



On Legal Requirements Engineering (LRE), another Target for Micro-Simulation

Introducing the Epiframer approach at CCS2019
Singapore – Tuesday, October 1



dotLegal
Consultancy &
Research

Supplementary material available at
<https://github.com/dotlegal>



2019 © Aernout Schmidt (Leiden University), with Kunbei Zhang (CBTU)
aernout.schmidt@gmail.com

SCHMDT
ADVOCATUUR

ONE WONDERS ..

why in 'regular' complexity science projects – like on climate change, pandemics, economic disasters or energy transitions – legal systems are hardly ever incorporated as organic parts of the main model?

Motivation: Get to grips with the roles of the law in an IT-services changing world, considering projects like e-CODEX, UIL, PEM, Napster, Rijksoverheid, DPP, and the USA-PRC trade war
Education: Law (LLM) Utrecht 1972; PhD Leiden 1981

CV: Computer programmer 1969-1975 (Utrecht, Amsterdam)
Manager IT Center at Leiden Law School (1976-1985)

Law & Computer Science Academic at LLS (1985-2010)

Prof. em. Leiden University, CHMIDT advocaat (2010...)

RESESEARCH QUESTION
Can legal requirements engineering help analyze complexity-related risks?

Andrea Modeling as research tool
1975 Statistical learning & the Law, the software crisis

1985 ... : Legal Knowledge-based systems, contingencies

2000 ... : Legal Requirements Engineering, complexity

2010 ... : Agent-based simulations, CASS*

Can complexity-theory tools like agent-based modeling help legal requirements engineering?

CASS = Complex Adaptive (networked) Social System

OUR ASSUMPTIONS

1. Laws function in complex adaptive social systems, so legal requirements engineering is a complex-adaptive-social-system theory affair
2. Legal practices provide organic functions in complex adaptive social systems, so legal practices are incomplete and adaptive themselves

CONTENTS

- Part 1 - preparation
How to code for LRE modeling
- Part 2 - application
Application to the trade war question; conclusions

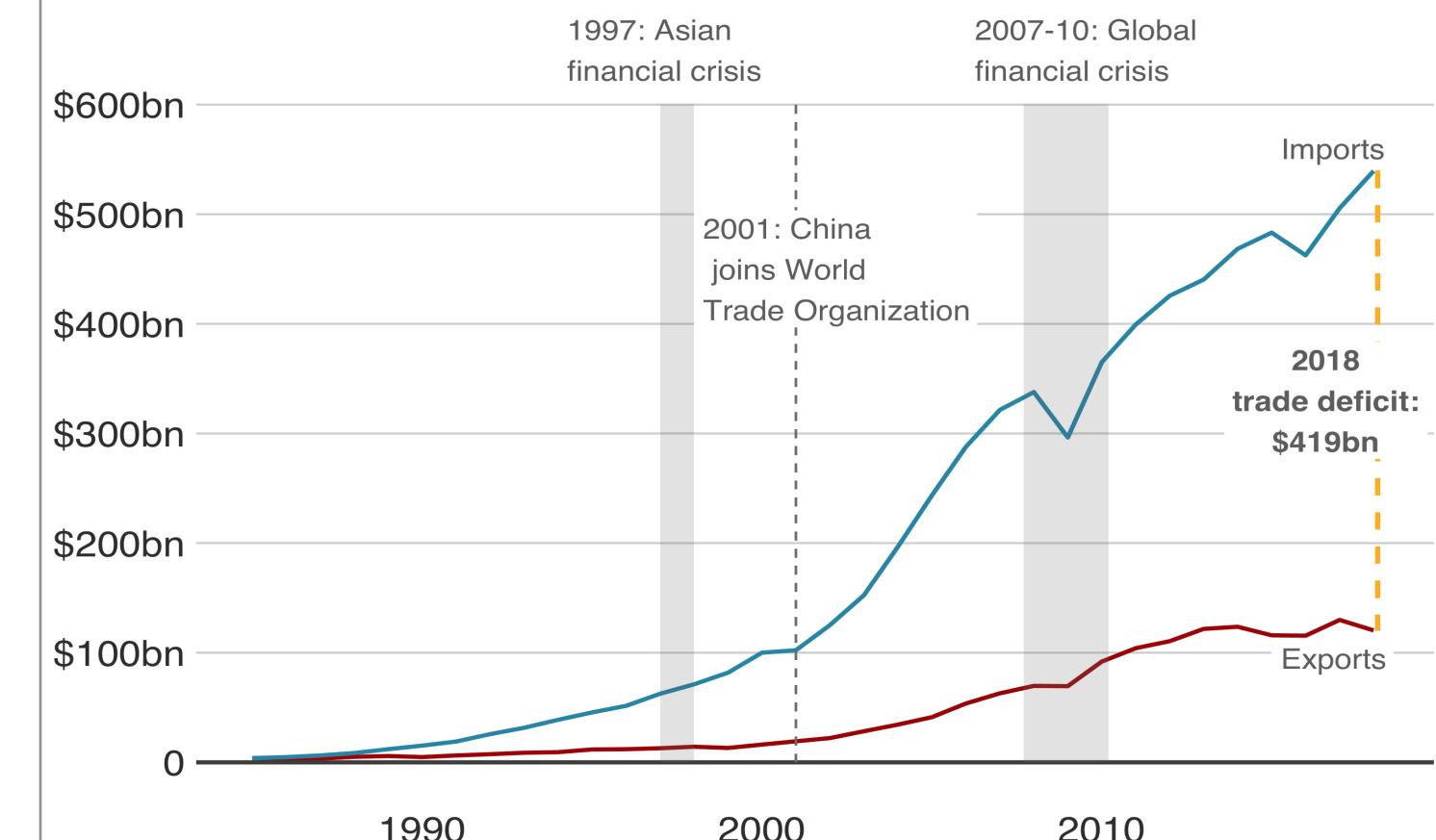
Example application .. the trade war



When will the USA - PRC trade war end, and under what conditions?

US trade with China

US trade deficit with China has soared since 1985



A few concepts

WHAT IS LEGAL REQUIREMENTS ENGINEERING?

