Minimal Models, Minimal Results

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Abstract

Philosophers and scientific modelers across a wide range of disciplines frequently rely on models to articulate and assess *modal claims* about real-world targets (e.g. Frigg, 2022, ch.9-12, Godfrey-Smith, 2006, Weisberg, 2013, ch.5-7). Over the last decade, there has been growing debate in the philosophical and scientific modeling literatures regarding the extent to which (and under what conditions) consideration of scientific models can provide *modal knowledge* about real-world targets (e.g. Massimi, 2018, Williamson, 2016, Wilson, 2021). However, widespread disagreement remains concerning the issue whether consideration of so-called *minimal models* (henceforth, *MM*) - i.e. models that "lack any similarity, isomorphism or resemblance relation to the world, (are) unconstrained by natural laws (and do not) isolate any real factors" - can provide such knowledge (Grune-Yanoff, 2009, 83; also Fumagalli, 2016, Nappo, 2022, Reutlinger et al., 2018, Verreault-Julien, 2022).

In recent years, leading authors have argued that "this disagreement rests on a misconception of the relevant possibilities" and have built on the distinction between *epistemic possibilities* and *objective possibilities* to "dissolve" such disagreement (Sjolin Wirling and Grune-Yanoff, 2022, 2 and 18). In their view, "heeding (...) the distinction between epistemic and objective notions of possibility" allows one to demonstrate that consideration of MM can enable philosophers and scientific modelers to ground justified claims of objective possibility about real-world targets and thereby show that those who disagree "are mistaken" or "talk about different things" (ibid., 1 and 17; also Grune-Yanoff and Verreault-Julien, 2021, 116). Let us call the claim that consideration of MM can enable philosophers and scientific modelers to ground justified claims of objective possibility about real-world targets *MEMM* ('modal epistemology meets minimal models'). If correct, MEMM would have far-reaching implications for both philosophers and scientific modelers, since claims of objective possibility are articulated and discussed in several areas of philosophy (e.g. Berto, 2017, on metaphysics; Nagel, 1998, on philosophy of mind; Van Inwagen, 1998, on epistemology) and scientific disciplines (e.g. Massimi, 2019, on physics; Sugden, 2000, on economics; Weisberg, 2013, on biology).

This paper combines insights from scientific modeling and modal epistemology to critically assess MEMM. The paper then defends the thesis that consideration of MM cannot provide modal knowledge about real-world targets in the sense indicated by MEMM - i.e. cannot *per se* ground *justified* claims of objective possibility about such targets - against several prominent objections that draw on the specialized literature on scientific modeling and modal epistemology. This result by no means excludes that philosophers and scientific modelers may gain valuable modal knowledge about real-world targets through consideration of

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highly idealized models (e.g. Reutlinger et al., 2018, on models that assume away factors that are known to causally influence modelers' targets; Weisberg, 2013, on models that distort modelers' characterizations of their targets to make these characterizations computationally tractable). Still, it provides compelling reasons to relinquish the most stringent definitions of MM and ground the ongoing debate about the epistemology of scientific modeling on more informative notions of models.

The paper is organized as follows. Section 2 outlines leading authors' case for MEMM and illustrates such case with some examples provided by the proponents of MEMM. Section 3 explicates and supports my thesis that consideration of MM cannot provide modal knowledge about real-world targets in the sense indicated by MEMM. Section 4 defends my critique of MEMM against several objections that draw on the broader literature on scientific modeling and modal epistemology, namely: the objection from *imaginary worlds*; the objection from *inferential accounts of representation*; the objection from *logical possibility*; the objection from *hypothetical targets*; the objection from *fictional targets*; and the objection from *nomologically impossible* targets.

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