Can Economics Afford Not To Become Natural Science?

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The moot question is: "Can economics be a Physical Science?" I would rather address a more general question: "Can economics or sociology avoid joining Natural Science?"

The answer of course depends on how we look at sociology or economics. Are they going to remain prescriptive as part of ethics (as often in political economics, or as social norms evolved through the history of the human kind) or they aspire to be a meaningful "tool" or "model" to comprehend the social dynamics and be useful to "engineer" the social dynamics when needed.

Epistemologically, our knowledge about truth can be either deductive or inductive. Mathematics is an usual example of the deductive knowledge (though not all of it can be deduced from axiomatic logic). Mathematical truths do not necessarily require any laboratory test or supports from "observations" of the "nature" to prove or validate them. Linguistically it is like the tautology "A bachelor does not have wife"; one need not check with each and every bachelor to confirm the statement – first part of the sentence confirms the second. The same is true about the statement "two plus two equals four". Mathematical truths are analytical truths, and mathematics therefore is not generally considered to be an empirically founded science, though it has been historically considered as the "mother' of all natural sciences. Mathematics is employed as a condensed form of the (deductive) logic, and as such, does not by itself reveal any new truth about nature (Whitehead & Russell, 1911-13, see also Kneebone, 2001). Natural sciences, however, are basically inductive in origin, based on natural or laboratory observations. The statement "The sun rises every twenty four hours on the east" is not a tautology or analytical truth. Though east may be defined as the direction of sun-rise, that it rises every twenty four hours, is an inductive (or empirically observed) truth, and therefore tentative (not like mathematical truths). The tools of mathematics and logic are employed to find and establish rela-

tionships among these observations, sometimes with the help of a common (abstract) hypothesis about the functioning of the nature (see e.g., Russell, 1967).

Mathematics has played, and still plays a significant role in developing the consistency logic in any natural science. This is particularly true in physics. In chemistry and biology, its role is gradually being replaced by (linguistic) logic. Even in Physics, there are increasing replacements by (gate based) computer algorithms or Boolean logic. There are even arguments that a new kind of (natural) science will be developed soon and will replace all our mathematics and linguistic logic by computer algorithms (Wolfram, 2002). Even when the mathematics is employed as the major tool in developing any natural science, as in physics, it is considered as applied mathematics; it does not generally contribute to the development of mathematics, as done by the mathematicians. Hence, even mathematical physics need not be confused with mathematics itself! Novel applications of mathematics do not lead to any success in physics unless it builds on empirical facts and leads to predict or engineer other empirical facts. Also, approximate mathematical solutions in the intermediate steps to comprehend the nature are most welcome (see e.g., Stanley, 2013; Weatherall, 2013). Even at its best, such intermediate analysis is just applied mathematics, and not (pure) mathematics. The same should be true for mainstream economic theories today. They do not by themselves contribute to the development of mathematics or to the development of economics as science, unless these (applied) mathematics comes at the intermediate stage to take us to the predictable set of empirical truths from the (base) set of observed truths .

Major use or application of one field to another never leads to identity: In any concert, many instruments are used, including the sound system, which is common. This never suggests identification of the concert with the sound system! More seriously perhaps, most concerts employ a piano or a harmonium whose players play key roles. Yet, the main conductors of the concerts may not be those players, nor even players of those instruments! Applied mathematicians need not be identified either as (natural) scientists or as (pure) mathematicians! These mistakes can be costly: "I suspect that the attempt to construct economics as an axiomatically hard science is doomed to fail" (Solow, 1985).

