The complexity challenge: Systemist thinking, computational modeling, and pluralism in economics

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Outline

What is the complexity challenge in economics?

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A meta-theoretical reaction: systemist thinking

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A methodological reaction: computational modeling

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The consequence of the challenge: pluralism in economics

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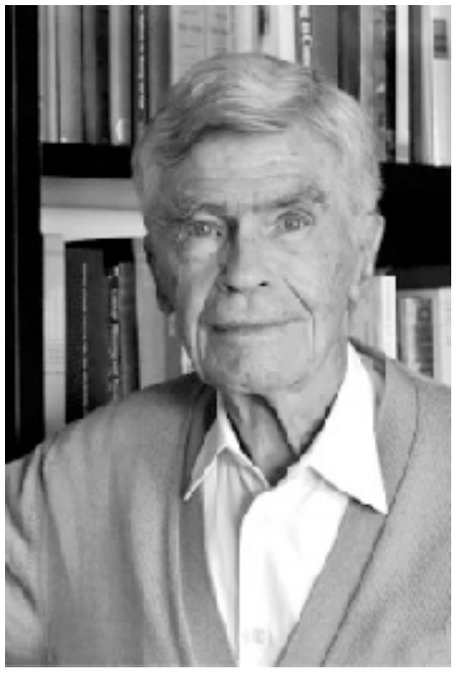
Ontology: what is an economic system?

- Ontology is about the *essence* of a being
  - *Essential* vs. *accidental* properties of beings / systems
- Vantage point: Synthesis of the work of two very distinct authors



Mario Bunge: What is a system, in particular a social system?

Picture removed due to copyright

Warren Weaver: What are simple and complex problems?

Picture from: https://en.wikipedia.org/wiki/Mario_Bunge#/media/File:MarioBungesmall.jpg

The complexity challenge in economics

- Every research starts with ontology
- Socio-economic systems seem to be *complex*
  - They consist of many heterogeneous and adaptive parts
  - These parts interact with each other
  - Structures emerge and feed back on the parts
  - The parts and the systems co-evolve over time
- The concept of complexity comes from physics
- Most scientific challenges today consider complex systems

The complexity challenge in economics

What are the consequences of economies being *complex*?

Epistemological: We create knowledge differently than for *simple* systems

- A time- and state-independend positivist epistemology common in economics is not suitable
- That is why physicists do not use Newtonian theory for complex systems

Methodological: What kind of methods are useful?

- The *maximization-cum-equilibrium* approach and the focus on Lagrangian optimization is useful for simple systems (Newton!)
- It is rather misleading for complex systems

- Mainstream economics has to change – but how?

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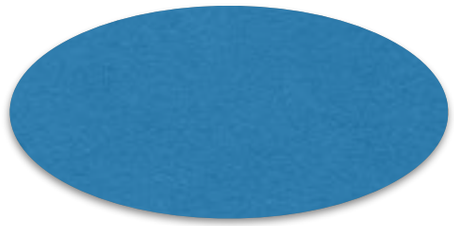
How to order our thought(s): Systemism

- Vantage point: every entity is either a system of a part of one

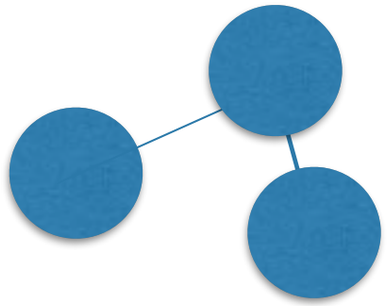
- Every system carries certain *mechanisms*

  - Main subject of *analytical sociology*

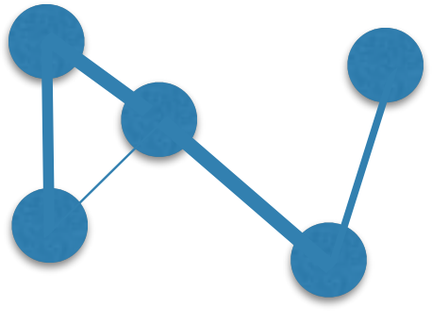
- Result: *layered ontology,* as it can already be found in evolutionary-institutional thought



Entire system (‚Macro')



Subsystems (‚Meso')