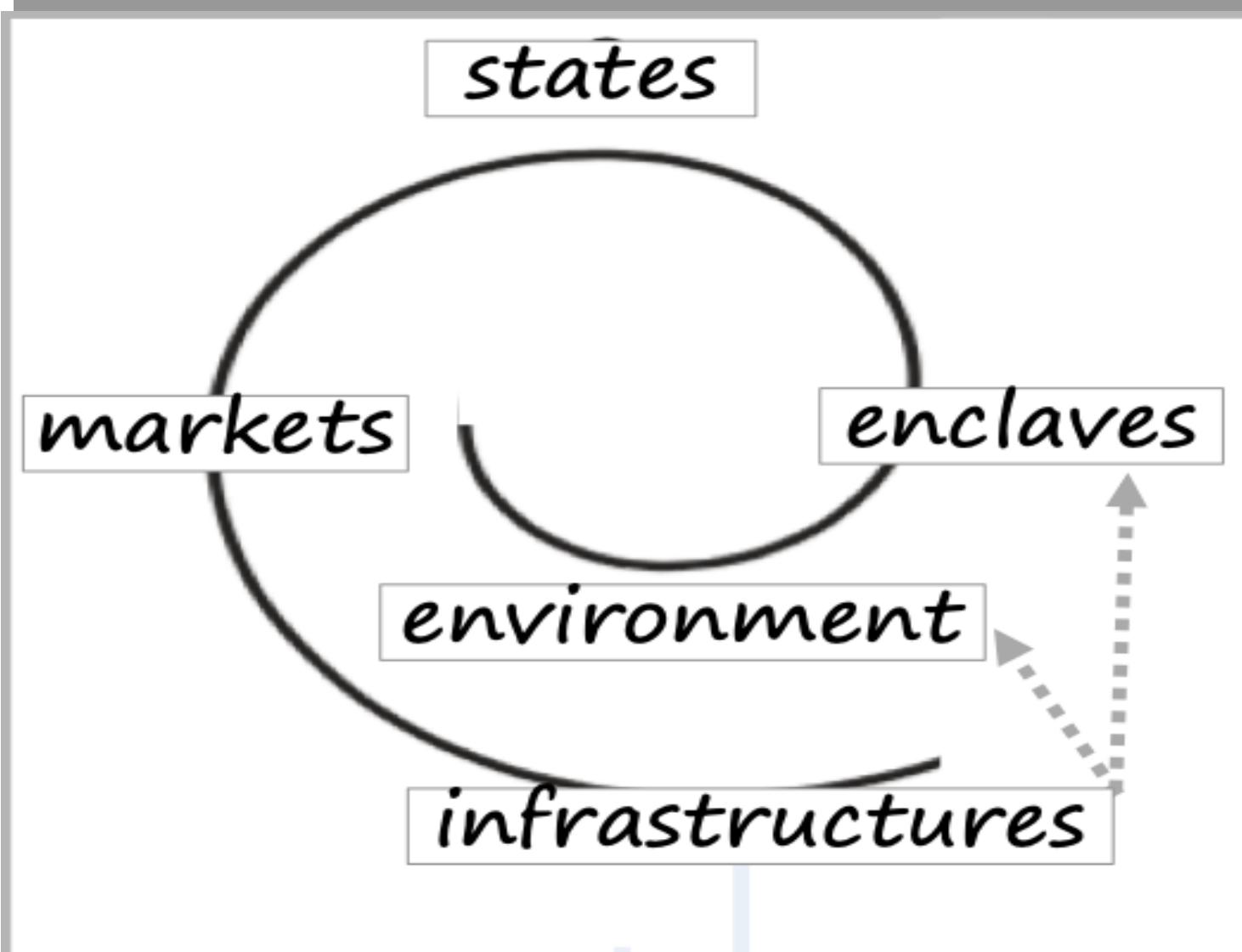
Legal requirements engineering looks at how functional requirements will result in legitimate & tolerable (IT-supported) legal practices

WHAT ARE LEGAL PRACTICES? (e.g.): legislation, contract design, -conclusion, -fulfillment, litigation, policing, law enforcement, voting in elections ...

CAN WE CODE DATA & MECHANISMS TO MODEL THEIR DOMAINS?

Coding legal practices (revisiting Durkheim 1892)

LEGAL REQUIREMENTS face **combinations** of ENCLAVES (honor, trust), STATES (security, legitimacy) MARKETS (wealth, capital) NETWORKS (visibility, access)



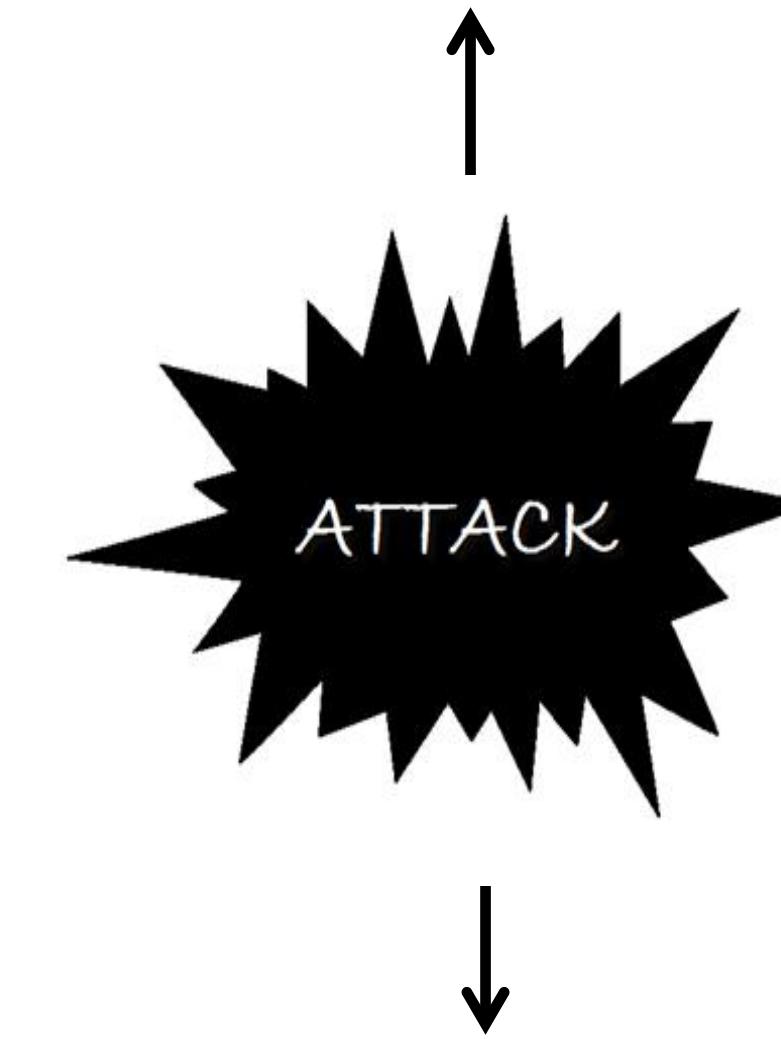
IMPACTS
of ACTIONS & (I)DEALS
are coded in value vectors like
[1 1 1 1]



