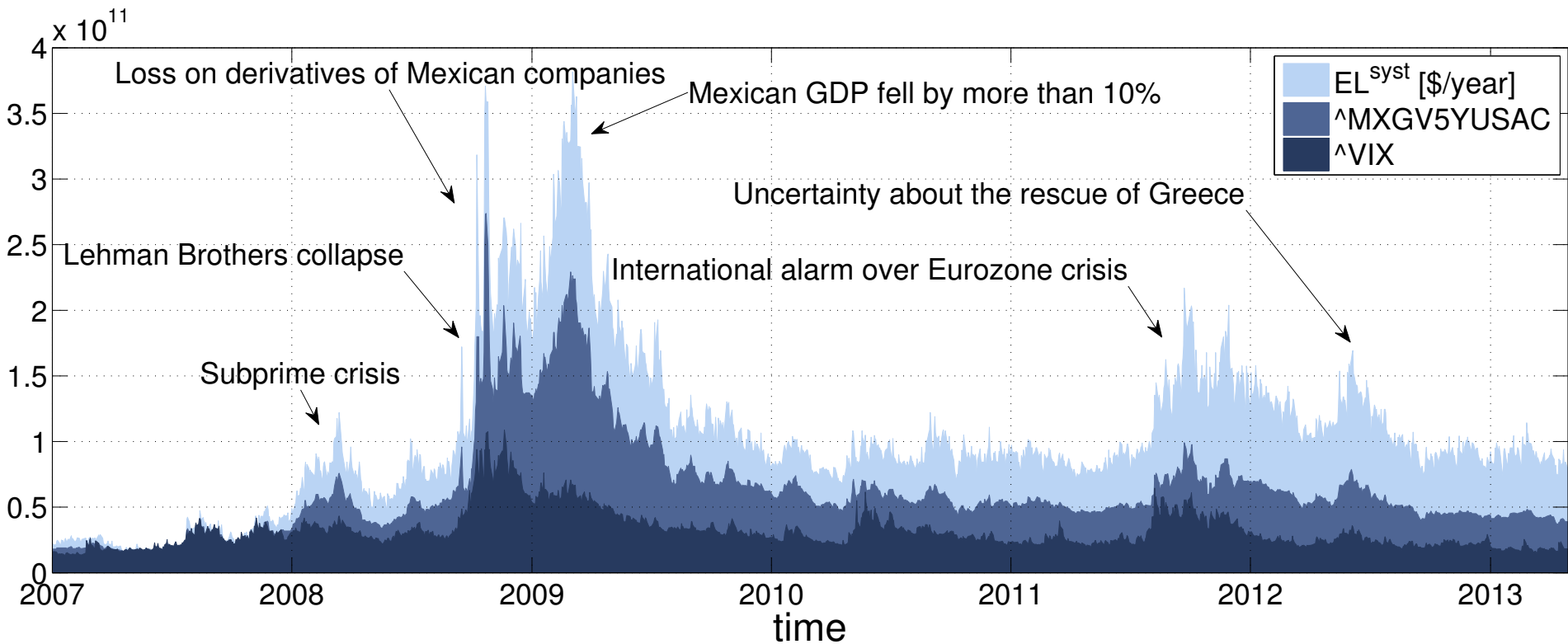


was kostet die nächste finanzkrise ?

expected systemic loss [Euro / Year]

$$\text{Expected systemic loss} = \sum_i p_{\text{default}}(i) \cdot \text{DebtRank}(i)$$

was kostet die nächste krise in Mexiko?



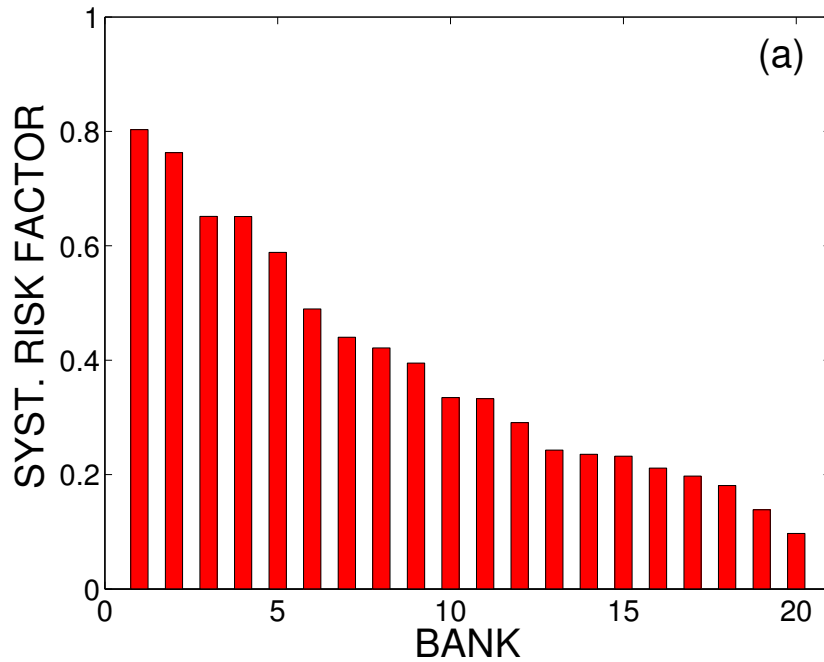
eliminieren von systemischem risiko

- wer bezahlt systemischen schaden?
- wie risikoreich ist eine transaktion?