These quantifiable links between the seemingly often unrelated observations help to identify the generic truths of nature and form the basis for

comprehension of the scientific (observational) laws. However, the perception and comprehension of truth can be partial and incomplete. A proverbial Indian story (Buddhist Udana) depicts a few blind people touching different parts of an elephant: the trunk, tusk, leg, tail etc., and interpreting them as different animate or inanimate objects depending on their own perceptions, ideas or experience. Physicists, chemists, biologists, all tend to do the same. Economists or sociologists tend to make the same mistake more dramatically! In all its various manifestations, inanimate, biological or sociological, mother nature perhaps employs the same elegant truth code, the gene, which gets suppressed partially and expressed differently in the various parts of her body. Scientists having different perspectives in mind perceive them differently. The generic truth established therefore in one branch of natural science (say, in physics) should not be invalid in another (say, in chemistry or biology) and the same should hold true for economics if viewed as another branch of natural science (Chakrabarti, 2013).

As argued earlier, mathematics in itself can not lead to any satisfactory theory or model of any natural system, unless the theory or the models are based on hypothesis connected to some observations. Even approximate and tentative attempts to connect various observations, employing (deductive) logic or mathematics can lead eventually to a successful theory or understanding about the nature. And that can be utilised to predict or suggest desired outcomes in different contexts, leading to successful and much desired engineering. Natural sciences therefore start with observations and end in observations; in the middle it grows in successive stages as the tentative models and theories try to accommodate more and more of the observations or data in more elegant and comprehensive way. Indeed, "lots of fields use mathematical models to understand the world. But physicists have a particular way of thinking about approximation and idealization. To make progress on interesting problems, physicists always have to make assumptions and approximations" (Weatherall, 2013), allowing respective engineering. In my mind, the mainstream economics is paying a heavy price of making this mistake, by refusing to address the social engineering problems!

Economics, apart from its wisdom to become a hard science with axiomatic or mathematical foundations, also suffers from its seemingly immediate practical ambition of policy prescriptions under the garb of political economy. In absence of any real science of economics which can be implemented for any kind of social engineering, this high-handed prescriptions

create even more problems. The historical origin of the concept of inviting the involvement of politics or the government in individual's economic activites derives from the mercantile experience in the colonial days. British merchants, who would even set prices on their own terms in colonies like India, observed growing instatbilities or unemployement in their home market in years whenever there was a net trade deficit (export less than import, leading to a net outflow of gold). Mercantiles prescribed involvement of the government (third party) to introduce taxes on import to control the loss of effective demand resulting from the "laissez-faire" of otherwise free individual traders or economic agents. Political economy was born to adovocate such appropriate measures. Later, this was further strengthened by the "Keynesian prescription" (Keynes, 1936) of fiscal measures by the government to curb the loss of effective demad or slump and the increased unemployment. In absence of any real foundation, one does not know when such prescriptions work and when not (see e.g., Harcourt & Kriesler, 2013). Even with such great insights and intentions, economics has failed so far to comprehend the social instabilities. The appointments of powerful finance ministers (with completely different level of assignments of the science ministers, who can never participate at any such root level) by the respective governments perhaps further worsen the situations all over the world! These also suggest some major review are needed for developing "scince of economics" urgently.

As mentioned above, mainstream economics today hardly cares for the subject's success in applications or social engineering. This has led to the recent upsurge of some heterodox approaches, including Econophysics. Econophysics (term coined in 1995 in a conference on statistical physics in Kolkata) views the problems in economics in a physical way and attempts to solve them employing the techniques of physics. Indeed, viewed more generally, it tends to believe that the dynamical aspects of the societies and of the markets in particular are purely physical in origin and nature, in contrast to the academic belief in economics that the complete economic world can be understood based on axiomatic logic.

The knowledge and truths of social sciences like economics can only be empirical or inductive like in physics or other natural sciences, where deductions or logical derivations, correlating various empirical observations, are essential for their comprehension, growth and strength. But that need not be mistaken to be an indication for an essentially deductive science, where logical elegance or mathematical beauty can dictate the truth! Just

like biophysics or biochemistry (each borrowing established knowledge i.e. truths from the parent subjects like physics or chemistry to develop biology), econophysics can help to develop economics utilizing the knowledge borrowed from physics which, being the oldest and most established of all the natural sciences, can offer a major helping hand. Hence the inevitability of econophysics.

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