2. Security
(legitimacy)



3. Wealth
(capital)



1. Honor
(trust)



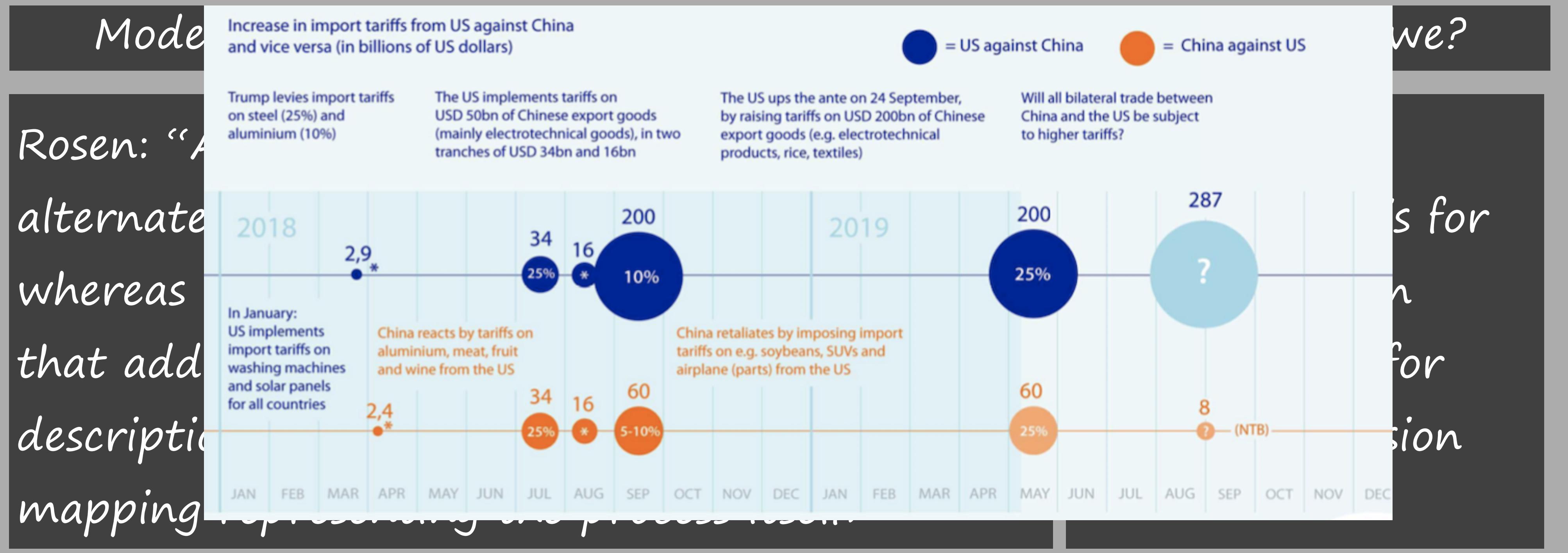
4. Access
(visibility)

Framing and modeling legal practices with insurgency timelines

Litigation & legislative dichotomies breed social dichotomies

Social dichotomies
breed
insurgency time lines

Insurgency time-lines can be modeled!



... timelines can be modeled – how? (cheat sheet for Epiframing)

Three agent types:

- A. Insurgents
- B. Incumbents
- C. Dependents

INSTITUTIONS:

Cooperatives (norms)

have members

Agencies (laws)

have civilians

Corporations (prices)

have consumers

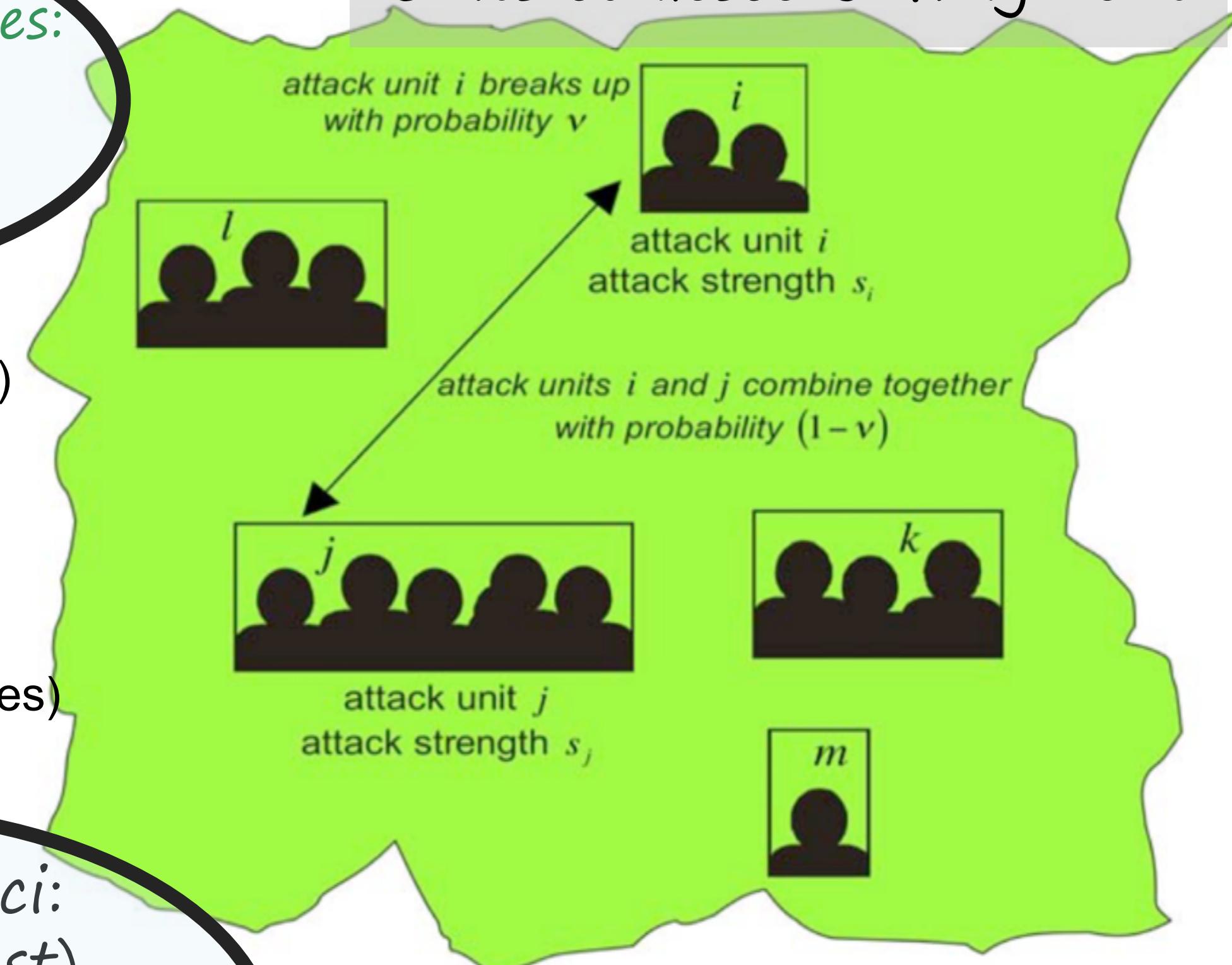
Networks (access rules)

have users

Four-values foci:

1. honour (trust)
2. legitimacy (security)
3. material wealth
4. visibility (access)