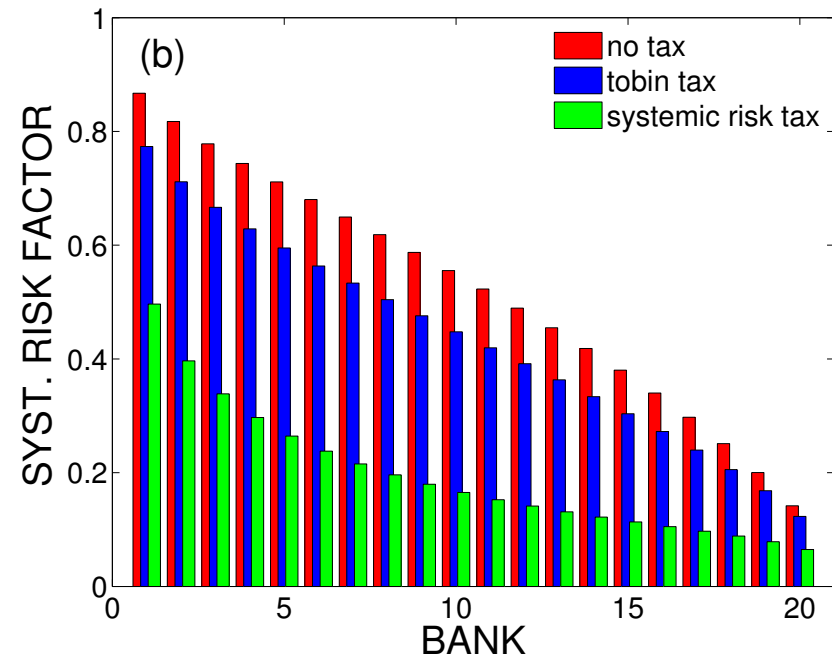
→ beststeuerung von transaktionen mit hohem system risiko

systemische risiko steuer halbiert risiko

Austria



Model



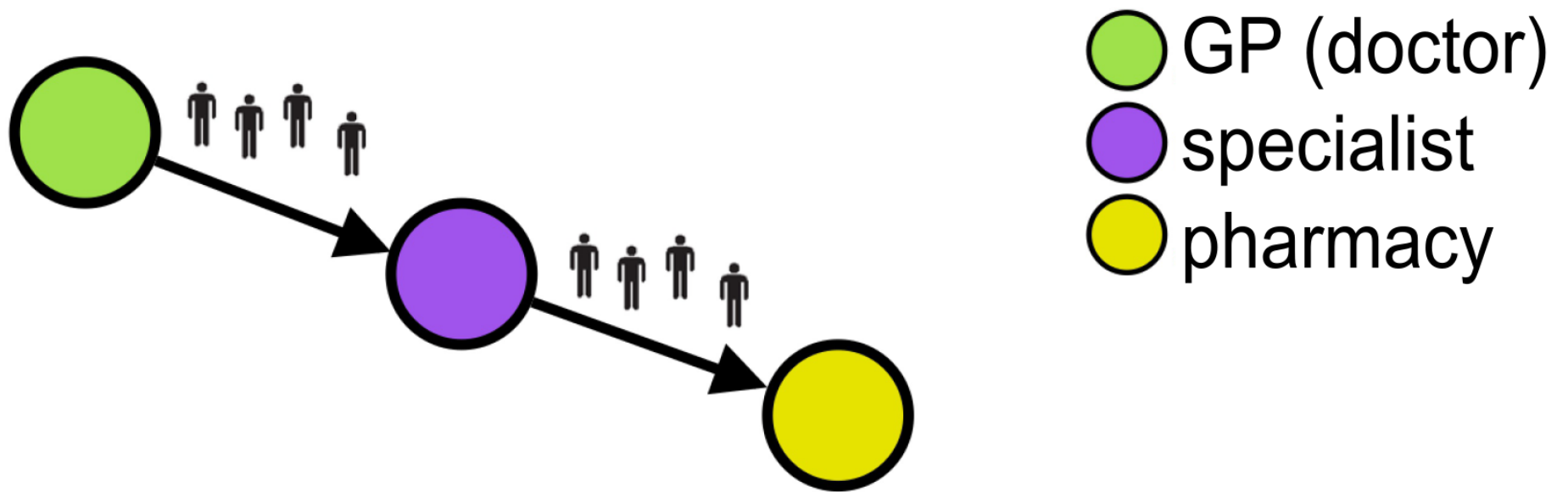
3 wie resilient ist gesundheitssystem?

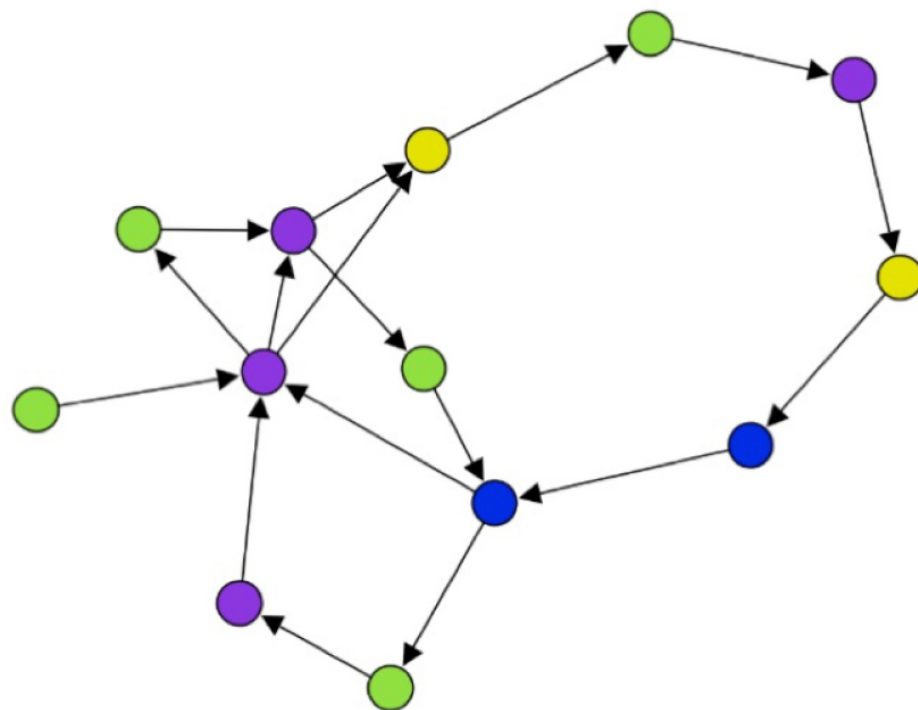
date — patient ID — healthcare practitioner ID — diagnosis — side diagnosis — prescription — price if generic drug/treatment/therapy — pharmacy ID — price of medication — date of purchase