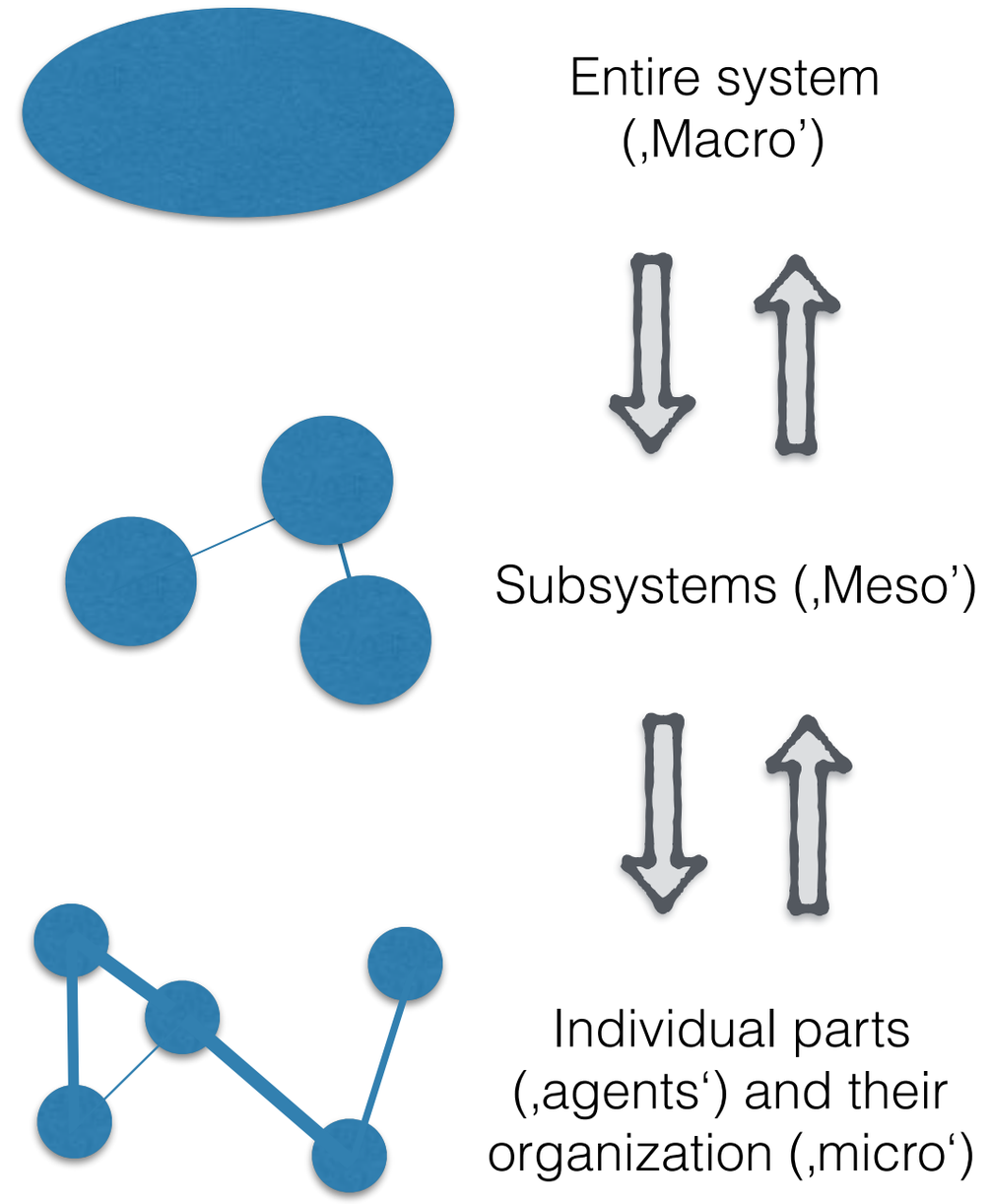


Individual parts (‚agents') and their organization (‚micro')

Gräbner & Kapeller (2016): The micro-macro link in heterodox economics, in: Jo, T.-H., Chester, L. & D'Ippoliti, C. (eds.) *The Handbook of Heterodox Economics.*

How to order or thought(s): systemism

- Aggregation as a central element in the investigation
  - *Emergence*
- But also: *top-down effects*
  - *reconstitutive downward effects*
- Classical example for a meso element: institutions
  - Shapes behavior of individuals
  - Is constituted and affected by individuals



