Yes, physical and social systems may be modeled with similar tools!

There is a strong aversion to building and using mathematical models among many heterodox economists. They correctly criticise the infatuation with complicated mathematics in the mainstream, which use advanced math to tinker with models that have little relevance for the real world, or are plain wrong. The ironic label "physics envy" is often heard, and this is quite appropriate in my opinion. Among many in the heterodoxy, this leads to an attitude that economics in a meaningful sense have to be done verbally.

Since I am very critical of the neoliberal mainstream in economics, I sympathise with these critics. But I disagree with their attitude against mathematics and modeling in economics. In my opinion, their aversion against neoclassicals' infatuation with "modeling" and (wrongly applied) maths, leads them to throw out the correct modeling and relevant maths baby with the bathwater.

In my world (modeling of dynamical systems), both social science research objects and physical science research objects have several traits in common. This allows us to approach social (including economic) systems with similar mathematical and simulation tools as for physical systems, *with one crucial caveat which will be discussed further below*.

But first, a brief definition of a "system": It is *a collection of units which interact which each other, and is also influenced by the system's surroundings*. The characteristics of the different units, of their interconnections, of the connections to the outside and of the signals influencing the system through these outside connections, decide the movements of the system over time -- its dynamics.

Some basic points when working with models of systems are:

1. Any system to be studied is influenced by its surroundings, however you have to decide what you consider to be part of the system and what should be considered to be the "outside".
2. You also have to define what ought to be considered as components (units, states) of the system, and their properties and interactions. A component will usually be a system itself, on a lower level in the hierarchy, but may be considered as just some type of simple unit (component) in the higher-level system to be modeled.
3. Systems with some level of complexity will often display behaviour that you couldn't predict by studying its components. This is called *emergence*, and is one of the most important motivations for modeling and simulation.

The above holds for both physical *and* social systems! This indicates that one should -- as stated above -- be careful not to throw the modeling baby out with the neoliberal bathwater. That said,

... there is one crucial difference between physical and social systems:

The latter category contains "components" (in fact: humans) that are *conscious*!

If these "components" understand the system that they are a part of, they will adjust their behaviour, which again means that the system will get changed dynamics -- in many cases, dramatically so.

To illustrate the difference we may use the example of a dangerous pandemic among animals as opposed to humans. In the animal pandemic they will infect each other regardless of dramatic developments with mass death. In a human similar pandemic people will change their behaviour because they are made aware of the infection mechanisms, and mass death will be (mostly) avoided. Both systems have the same infective mechanisms: *contact rate*, *infectivity* (= infection probability when in contact), incubation time, etc. In that sense they may be modeled in quite similar ways (the reader may google *SI* and *SIR* models). But they differ because of the *system insight* of its units. Thus a valid model of a system containing humans (including economic systems) also has to incorporate changes in behaviour because of communication between system "components" and their understanding about how the system that they are part of, works. In the pandemic model this means that, while having the same structure, parameters and variables as the version for animals, one must add connections from the amount of infected units to parameters -- such as contact rate and infectivity (both will be reduced because people -- as opposed to animals -- start to avoid others during a pandemic, and they also try to reduce infectivity in situations where contact cannot be avoided).

Note however that some sort of system insight is not an exclusive human trait. It also exists to a certain degree in animals. An example is pack hunting (wolves), where individuals behave based on knowledge of the workings of the group. But there is a difference from humans in that group behaviour in animals is mostly hard-wired and a result of evolutionary selection, while humans can deliberately construct societal systems and then adjust their behaviour to achieve the system's goals. Or they can do the opposite: try to exploit weaknesses of the system for own gain. In both cases system insight is required. Perhaps we could distinguish between *system insight* (humans) and *system awareness* (humans and animals)? (One could possibly include a third and even lower level of individual behaviour that exploits membership of a system: Ants use chemical signals to communicate with one another, and through this establish beneficial trails for foraging. But here it is probably more reasonable to consider the system of ants to be one big organism, so we exclude it from the discussion here.)

The general conclusion is that dynamical modeling of social systems with tools from modeling of physical systems is perfectly meaningful, but *only if one accounts for (the big consequences of) the system insight of the human "components"*.