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Austrian and Mainstream Economics on Mathematics – a Comment on Pieniążek (2018)

The case of faulty generalization

The greatest value of Pieniążek's piece (2018) is its discussion about some of the failed arguments against the tools used in the "mainstream economics" (I have reservations whether to use that term or not; perhaps "neoclassical" would be a better term). Particularly targeted are mostly Mises and Rothbard's general attacks on the usage of mathematics. Some of the important and relevant points made by the author are about outdated nature of anti-mathematical arguments (models have changed) and about their incorrectness even in the past circumstances, such as in case of "mutual dependence" as opposed to causality (for example Pieniążek 2018, p. 220). The general conclusion to be drawn from those inquiries seems to be firm and overall correct: Austrians have not made ultimate *general* arguments about the misusage of mathematical methods in economics. So far so good.

I do not have a problem with such inference as the riddle with Pieniążek's article lies elsewhere: in the abstract of an article and in a concluding section. The abstract and introduction start with a very promising notion about the discussion of alternative paradigms in economics. It has been stated: the aim of the article is to discuss whether the Austrian School can be a promising alternative to mainstream economics. And how is this aim to be achieved? In the next step the aim is watered down to study of Austrian School's methodology. That in itself is already disappointing, since methodology of economics is not really economics just as much as Austrian School's methodology is not Austrian School's economics (especially since he seems not to find very big gap between Austrian's approach and alternative approaches). Following the comments on method he plans to mostly discuss some of the Austrian arguments against general usage of mathematics.

I am ready to side with him that the arguments about general usage fail. Moreover, only arguments against particular usage seem to make much more sense, since they are based on more concrete analysis and dwell around sensibility of unrealistic assumptions used in economic theorizing (as Pieniążek lucidly points out on page 225). Nevertheless, the path between accepting those two premises (as Pieniążek and me would probably

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agree on them) and accepting a thesis that Austrian School offers no alternative to "mainstream" economics is actually huge. It is a faulty generalization at its best – a mistake committed both by some of the Austrians commenting on mathematics and by the author making the claims about the Austrians commenting on mathematics.

Good football players play well and often with their heads. Lionel Messi does not do so very often, but it does not make him a weak football player. Similarly, good economists often make good arguments about general usage of mathematics in economics. Some of Austrian economists do not do so often, but it does not make them weak economists, or Austrian economics weak in general. Pieniążek has defended a convincing thesis that some general Austrian arguments about mathematical economics do not work. From such (acceptable and defendable) thesis, however, his general conclusion about the Austrian School does not follow as it is not supported by arguments.

Thinking and meaning are more fundamental than ways of presentation

My above argument is a somewhat trivial query, which I feel should be supplement by a more promising remark. After all, discussions in economics should be about something more than just clarity and ordering of the arguments. Pieniążek's contribution is in there, but it is just improperly stated. Let me try to make further a small case about the usage of mathematics, alongside what Pieniążek (2018, p. 229) has intelligently stated about letters and symbols.

Mathematics is probably a *language*. For the sake of this note I may assume it is. My assumption may be realistic or not. Let me verify that with some of linguistic studies.

While discussing the issue of mathematics and verbal economics there is a lot of room for misconceptions and misunderstandings. Now, if only the usage of algebraic symbols would make things better. The reality is that even the word "language" itself appears to be used improperly or inconsequently. When linguists discuss nature of language they often start off with i-language, or an internal thinking device which is rudimentary for abstraction, thought process and systematic theorizing (Berwick and Chomsky, pp. 89–90). In that sense language is definitely more fundamental than both "mathematical" economics and verbal economics. In other words, language at core is a thinking device, not primarily an external device (which is the next step). Now of course, i-language cannot be *just* an internal device, because its capacity to generate meaning is accessible to any other rational being. Or to paraphrase Wittgenstein, there is no such thing as a private language. Language as a thinking tool inherently opens channels for rational communication.

All right – I guess I may have to back out from my initial claim. Mathematics is not a language, but the means of expressing and communicating thinking. Particular symbols, be it letters, drawings, diagrams, or numbers are merely tools expressing the lines of thought. They are not the real *content* in itself. That seems well apply to economics, in which all symbols and letters require some frame of reference.

How is it with "mathematics" in economics?