100.000.000 datenzeilen / year

daten

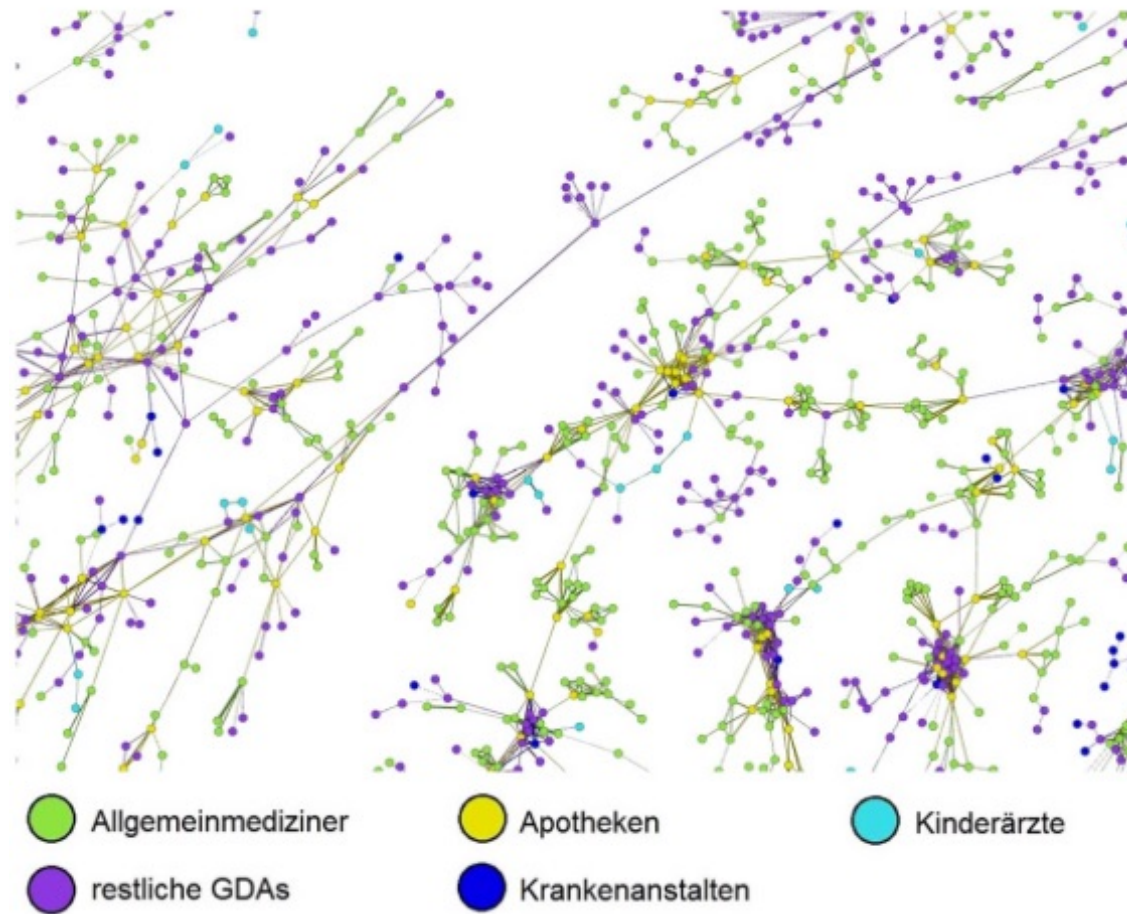
- 8,000,000 patients
- 100,000,000 patient contacts per year
- 2,000,000 hospitalizations per year
- 12,000 health care providers
- 6,102 diseases (ICD10 code)
- 1,171 substances (ATC code)
- 255 hospitals
- 1,238 pharmacies





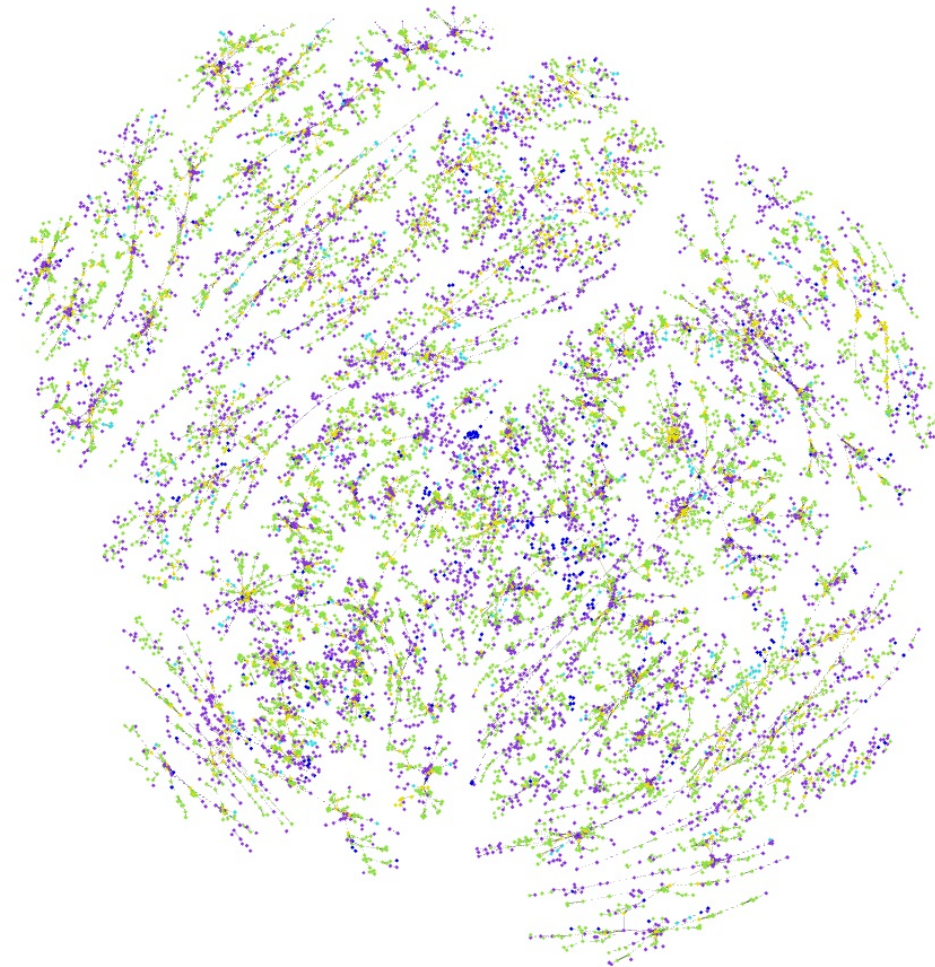
-  GP
-  specialist
-  pharmacy
-  hospital

patientenflüsse 2006



Dorda W, et al. Analyse von Behandlungsnetzwerken (HVB, 2013)