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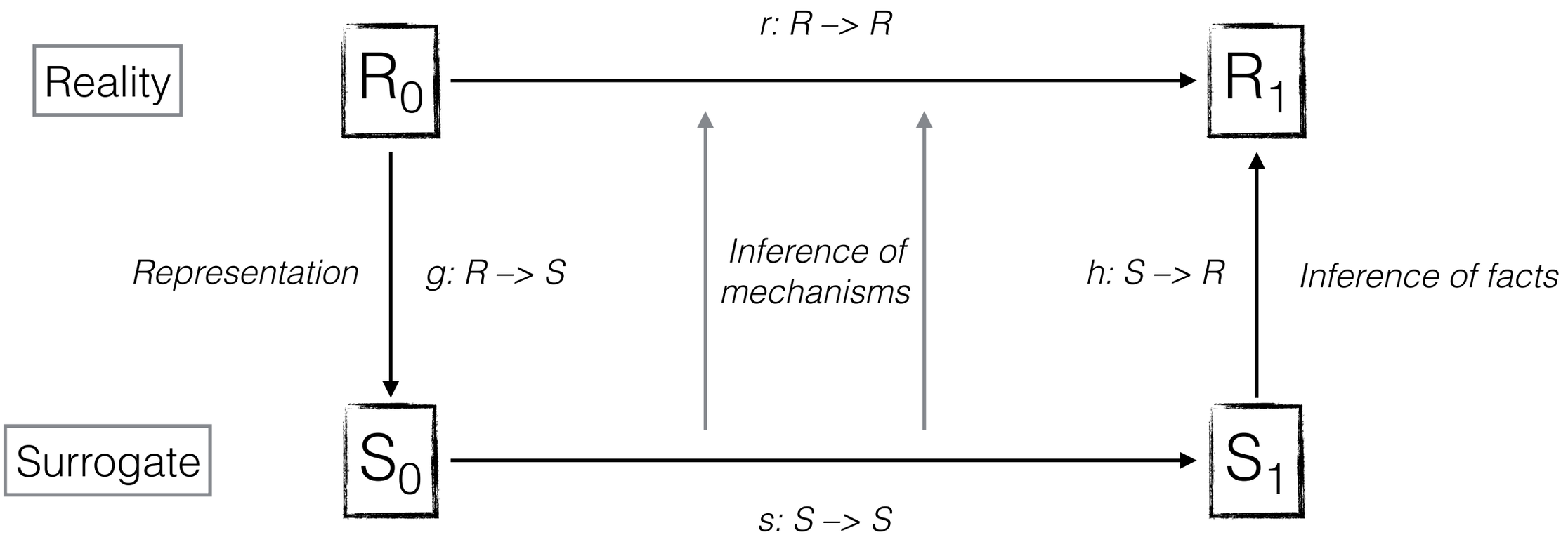
The epistemological challenge

- We know what is out there, but how to study it?
  - Further development of Mäki's *Models as Isolations and Surrogate Systems* (MISS)



My personal specifications

1. Through *systemism*
   ➡ Mechanism-based explanations
2. Through *evolutionary-institutional theory*
   ➡ Principle of evolutionary explanation
3. Through theory on *computational social sciences*
   ➡ Criterion of generative sufficiency

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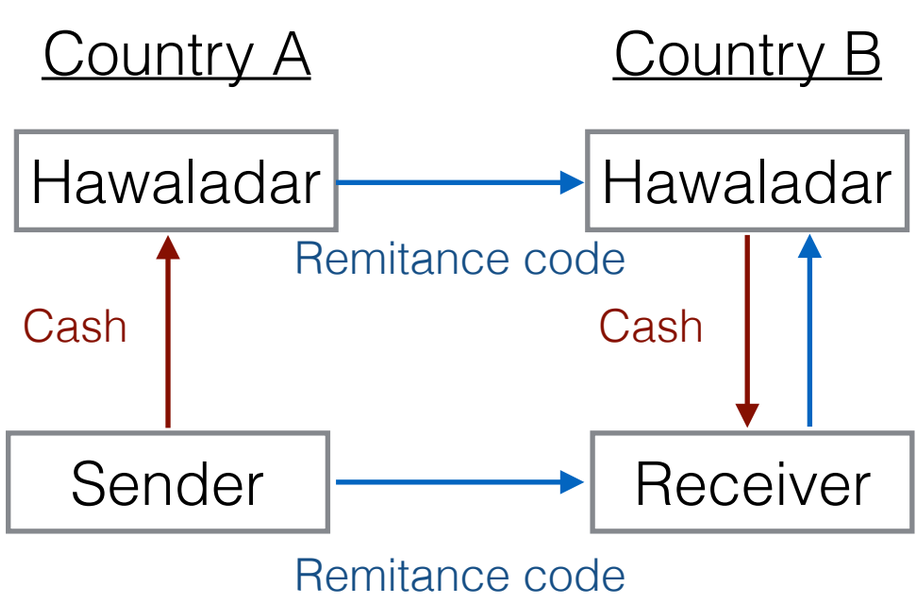
Computational models