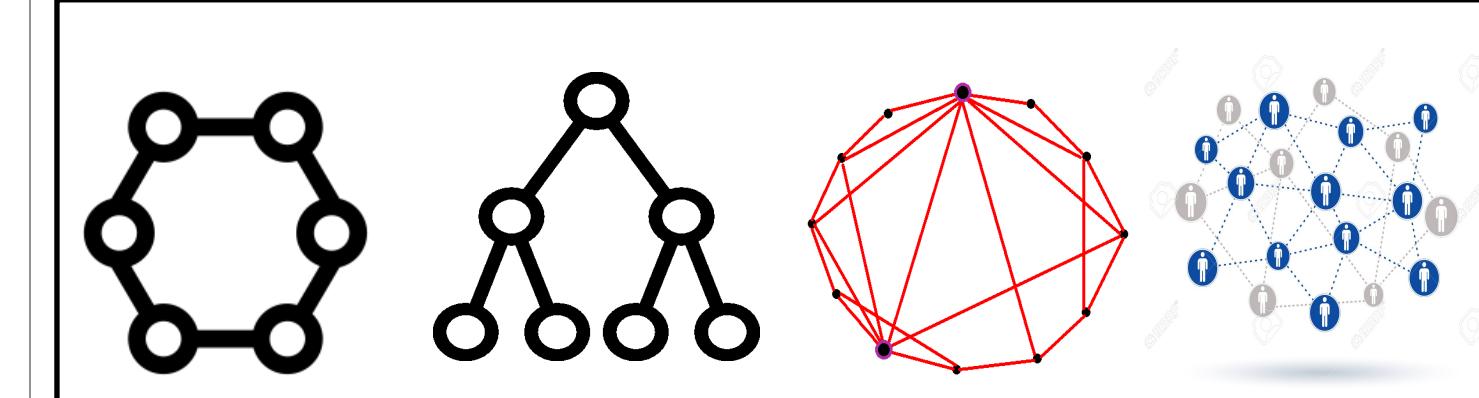
Units coalesce & fragment



Timelines show two event observables:
(1) punctiation in time (burstiness) and
(2) impact size. Both are assumed to have a ± 2.5 power-law distribution.

The epiframer approach:

(1) name the battle field and its laws, and the As, Bs and Cs. (2) create time lines with events and their 4-value impacts. (3) harvest rules that can model what happened. (4) run them as simulation. (5) Evaluate



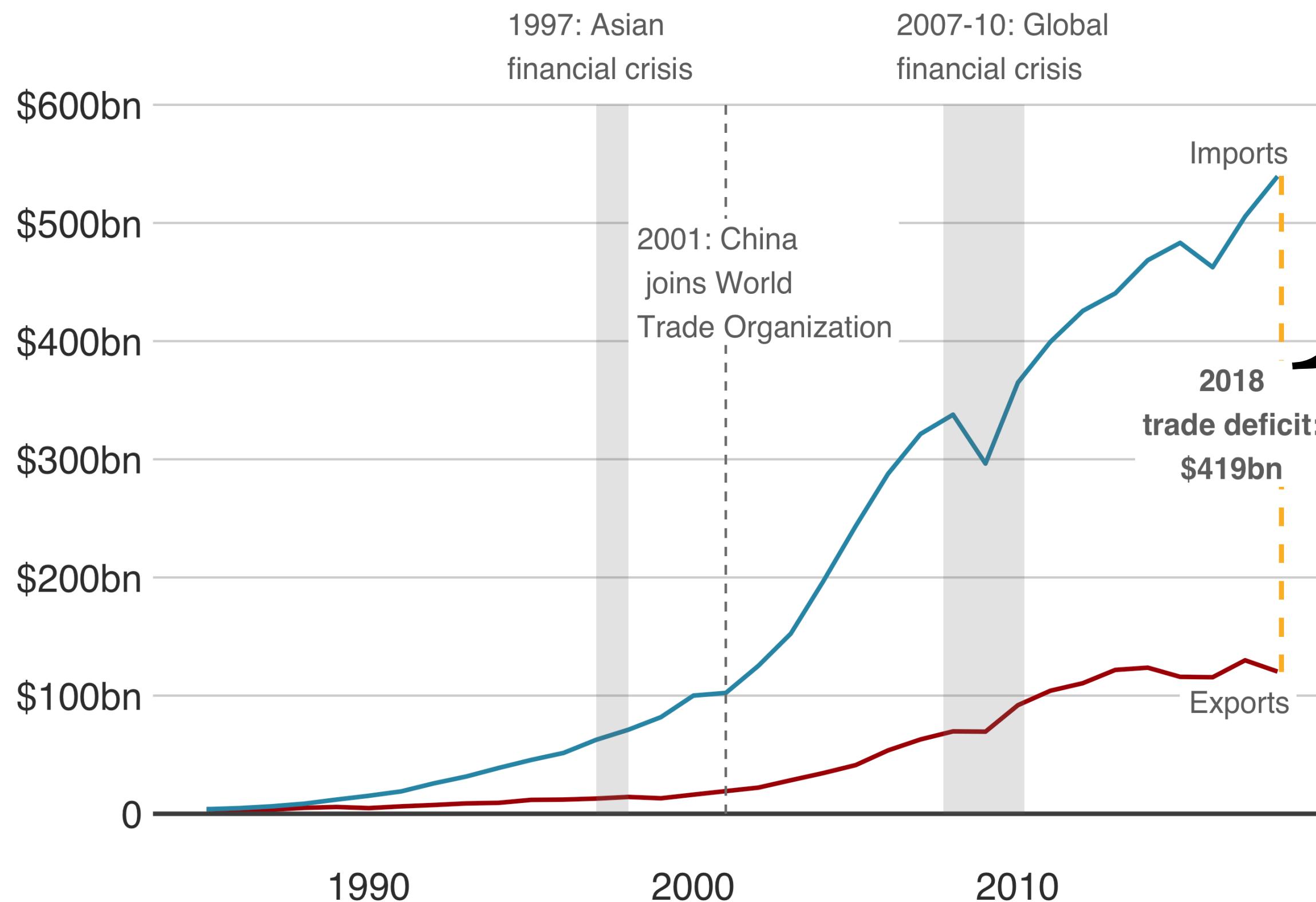
Summarizing the introductory part

In summary: we chose this approach of insurgency modeling because legal practices lead to social dichotomies that in turn lead to insurgency timelines, while simulating these remains sensitive to absorbing parameter-space reducing heuristics, harvested from cultural, legal, economic and network-theory results (Johnson et al 2015, Douglas 1992, Bobbitt 1982, Williamson 2005, Barabasi & Albert 1999).