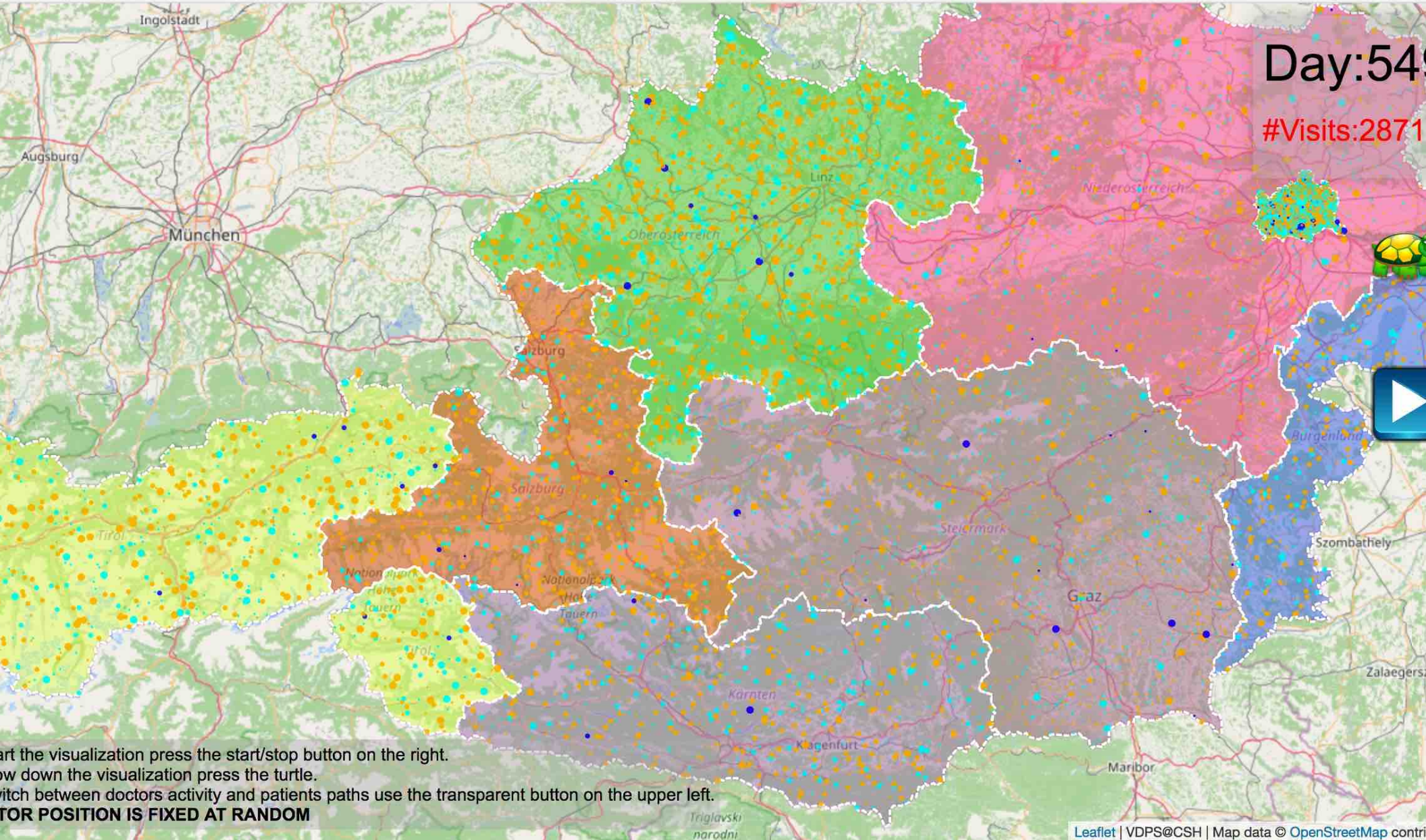
patientenflüsse



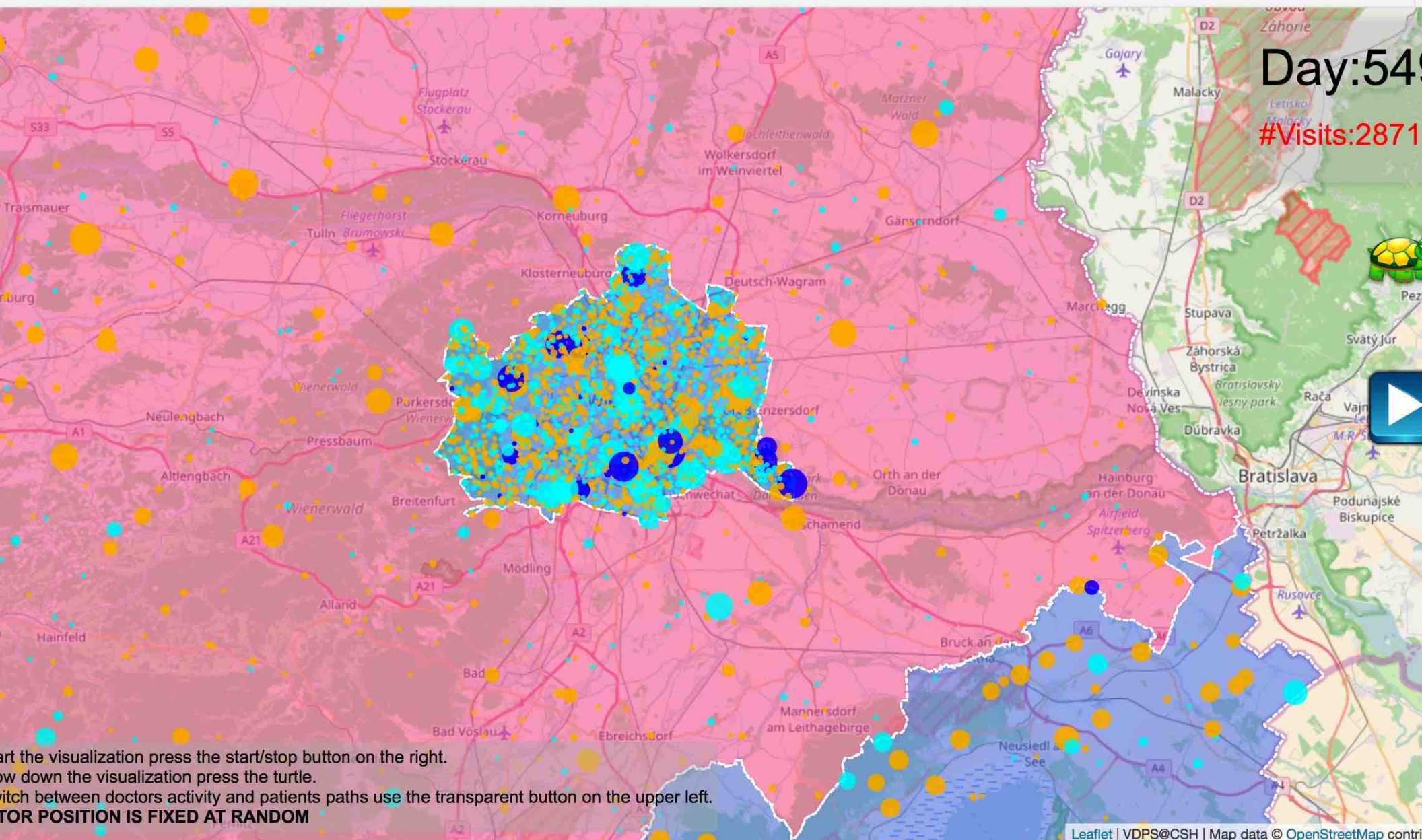
- Allgemeinmediziner
- Apotheken
- Kinderärzte
- restliche GDAs
- Krankenanstalten