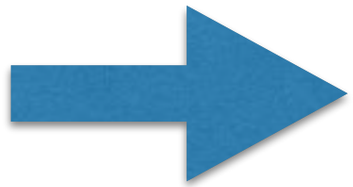
- Computational thinking/modeling greatly facilitates the identification of social mechanisms
  - Does not need to be a computer simulation
    - …but it is often required
  - Does not need to be formal
    - …but it is often very helpful
- The model and the theory always come together
  - So do words, equations, algorithms,…
  - Great potential for history of economic thought approaches

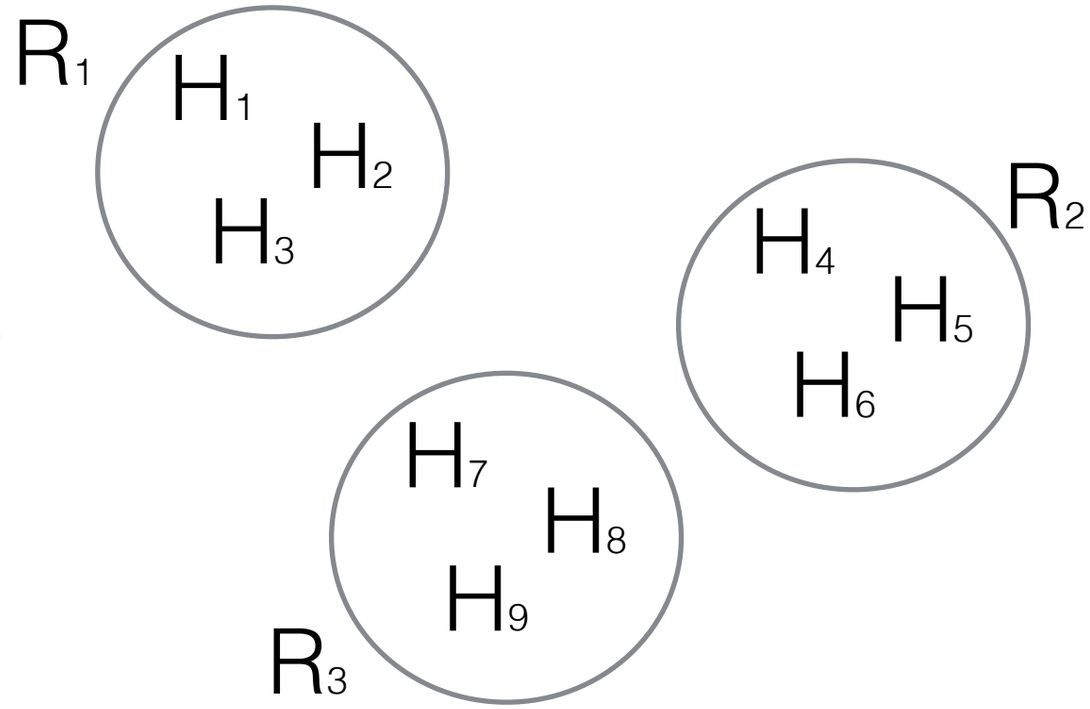
Simple example for a qualitative computational model

- Huge debate on the importance of *trust* and *social control* in various circumstances
  - Difficult to distinguish analytically
  - Here: model of the functioning of informal value transfer systems
  - Translation into computational terms extremely helpful