PART 2: an example application

US trade with China

US trade deficit with China has soared since 1985



Considering its trade gap position,
the USA is the insurgent agent

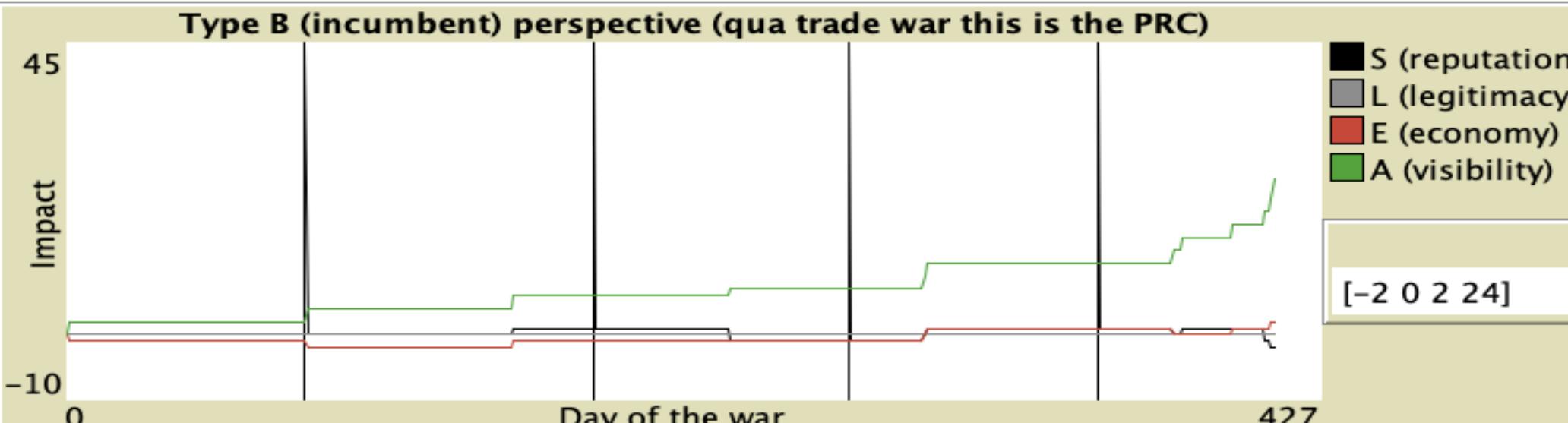
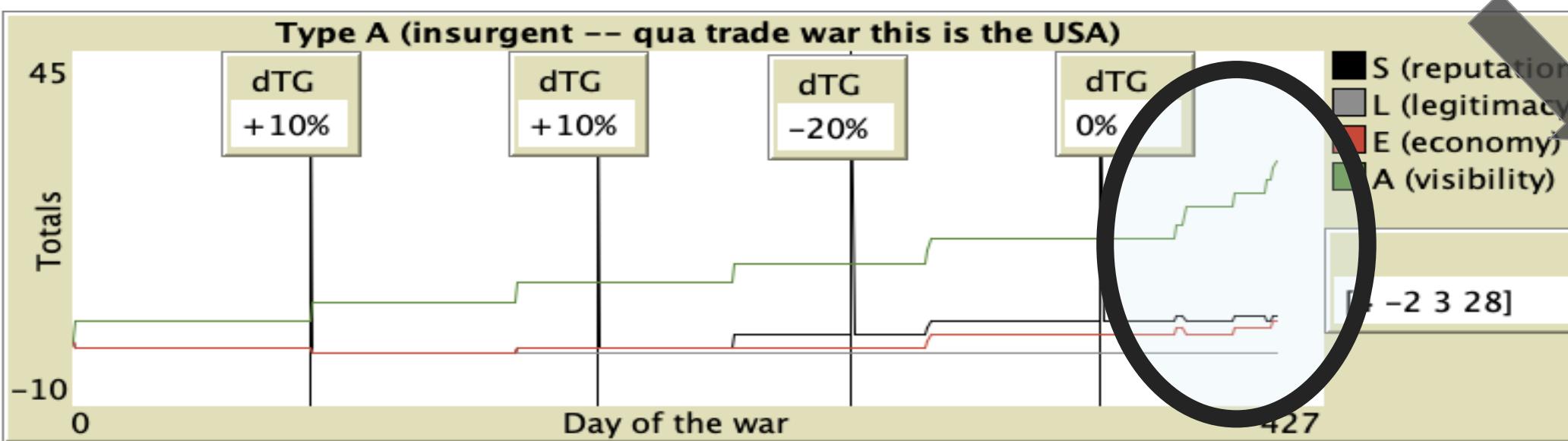
Considering its trade gap position,
the PRC is the incumbent agent

Considering its trade gap position,
the WTO and its members are the
dependent agents

Some law:
Lex mercatoria
International private law
WTO rules e.g., on
IP-enforcement and
the ban on state aid