Day:54

#Visits:2871

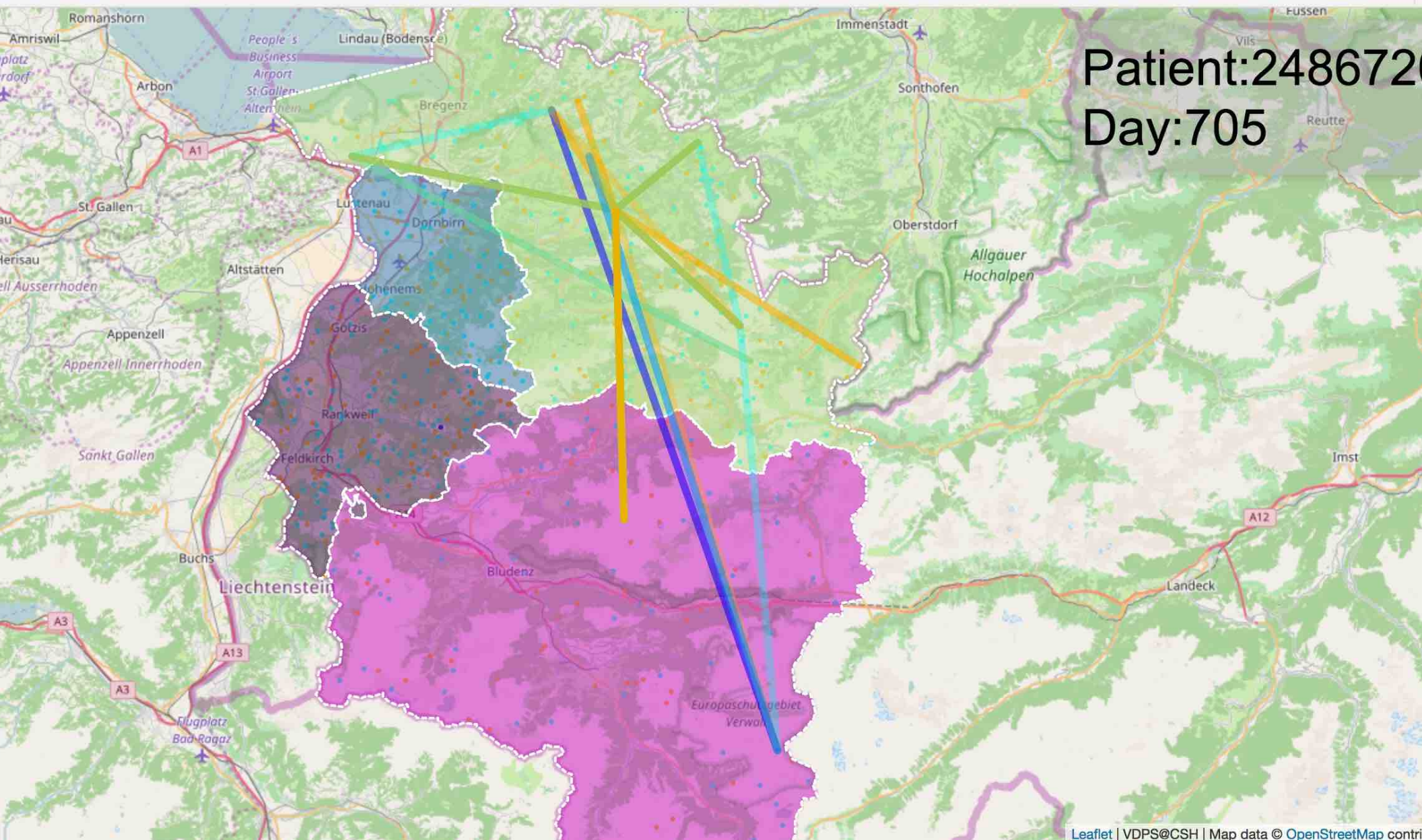


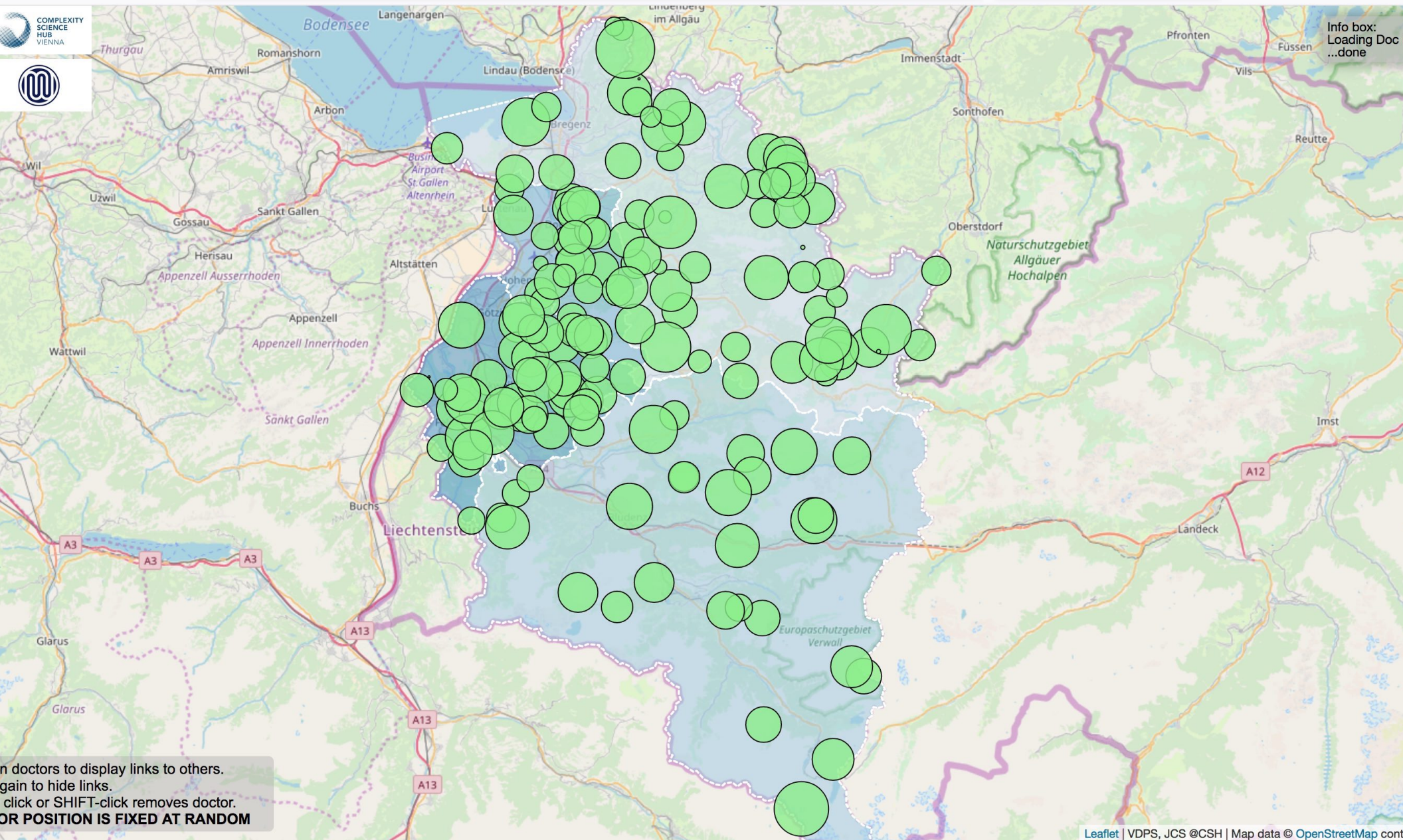
Start the visualization press the start/stop button on the right.
 Pause down the visualization press the turtle.
 Switch between doctors activity and patients paths use the transparent button on the upper left.