The Hawala financial system





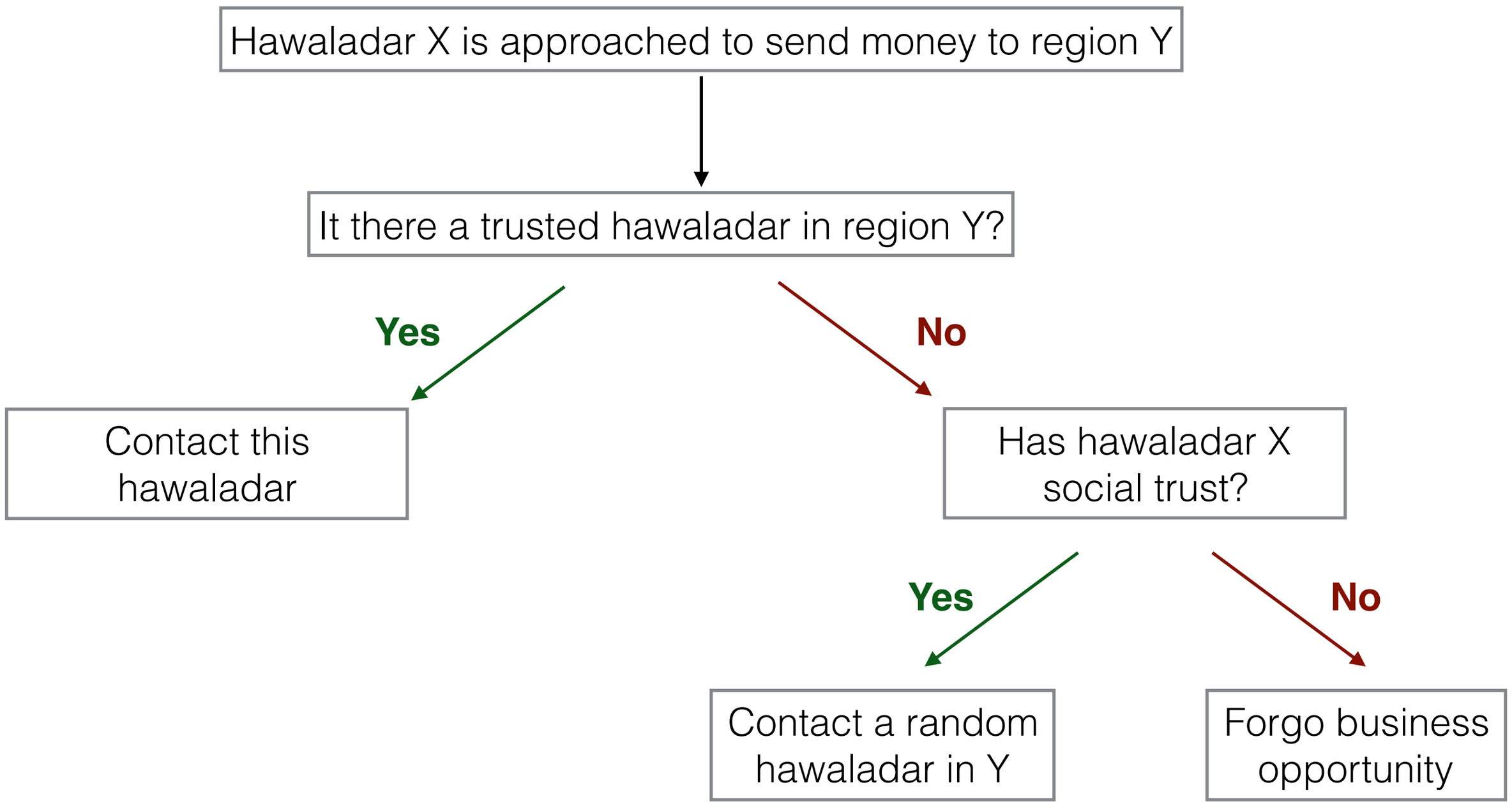


After a completed transaction, all formal traces are destroyed

Very clear mapping from theoretical concepts to model artifacts

- Trust: willingness of an honest agent to interact with a stranger
- Social control: ability to reject interaction with a former cheater

