

## Misunderstandings about formalization

Jeroen Bruggeman (2002, with minor changes in 2007), initially written as Appendix to Bruggeman and Vermeulen (2002), although not published as such.

Among sociologists, anthropologists, and others, there exist pervasive misunderstandings about formalization. I attempt to clarify some of these misunderstandings each in turn, starting with "logic." In common usage, the notion logic has been "hopelessly devaluated", as logician Van Benthem said. Not only is it used, as it should, to evaluate arguments, but also rethorically to persuade readers to believe questionable arguments without further questioning, and to indicate causal mechanisms, which however have nothing to do with logic. One of the ramifications of this devaluation is that some reviewers of sociological journals put forward as counter-argument against a proof an intuition -without any formal specification- blissfully unaware that a proof can only be refuted by pointing out a mistake in it.

"Formalization can not be applied to all scientific theories, only to some." The latter, then, are theories that to various extent simplify phenomena of interest. However, people always approximate and thereby simplify the phenomena of their interest in their (mental) models (see the extensive literature of cognitive psychology). They are forced do so because the full blown complexity of the world can not be handled by human cognition. Even "thick descriptions" leave out, among others, subtleties of non-verbal communication. The latter can be filmed, but a film in its turn leaves out what's outside the camera's frame. In short, all methods of observation and all styles of theorizing leave out something. Whereas in formal theories it is rather obvious what has been abstracted away from, this is far less clear in "thick descriptions," which some readers mistakenly interpret as (nearly) complete accounts of social life. Obviously, the challenge is not to avoid simplifications but to make accurate and relevant approximations and abstractions, which is an "art" in itself. In particular, if one wants to make general statements, one needs a higher level of abstraction than if one wants to depict a unique phenomenon in great detail. The choice of level surely affects one's model(s) and theory, but detail and generality are matters of degree. Therefore there are no social theories that could not be formalized for any fundamental reason, even though not all subtleties of natural language can be translated into formal language. If on the descriptive level one wants to literally represent what people say, however, without losing *any* detail of conversation, then formalization is neither possible nor would it make sense.

"One can not make a consistent theory about humans because they (or some of them) have inconsistent desires." Here the object-level, of social actors and their desires, is confused with the meta-level, of a theory *about* actors and desires (this counter argument was initially made by Pareto).

"Social phenomena are too complex to formalize." If a scientific theory can be stated informally, then it can, in principle, be formalized as well. But if the theorist has no sensible ideas about the complex world around him, then formalization will not help him either.

"Only quantitative phenomena can be formalized, not qualitative." Phenomena are neither quantitative nor qualitative. This distinction is artificial, as phenomena (or

values of the variables capturing them) can arbitrarily be labeled with names or numbers. Their ordering relations are what matters, and orderings can be formalized.

“Assumptions are statements that are not tested empirically.” In empirical sciences, all claims about empirical phenomena should be testable and eventually tested, most certainly assumptions. Freese (1980 p.202) says that “before a statement can be used in inference its truth or falsity must be determined.” This is asking a bit too much, though, because in formal logic one is free to draw a true conclusion from either false or true premises. The definition of inference requires that from true assumptions only true conclusions are drawn, which is less than Freese asks for, although he is right about empirical claims.

“Theories can be logical only in degree.” Here, absolute logical properties (consistency and validity of inference) are confused with relative empirical support. In the latter sense, no empirical theory is absolutely true, of course.

Freese (1980) argues that because logical calculi are limited to two values, true and false, mathematical equations have less limitations than logical calculi have (p.199). However, any mathematical equation can be written in logic, and limitations of logic have nothing to do with truth values. A related confusion exists between binary truth valued logics (true or false) and statistics. In a two-valued logic one can reason about an infinite number of probability values, although the statements about these values can be only true or false.

“Formalization is positivism.” What is usually meant by this claim is that formalization (1) implies universal laws, or (2) is a commitment to “closed systems,” or that it (3) requires a naive belief of the formalizer that formal theories (should) neatly correspond to an objective reality. (1) By skilfully indicating the intended domain of a theory, or by making restrictions explicit in the antecedents of assumptions and theorems, a universally quantified sentence implies that validity is claimed neither for eternity nor for all objects of a certain type. (2) A closed system is neither a constraint imposed by formal languages, as one can model open systems formally, nor an ontological commitment on the part of formalizers. (3) Some informal scientists prefer to imagine that formal scientists are hopelessly naive rather than to study what formal methods may contribute to their fields.

“If formalization of sociology were to succeed, we would eventually get to the foundations of the discipline.” In geometry, for example, it was shown that the axioms believed to be fundamental for thousands of years can be replaced by different axioms that are equally fundamental. Sociology does not have such foundational axioms. As logical formalization is concerned, logic only tells whether conclusions are true given that assumptions are true. For each assumption, one may require an explanation of its own, based on more “fundamental” or at least different assumptions. There seems to be neither an obvious end to this inquiry nor a need for it.