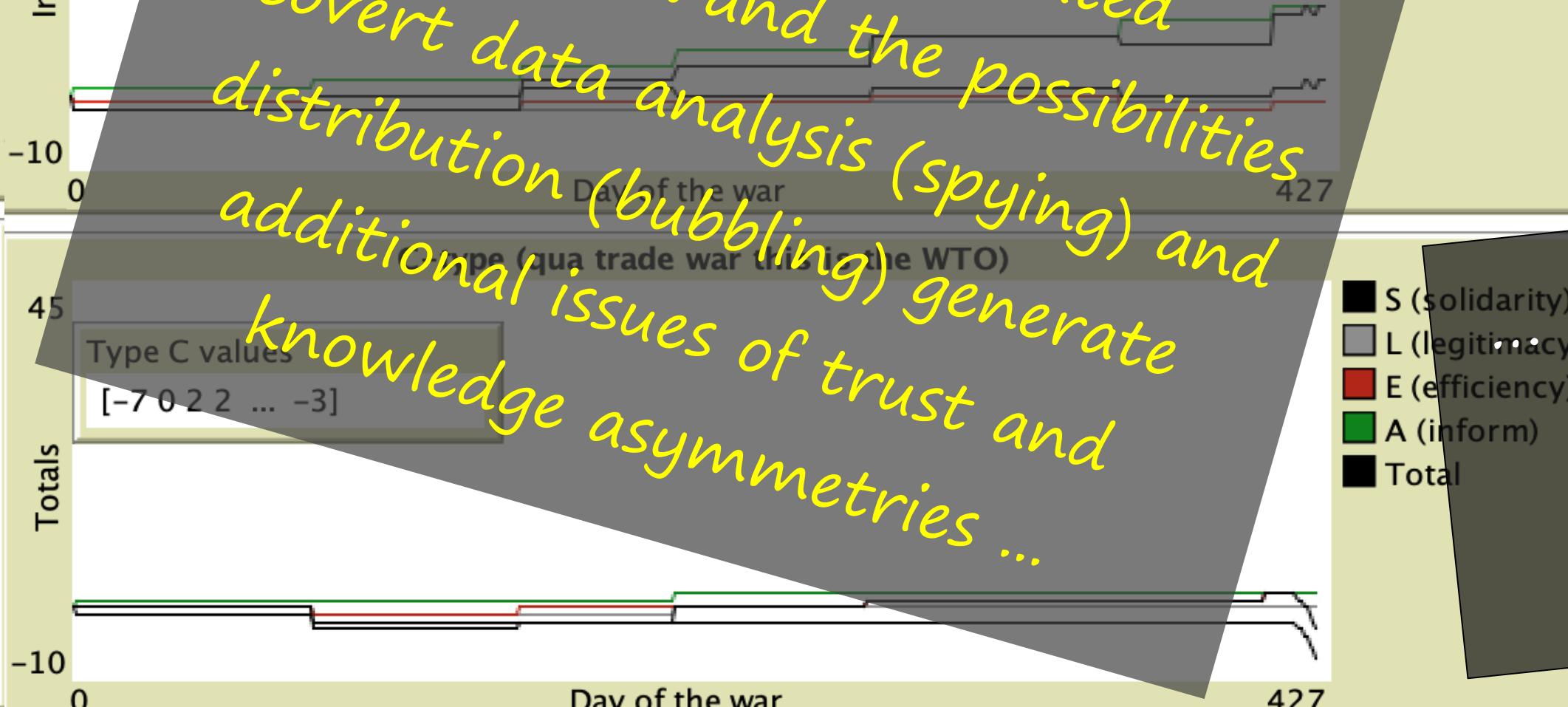
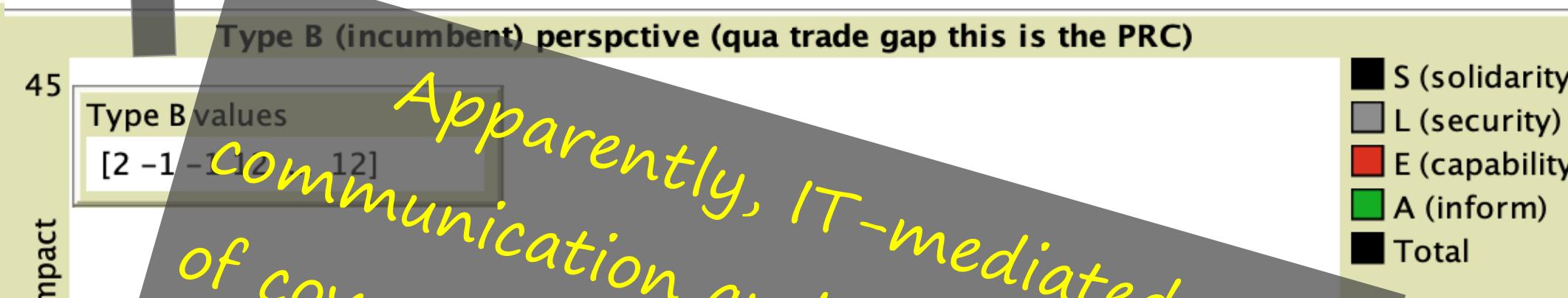
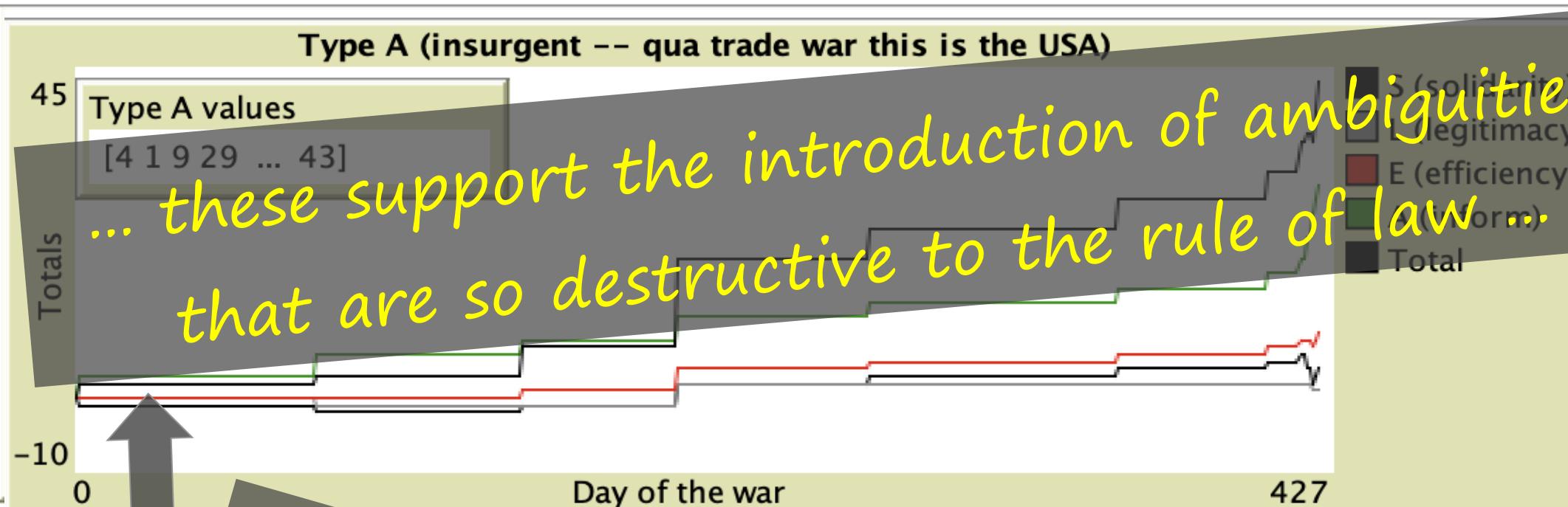
Epiframing the trade war (2): making/reading insurgency timelines

MORE LAW
 Extraterritorials (art. 301)
 Sanctions, coalitions
 Bi- and multi lateral treaties
 National sovereignty, security



- F:2-PRC disputes legitimacy of art 301 tariffs (at WTO) -D:33
 - F:3-USA tariff revision (+\$200 billion) -D:81
 - F:4-Trade gap Q3 up ±10% -D:81
 - F:3-PRC Tariff revision (+\$60 billion) -D:88
 - F:1-USA: announces dual-purpose goods appeals -D:137
 - F:4-USA takes part in dinner & 90 day truce -D:150
 - F:4-PRC takes part in dinner & 90 day truce -D:150
 - F:4-Trade gap Q4 up ±20% -D:179
 - F:4-USA proposed IP-enforcement rules -D:201
 - F:4-USA cancels trade talk on IP enforcement rules -D:201
 - F:4-USA: Trade talks resumed -D:266
 - F:4-PRC: Trade talks resumed -D:266
 - F:4-Trade gap Q1 up ±20% -D:266
 - F:4-Trump threatens to raise tariffs -D:305
 - F:3-USA increases tariffs to 25% -D:310
 - F:4-PRC announces retaliation plans -D:313
 - F:1-USA places Huawei on unreliable entity list -D:316
 - F:4-PRC announces to create an entity list too -D:330
 - F:3-PRC effectuates tariff retaliation plan (60b) -D:331
 - F:3-USA got tariff exemption procedure in place -D:349
 - F:3-PRC got tariff exemption procedure in place -D:349
 - F:4-Trade gap Q2 remains equal -D:351
 - F:1-USA adds 5 PRC companies to entity list -D:351
 - F:4-USA threatens with another 10% on \$300 billion -D:392
 - F:1-USA declares PRC a currency manipulator -D:397
 - F:4-US agrees to talk again in two weeks -D:404
 - F:4-PRC agrees to talk again in two weeks -D:404
 - F:4-PRC announces \$75b. in tariffs (retaliation) -D:414
 - F:1-Trump orders USA companies: look for alternatives to China -D:414
 - F:4-Trump announces at G7 talks with PRC on their request -D:416
 - F:1-Huawei is ready to sell company's 5G tech to Western buyer -D:423
- (i) a two-month lag
 (ii) opaque insurgency-trade gap relation
 (iii) one-day retaliation time
 (iv) an insurgency diversification burst around day 400
 (v) no trust-supporting legal mechanism

Epiframing the trade war: an LRE conundrum



USA places Huawei on unreliable entity list
- [-1 -1 2 3] [-1 -1 2 3] [-1 -1 2 3] 16-316-330-3

PRC announces to create an entity list to
- [-2 0 -1 3] [-2 0 -1 3] [-2 0 -1 3] 17-330-331-0

PRC effectuates tariff retaliation plan (60b)
- [1 0 1 2] [1 0 1 2] [1 0 1 2] 18-331-349-1

USA got tariff exemption procedure in place
- [-1 0 -2 2] [-1 0 -2 2] [-1 0 -2 2] 20-349-351-4

PRC got tariff exemption procedure in place
- [-1 -1 2 3] [-1 -1 2 3] [-1 -1 2 3] 21-351-392-3