After recognizing mathematics as the means for communicating thought, a more challenging question arises: how do we tell the difference between mathematical and non-mathematical ways of communicating? The student from elementary school would hardly have problems with that as she associates specific symbols with mathematical tasks. Yet as

we move more into the nature of mathematical science and into philosophy of science, the task is becoming increasingly difficult, since even mathematics university teachers have different images of what the term actually means (Mura 1993, p. 384). There is no universally accepted definition of mathematics, but we know it has something to do with quantity, space, change and structure.[1] Guess what – all of those elements are central also in economic theorizing, including the so called "verbal" Austrian School of economics. With a very broad definition in mind, then, Austrian economics is also at least in some sense mathematical because of its nomothetic character. The whole theoretical body of knowledge relevant in Austrian treatises – Rothbard's *Man, Economy, and State* (2004) and Mises's *Human Action* (1966) – beautifully resembles a mathematical structure: from a small range of assumptions (supplemented by empirical statements) into sets of logical consequences rigorously presented by deductive reasoning (correctly or incorrectly).

The reason why I used quotation marks in the title section with regards to "mathematics" is because (as the Austrian case proves) there is no clear-cut definition that would allow us to definitely separate "mathematical economics" from "verbal economics". It is usually argued that Austrian economics is verbal. Nevertheless one can make a pretty substantive arguments that Austrian economics is also mathematical, since for example, the notion of marginal, though non-measurable, utility may be formalized in some way (Rothbard 2004, p. 30)[2]. Similarly the notion of time preference, discounting, ordering (non-cardinal) of preferences (Rothbard 2004, p. 32). The highly debated topic of the structure of production fitting into discussions about capital structuring, so called reswitching debates, has a mathematical dimension to it (Garrison 2006; Robinson 1975; Sen 1974). Austrian arguments about low interest rates leading to more roundabout processes of production may easily be presented in a mathematical form. No different is a case with the so called Austrian business cycle theory. Pieniążek points to Roger Garrison's work, which combines such elements as: the length of production, loanable funds market and production possibilities frontier (Garrison 2001, p. 50). Despite the fact that Garrison does not use algebra in his presentation, it is essentially mathematical: for geometry is certainly a part of a mathematical discipline.

Many of economic theorems represent correct or incorrect notions about how economic reality functions. Most of those theorems may be presented with different symbols: pictures, drawings, metaphors, letters of Latin alphabet in various combinations, Cyrillic script, logograms, numbers and many more. Eventually they are all means of communication and codification. The tools used in a search for grasping and understanding economic action. Hence many quarrels about particular symbols may turn out to be McCloskian rhetorical duels (see McCloskey 1983).

Ultimately what matters is *suitability* of a particular theory. Its exact form may relate to that. Although not necessarily so.

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[1] Mura (1993, p. 382) continues his research on mathematics university professors "The level of interest in philosophical and historical questions among the university teachers of mathematical sciences who participated in the study appears to be rather low. Many of the respondents who returned the questionnaires did not answer the two particular questions discussed (…) Some offered comments about the difficulty of defining mathematics or even naming a few major books in the field. Others explicitly admitted their lack of interest. Here are a few examples pertaining to the first question: 'Sorry, too complex a question to give a good answer', 'I wouldn't try', 'I wish I knew', 'It has no definite definition', 'All the usual definitions are acceptable to me', 'I never thought I need to define it!'. And to the second question: 'Too big a job – I decline to answer!', 'Not something I have given thought to in the past and too much work to do it now', 'Sorry I'm weak on history of mathematics and not wildly interested'."

[2] Nobody ever said that mathematics always requires continuity. Using non-continuous functions like Rothbard does is still mathematics.

Some example

Perhaps in order to be a little more concrete about "mathematics" in economics we may use a simple known microeconomic example: production theory. Both the Austrian School and a typical neoclassical presentation use the concept which we may call "production function". Now the difference is that neoclassical function is usually presented in apparently more "mathematical" form: with known coefficients and variables with clearly established influence on production (see Pressman 2005). In case of the Austrian versions production functions are not written in forms of equations, because of two primary reasons. One, all the variables and their influences are not known. Second, so is the case with coefficients, possible tradeoffs, and issues of complementarity versus substitutability.