Example for heuristic decision making



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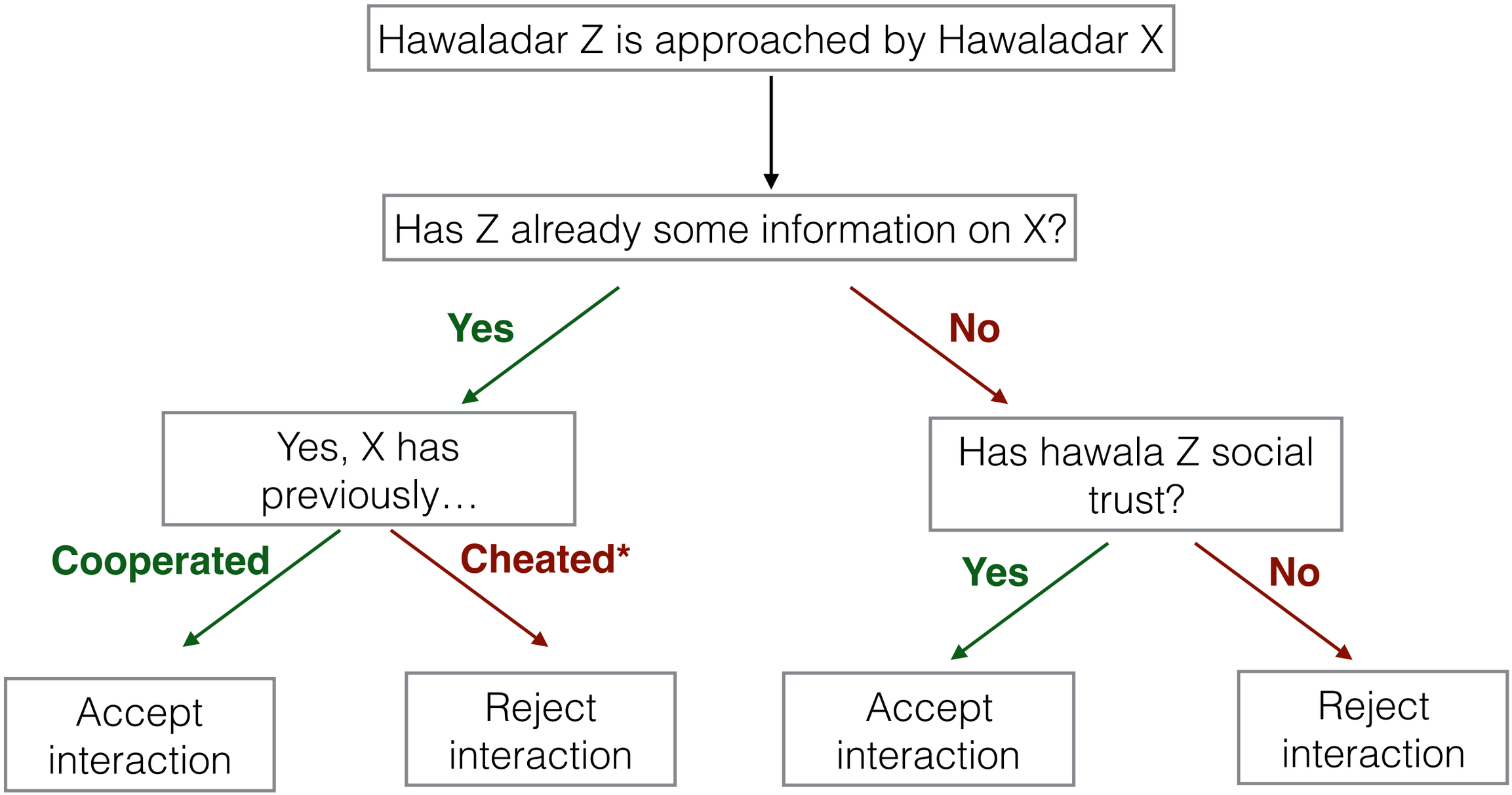
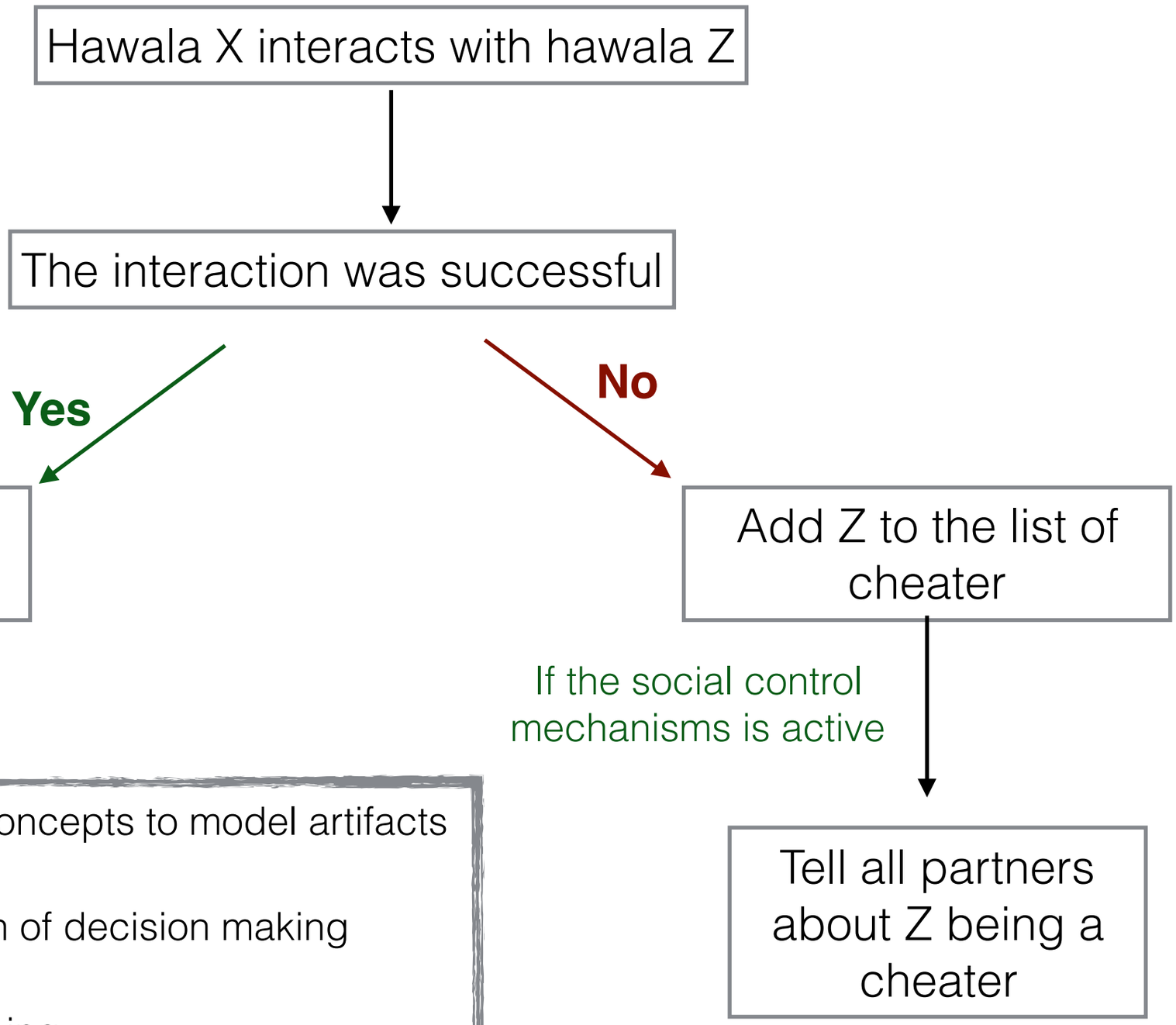