USA adds 5 companies to entity list
- [-1 0 -1 2] [-1 0 -1 2] [-1 0 -1 2] 22-392-387-0

USA threatens with another 10% on \$200b in
- [-1 -1 2 3] [-1 -1 2 3] [-1 -1 2 3] 23-397-404-3

USA declares PRC a currency manipulator
- [1 0 1 2] [1 0 1 2] [1 0 1 2] 24-404-404-0

US agrees to talk again in two weeks
- [1 0 1 2] [1 0 1 2] [1 0 1 2] 25-404-414-0

PRC agrees to talk again in two weeks
- [1 0 1 2] [1 0 1 2] [1 0 1 2] 26-414-414-0

PRC announces \$75b. in tariffs (retaliation)
- [-2 0 -1 3] [-2 0 -1 3] [-2 0 -1 3] 27-414-415-0

Trump orders American companies to look for alternatives to China
- [-2 0 0 3] [-2 0 0 3] [-2 0 0 3] 28-415-415-0

Trump wants to buy Greenland
- [-2 0 0 2] [-2 0 0 2] [-2 0 0 2] 29-415-416-0

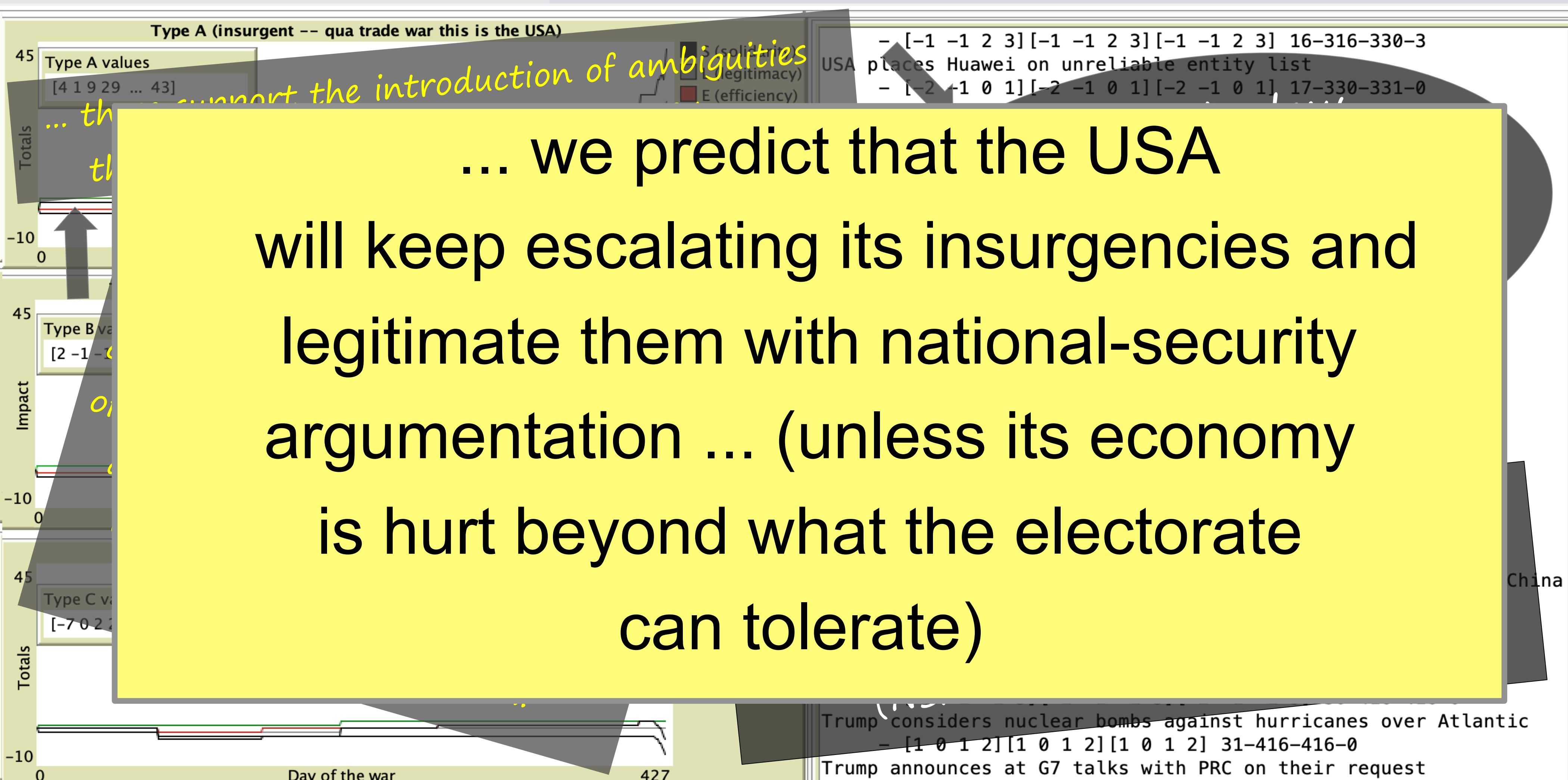
Trump cancels visit to Denmark when offer is declined
- [-1 -1 1 3] [-2 -1 -1 3] [-2 -1 -1 3] 30-416-416-0

Trump considers nuclear bombs against hurricanes over Atlantic
- [1 0 1 2] [1 0 1 2] [1 0 1 2] 31-416-416-0

Trump announces at G7 talks with PRC on their request

Epiframing the trade war: our, not the machine's prediction

... we predict that the USA
will keep escalating its insurgencies and
legitimate them with national-security
argumentation ... (unless its economy
is hurt beyond what the electorate
can tolerate)



On LRE as another target for agent-based modeling

- Concluding remarks (this is work in progress!)

Our contributions thus far:

(1) Introduction of a four-valued, situated, utility concept as an improvement over axiomatic rational, efficient & fixed preferences for investigative agent-based modeling.

(2) Preparation of complexity theory and agent based modeling for application in legal requirements engineering research.

(3) Identification of an essential but missing legal requirements engineering result.

On LRE as another target for agent-based modeling

- Concluding remarks (considering further work)

Find validation mechanisms for 4-value codings of (trans)action impacts.

Find insurgency timelines that legitimate additional micro- and meso-models.

Find suitable business models for application areas in risk assessment research, in contract negotiations and contract design and in mediation for long-term conflicts.