FOR POSITION IS FIXED AT RANDOM



Day:54
 #Visits:2871

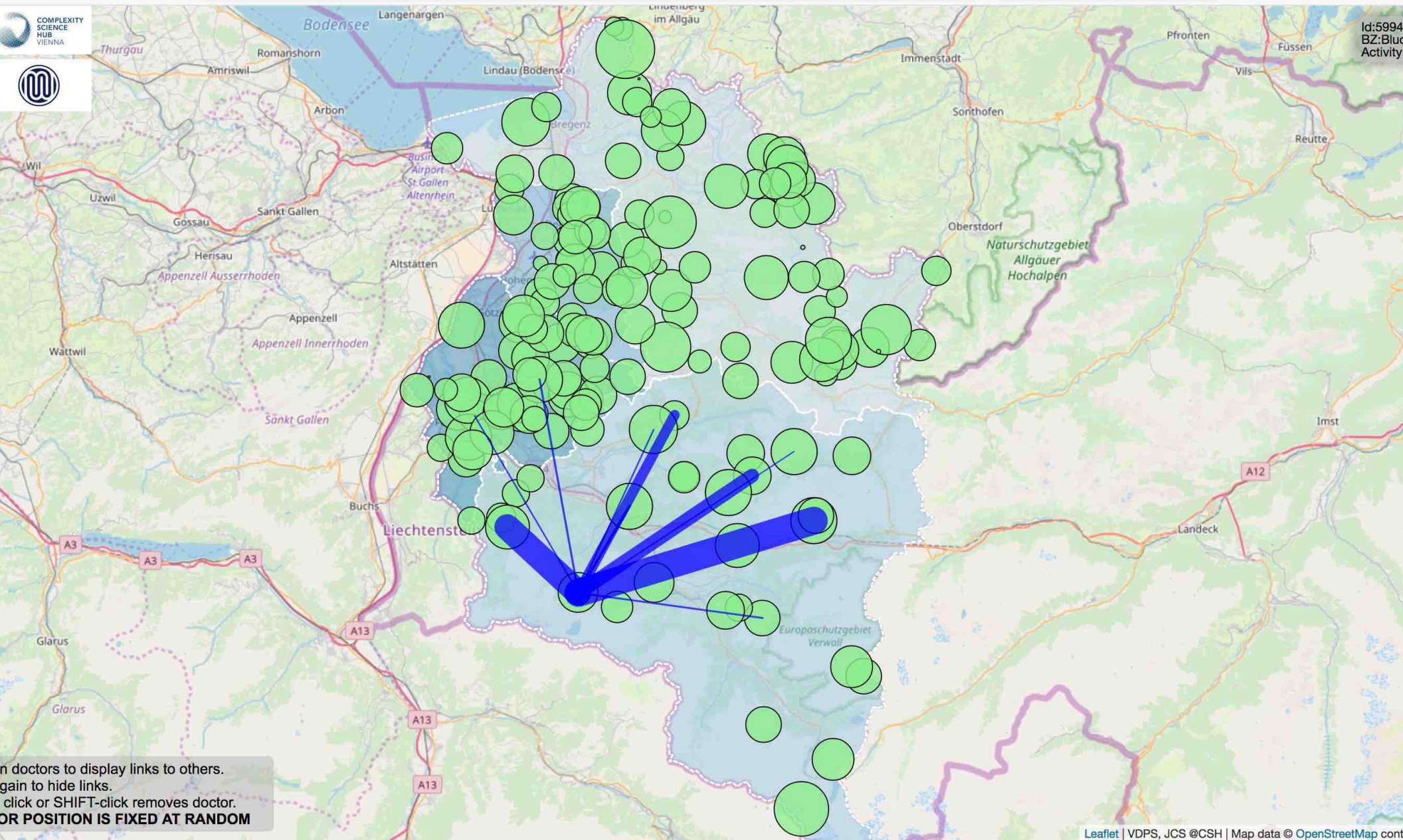
Start the visualization press the start/stop button on the right.
 Slow down the visualization press the turtle.
 Switch between doctors activity and patients paths use the transparent button on the upper left.
DOCTOR POSITION IS FIXED AT RANDOM