Nevertheless, despite lacking mathematical transformations and operations with equations, the Austrian version may easily be seen as mathematical in a philosophical sense: establishing relations between objects in various arrays of time and place. What I want to emphasize here is that "mathematics" is probably never a problem. The problem is what lies behind any type of theoretical statement, be it "mathematical" or not.

Different approach to production function also results in a radically different description of the market process. Whereas in case of the neoclassical version, the distribution may be taken care by Euler theorem – as Pieniążek points out (2018, p. 224) – in case of the Austrian version, the gap between factor productivity and income payments is inherently tied to the market process. Now, of course that in itself does not destroy any value of the neoclassical presentation. The question of suitability remains – what is a particular theorem suitable for? We know what it is not suitable for: for example to explain long-run economic growth. Some qualitative variables are necessary, the ones related to formal and informal institutions, ideas, or culture – things which are not easily measurable (McCloskey 2010, p. 411–419[3]). Things which are studies by the various thinkers and schools, especially the Austrian one, though not exclusively of course. I here offer a proposition that Austrian analysis is definitely more promising in explaining economic growth than a typical neoclassical modeling is.

Such insights have definitely more to offer than Cobb-Douglas versions of product growth. I do not claim that Cobb-Douglas is to be rejected because of its particular mathematical character. I only claim it is not suitable for the goal of explaining or even demonstrating economic growth. As mentioned above, this example is just one of many and does not aspire to be conclusive. I may be wrong in particular tenets of my description, but I hope to make a good exemplification of why math in itself is not really an issue in economic theorizing.

To sum up this particular example, neoclassical production function is not *wrong*, because it is *mathematical*. Rather: it is not *suitable* to explain economic process, because it is a *Cobb-Douglas function* (see an illuminating critique given in Filipe and McCombie

[3] Actually, McCloskey's work (2010) can be a perfect demonstration of how much Austrian economics can add to our understanding of long-run economic growth. Certainly it is worth more than various production functions, including the ones used in sophisticated modeling in the present day. Georgescu-Rogen (1979, p. 325) seems to have hit the hammer on the head with his summary: "The usefulness of the analytical models that represent similes of actual processes (divested, however, of any qualitative change) cannot be denied. But what matters most in the case of evolutionary structures is the emergence of novelties, of qualitative changes. For these aspects we have no other solution than that of a dialectical approach, involving in particular structural changes. This means to use words, instead of numbers, for truly qualitative changes cannot be represented by an arithmomorphic model. Qualities are not preordered, as numbers are, by their own special nature. The most relevant part of history is a story told in words, even when it is accompanied by some time series that mark the passage of time."

2005).[4] I hope the difference between the latter and the former statement visibly illustrates why discussions about "math" in economics may be confusing.

Perhaps a sensible approach to mathematical economics was expressed a while ago by Bodenhorn (1956, p. 32): "Many mathematical economists have suggested that communication between literary and mathematical economists would be greatly facilitated if literary economists would learn more mathematics. This point is well taken (…) However, it is also possible that communication would be improved if mathematical economists would learn more economics (…) Moreover, communication might be improved if mathematical economists would state their economic assumptions clearly in literary form and discuss fully the economic implications of the mathematical model which they are employing. The reader should not be required to undertake a major research project in order to determine the economic assumptions on which the analysis is probably based."

The above words seem not to have lost any part of their universal wisdom despite being written over seventy years ago. Any useful and suitable mathematics should be welcomed, provided it is not losing touch with reality.

Conclusions

Pieniążek has made a compelling criticism of some of Austrian critique directed at using mathematics in economic science. He has not managed, however, to draw a conclusion about general not-usefulness of Austrian economics as an alternative paradigm. Much like Austrians seem to be mistaken in some aspects about general criticism of mathematical tools, so Pieniążek seems to be mistaken on his general criticism of the Austrian School. To use his own words, his criticism is non-essential. Some Austrians use failed archetypes of mathematical economics. Pieniążek seems to have his unfitting archetype of the Austrian economics.

As my later considerations on mathematics in economics reflect – I have doubts it is possible to make any general arguments about the usefulness or non-usefulness of mathematics in economics. Every particular tool deserves its own assessment much like every theorem does. Especially since we cannot be sure what mathematics (in general) really is.

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[4] Much like Euler's theorem is not "wrong" – it just cannot explain real world distribution process.

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