Example for heuristic decision making



Very clear mapping from theoretical concepts to model artifacts

- Very precise and flexible formulation of decision making
- Results exact and potentially surprising

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The importance of pluralism

- Every reasoning reduces the complexity of its subject of investigation
  - Given the complexity of social systems, there are many ways to reduce their complexity
- Particular strategies of complexity reduction (i.e. research programs) feature *increasing returns*
  - May lead to lock-in and inefficient outcomes
  - Pluralism does not come by itself

Productive vs. unproductive pluralism

- Given the many different approaches, it is difficult to communicate among them
- Finding a common language is impossible, but we can and must try
  - Flexible computational models could be a way
- Simply explaining why the others are wrong is not enough
  - We need a productive eclecticism which requires the ability of *paradigm switching*
  - In the end there need to be competitive alternatives to the dominant approach
- All this requires us to be honest about the subjective and political element in scientific inquiry

Conclusion

I. Social systems are complex

- This has ontological, epistemological and methodological implications

II. There are many reasonable ways to reduce the complexity of social systems

- Pluralism is inevitable for successful science - but it does not emerge naturally
- There is a competitions among different ideas, with a ‚natural' tendency towards monism
- One also needs to develop constructive alternatives to dominant approaches

III. Pluralism must be made productive

- Explicit meta-theoretical frameworks can help to facilitate communication
- Computational models as a common language?