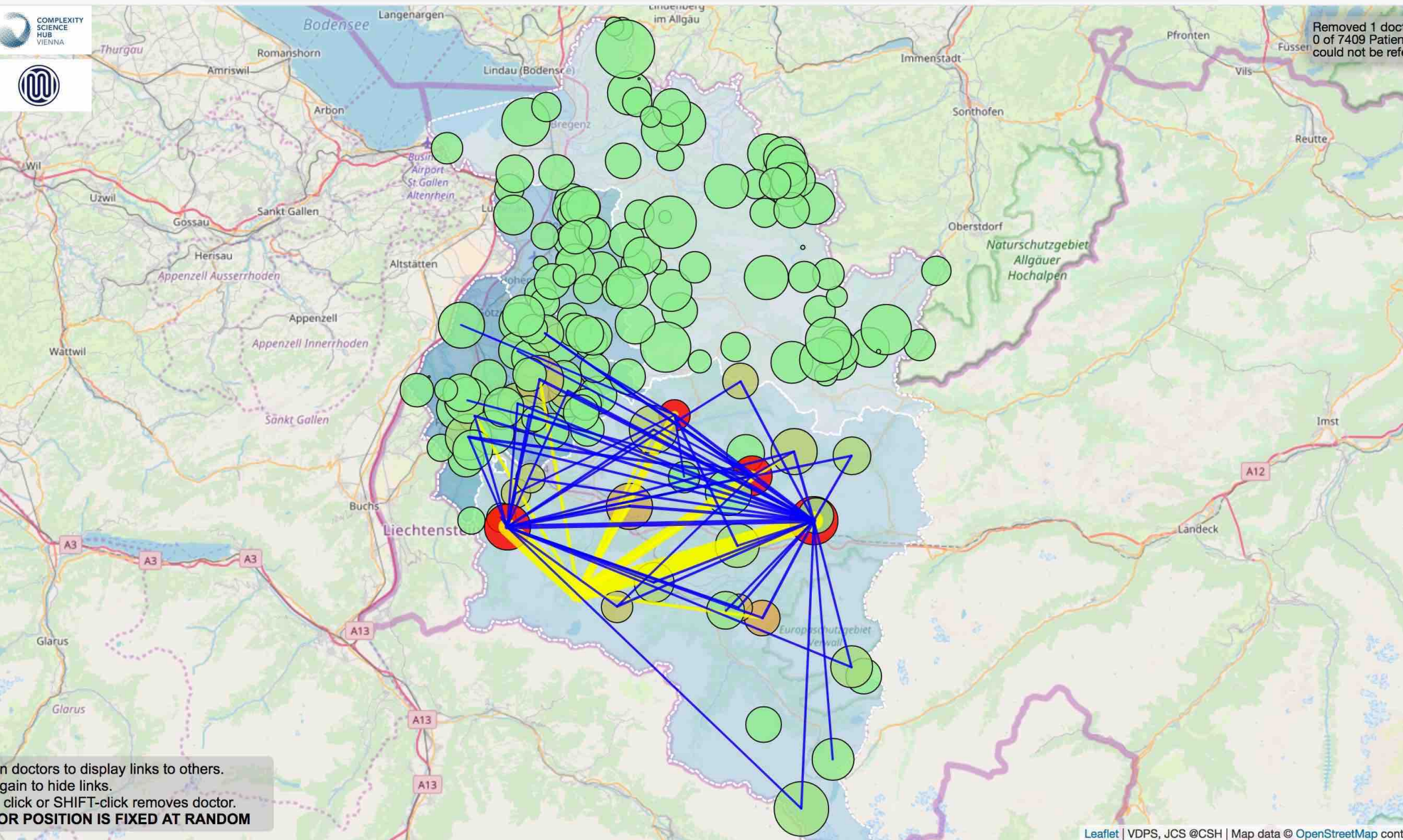


Info box: Loading Doc ...done

Click on doctors to display links to others.
Double-click to hide links.
Right-click or SHIFT-click removes doctor.
DR POSITION IS FIXED AT RANDOM