- Preliminary assessment of our approach [-1 0 -1 0]
- the goal is [1 1 1 2]



Thank you! – and thanks to:

Asch, S. 1951. Effects of group pressure upon the modification and distortion of judgment. in: Harold Guetzkow (ed.) *Groups, Leadership and Men*, Carnegie Press, Pittsburgh, Pages 177–190. **Barabási and Albert, 1999.** Emergence of scaling in random networks, *Science*, Volume 286 Number 5439 Pages 509—512 **Bobbitt, Philip.** 1982. *Constitutional Fate: Theory of the Constitution*. Oxford University Press. **Bohorquez, J. C., S. Gourley, A. R. Dixon, M. Spagat and N. F. Johnson.** 2009. Common ecology quantifies human insurgency, *Nature* 462 (2009), 911. **Coase, Ronald H.** 1937. The Nature of the Firm. *Economica*, 4(16), 386–405. **De Marchi, Scott.** 2005. *Computational and mathematical modeling in the social sciences*. Cambridge University Press. **Douglas, Mary.** 1992. *Risk and Blame: Essays in Cultural Theory*. Routledge. **Durkheim, Emile.** 1893. *The Division of Labor in Society*, translated by George Simpson 1965. Free Press. **Fuller, Lon L.** 1967. *The Morality of Law*, revised edition, Yale University Press. **Holland, John H.** 2006. Studying complex adaptive systems. *Journal of Systems Science and Complexity*, 19(1), 1–8. **Johnson, N. F., E. M. Restrepo and D. E. Johnson.** 2015. Modeling human conflict and terrorism across geographic scales, Chapter 11 in *Social Phenomena: From Data Analysis to Models*, Springer International Publishing, 227–254. **A.H. Louie,** 2010. Robert Rosen's anticipatory systems, *foresight*, VOL. 12 NO. 3, 2010, pp. 18-29. **Mihai Nadin,** 1999. Anticipation – A Spooky Computation. Conference on Computing Anticipatory Systems (CASYS 99), Liege, Belgium, August 8-11, 1999 <https://www.nadin.ws/archives/39>. **Mihai Nadin,** 2011. The anticipatory profile. An attempt to describe anticipation as process, *International Journal of General Systems* **Sherif, M.** 1958. Group influences upon the formation of norms and attitudes. *Readings in social psychology*, 3, 219–232 **Wilensky, U. and W. Rand.** 2015. An introduction to agent- based modeling: modeling natural, social, and engineered complex systems with NetLogo (MIT Press, 2015). **Williamson, Oliver E.** 2005. The Economics of Governance. *American Economic Review*, 95(2), 1–18.



dotLegal

Consultancy &
Research

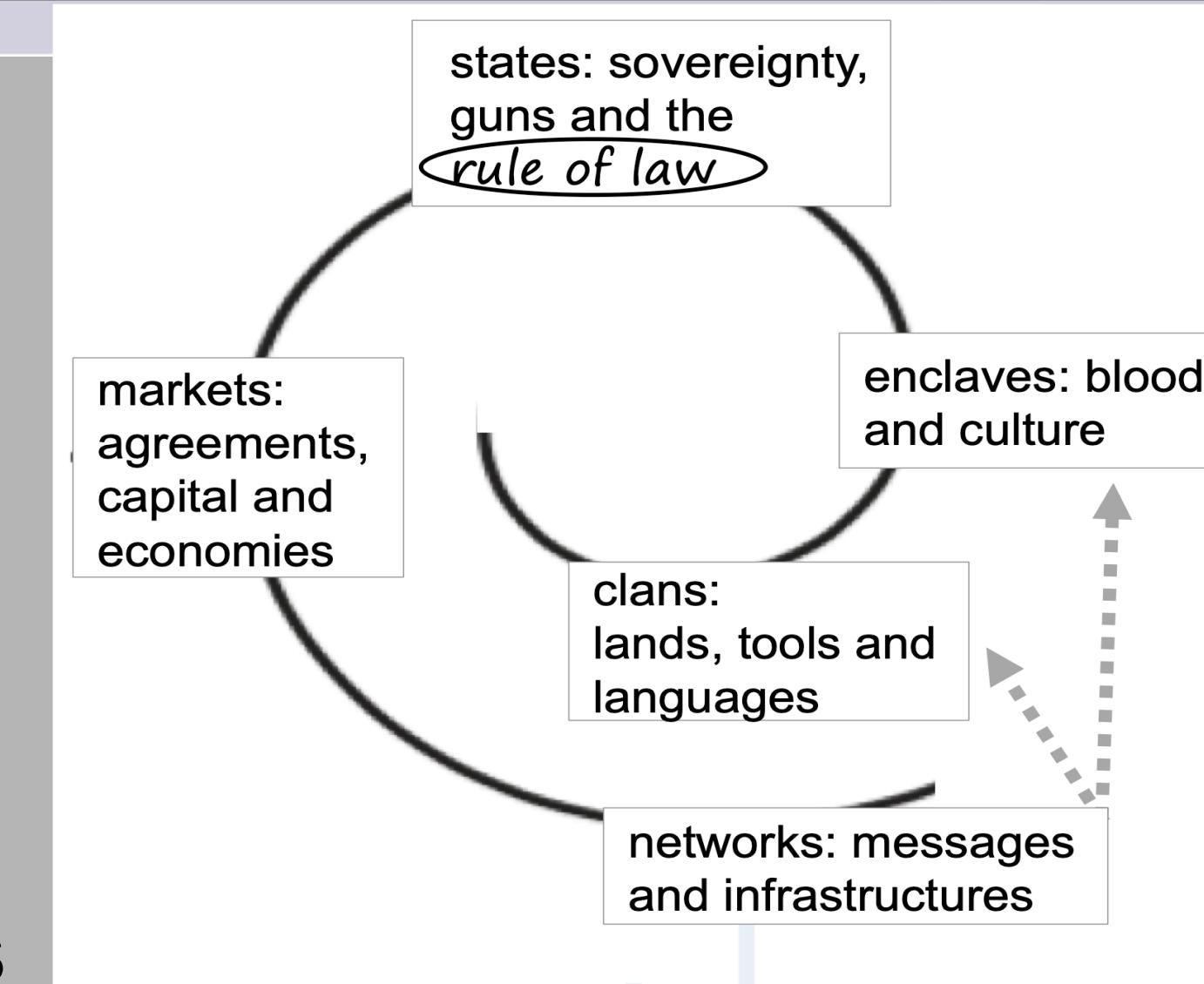


2019 © Aernout Schmidt (Leiden University)
aernout.schmidt@gmail.com

Where are legal practices? (Durkheim 1892 revisited)

With growing technology, numbers and group sizes, four group forms emerged: clans, enclaves, states and markets. They have different ruling mechanisms, different core values and different network architectures. These characteristics are not exclusive: international markets embed states, states embed cultures and cultures embed families. Consequently, each behavioral act between two parties is evaluated by each party with four values concurrently. And is thus subject to 4 regulatory perspectives concurrently. Legal practices focus on one of them.

group form	ruling mech	core value	network architecture
clan	equity	access	random
enclave	norm	honor	wheel
state	law	security	tree
market	contract	capital	preferential



They are grounded in nation states with their claims on sovereignty over rule-making, policing and enforcement. They lag behind international coalescing forces and their results (e.g., treaties and trade wars).

... (cheat sheet for Epiframing extended) ...

Members, civilians, consumers and users can transact and recursively fragment and coalesce in (intermediate) units with diverging organizing and regulating mechanisms. Such can be mapped on power politics.

INSTITUTIONAL FORMS:

1. Cooperatives (wheels)
have members
2. Agencies (trees) {1}
have subjects
3. Corporations (preferentials) {1,2}
have consumers
4. Networks (random) {1,2,3}
have users

Four value foci:

1. honour (trust)
2. security (legitimacy)
3. material wealth
4. visibility (access)

Three agent types:

- A. Insurgents
- B. Incumbents
- C. Dependents

Three agent functions (per group/network):

- i. Root
- ii. Intermediary
- iii. Leaf

One power concept:
the size of the group
(= the size of the network)