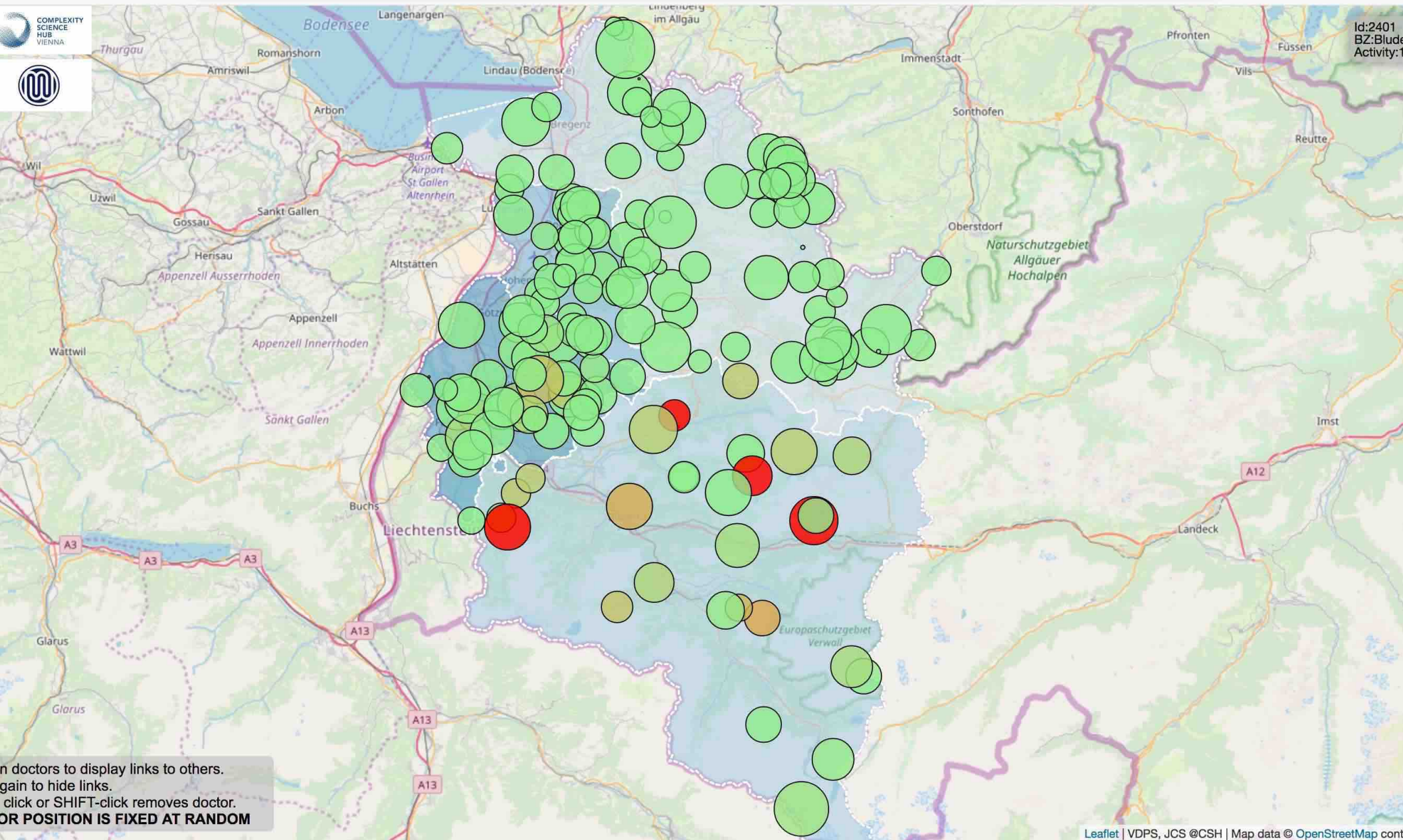


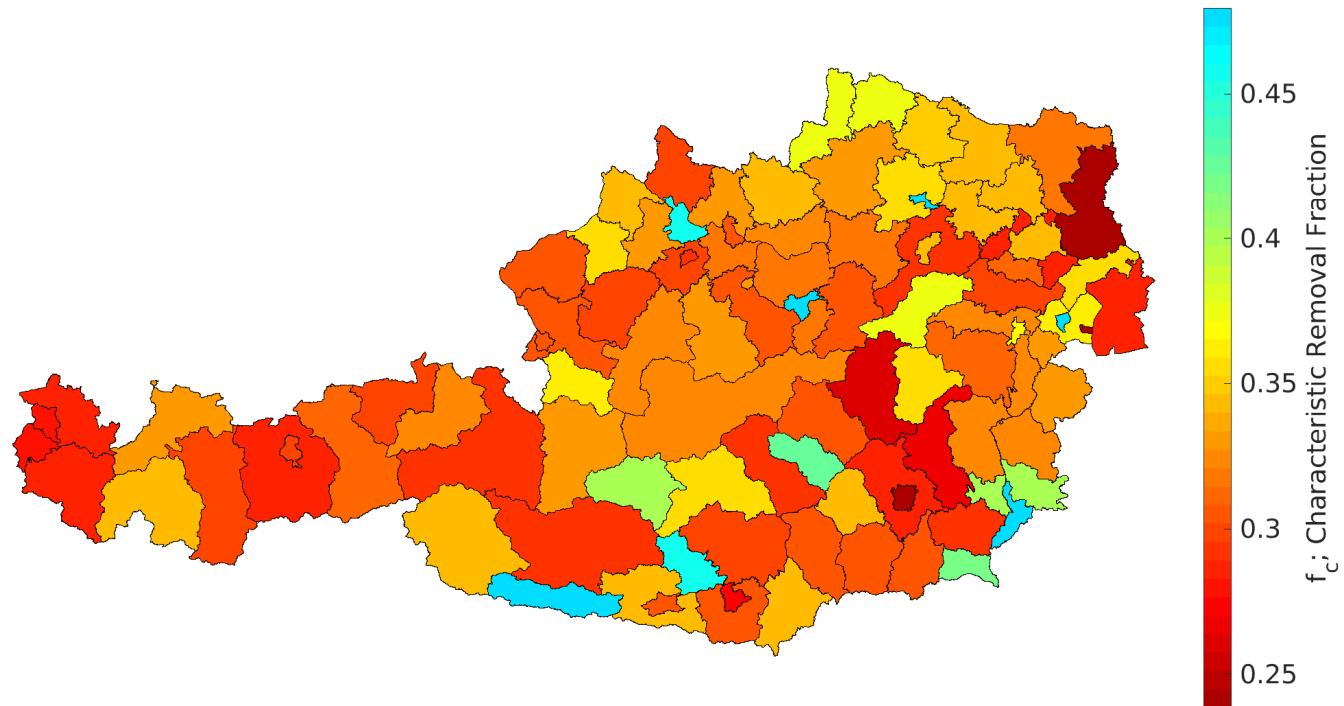
Click on doctors to display links to others.
Click again to hide links.
Click or SHIFT-click removes doctor.
DOCTOR POSITION IS FIXED AT RANDOM



Click on doctors to display links to others.
Double-click to hide links.
Right-click or SHIFT-click removes doctor.
DR POSITION IS FIXED AT RANDOM

Removed 1 doctor.
0 of 7409 Patients
could not be referred





- bauen an der digitalen kopie des planeten
- werden ökonomie, gesundheit, städte, verwaltung, planung vollkommen neu denken, weil daten sicht auf welt radikal ändern
- wer nicht mitmacht — fliegt raus
- NB braucht immer weniger die immer mehr können
- um mitzumachen brauchen wir leute, die das können
- haben wir die?
- kommen die besten an unis mit rang 143?
- nimmt man österreich noch wahr?

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