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SPRACHGEIST AND REALISTICNESS:
THE TROUBLED RELATIONSHIP
BETWEEN (AUSTRIAN) ECONOMICS
AND MATHEMATICS REVISITED

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CENTER FOR THE
HISTORY OF POLITICAL ECONOMY
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Sprachgeist and Realisticness:

The troubled Relationship between (Austrian) Economics and Mathematics revisited

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Abstract: In recent academic and to some extent public debates, mainstream economics has been accused of excessive mathematization. The rejection of mathematical and other formal methods is often cited as a crucial trait of Austrian economics. Based on a systematic discussion of potential benefits and potential drawbacks of formalization in economics, the paper concludes that - contrary to the received view - the most prominent representatives of Austrian economists including Carl Menger, Ludwig Mises, and Friedrich August Hayek neither provide a justification for a rejection of formalization tout court nor actually reject it. Those Neo-Austrians who do, seem to rely on an unconvincing *Sprachgeist* argument traceable to Friedrich Wieser.

Keywords: Austrian economics, essentialism, formalization, Friedrich Wieser, mathematical methods, praxeology, realisticness

JEL Codes: B13, B16, B23, B25, B41, B50, B53, C00

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*Science is what we understand well enough to explain to a computer. Art is everything else we do.
[W]e should continually be striving to transform every art into a science: in the process, we advance the art.
(Don Knuth, alluding to John Stuart Mill)*

1 If Economics had a Soul, Would it be Mathematical?

When the world economy hit rock bottom in 2008, the Queen of England was not alone in blaming economists for their inability to predict, let alone prevent, the crash. The public as well as policymakers meandered between disregard for science, distrust in science, and an eagerness for eloquent experts who confidently prophesize the economic future without hesitation or doubt.

Yet, the financial crisis did provoke and intensify ongoing soul-searching in economics and its methodology. In academic and to some extent public debates, mainstream economics has been accused of excessive mathematization. By retreating into a mathematical ivory tower and delving into more and more abstract and unrealistic mathematical models, economics allegedly had lost touch with relevant ‘real world problems’.

Is over-mathematization and formalization the source of the perceived failures of mainstream economics? Would heterodox schools which employ less or no formal methods fare better and rekindle public trust in economics? Or does the perceived chasm between different schools itself disqualify the discipline? Although one paper cannot settle all these disputes, my case study reappraises Austrian economics’ stance towards benefits and drawbacks of formalization in order to clear up some misconceptions implicit in many arguments for and against formalization and eventually facilitate more fruitful discussions.

2 Austrian Economics as a Paragon of Anti-Formalism I: the Received View

Among heterodox approaches to economics, the Austrian School has always been regarded as a staunch opponent of formalization. The *Stanford Encyclopedia* entry on “Philosophy of Economics” spends only one sentence the Austrian School, yet mentions that its proponents are “skeptical about the value of mathematical modelling” (Hausman 2018). The skepticism, neglect, or dismissal of formalization is not only attributed to contemporary Neo-Austrians. Jaffe distinguishes the founder of the Austrian School, Carl Menger, from other protagonists of the marginal revolution because he allegedly “avoided the use of mathematics in his economics not because he did not know any better, but out of principle” (1976, p. 521).

Similar to Hausman's and Jaffe's external assessments, *pars pro toto* a self-description in the *Advanced Introduction to Austrian Economics* maintains: "The Austrian school is much less reliant on mathematical and statistical analysis, and is often suspicious of the economic analyses that rely on them." (Holcombe 2014, p. 109)

Mathematical formulas or diagrams are rare not only in scholarly books and articles by Austrian economists, the anti-formal identity of the School is also perpetuated by its textbooks. The most prominent Austrian textbook, *The Economic Way of Thinking* (Heyne, Boettke & Prychitko 2013) contains several scattered diagrams, graphs, and tables but no algebraic formulas whatsoever. For the most part, it consists of text in plain English. The authors seek to accomplish more "with less emphasis on formal modelling" without watering-down the content (*ibid.*, p. xiv).

In many instances, especially since the "revival of Austrian economics", Austrian economists' stance towards formalization has surpassed scepticism and reached rejection or utter hostility. Such examples are most frequent within the praxeological branch of the Austrian School (see e.g. Wutscher, Murphy & Block 2010). Invoking Ludwig Mises and Murray Rothbard as the principal originators of praxeology as the methodology of the social sciences, adherents proclaim that there is an a priori true starting point for economic theorizing, the so-called fundamental axiom "Man acts.", from which purportedly all economic theory can be obtained by deduction.¹ In order to guarantee the truth and uphold the a priori character of all the attained theorems as intended, the correctness of each deductive step is crucial:

Praxeology – and consequently economics too – is a deductive system. [...] No economic theorem can be considered sound that is not solidly fastened upon its foundation by an irrefutable chain of reasoning. A statement proclaimed without such a connection is arbitrary and floats in midair. (Mises 1949/1998, p. 68)

Given the pivotal role of deduction, one would expect logic to play a central role in the methodological considerations and teachings of praxeologists. And indeed, the most prominent contemporary textbook, David Gordon's *An Introduction to Economic Reasoning* (2000) devotes the entire first chapter titled "The Method of Economics" to deductive logic. Not to modern symbolic propositional logic or predicate logic though, but to verbal logic in

¹ Alongside the a priori fundamental axiom, a few a posteriori auxiliary axioms are acknowledged. For a more comprehensive account of praxeology and its interplay with empirical thymology, see e.g. Linsbichler (2017, 2019).

the vein of Aristotelian syllogisms. This is in line with Rothbard's programmatic claim for praxeology that "mathematical logic is uniquely appropriate to physics" (1956/2011, p. 292) whereas "verbal logic permits each law to be meaningful as it is deduced" (1952/2009).

It is however by no means obvious on what grounds Austrian economists hardly use formal methods in their publications and in Rothbard's and some other cases even reject the possibility of their usefulness in the social sciences entirely. Which arguments do Austrian economists or other opponents of formalization provide? Roger Backhouse responds that "no Austrian, to my knowledge, has ever explained why mathematics cannot be used alongside natural-language explanations" (2000, 40).

Having cast doubts on the Austrian School's rejection of formalization tout court in section 4, I will present types of arguments for (section 5) and against (sections 6 and 7) formalization and subject them to an "nondogmatic methodological critique" (Caldwell 1982/2003, p. 129), i.e. evaluate the arguments from an Austrian perspective. I will contend that: (1) Contrary to the received view, most Austrian economists in the School's history do not reject formalization per se and altogether. Neo-Austrians (or older Austrians) who reject formalization per se seem to have to rely on a very particular and less than convincing *Sprachgeist* argument (section 8). Otherwise, they lack the argumentative resources for a rejection. (2) More generally, Austrian economists and other critics of excessive over-formalization raise valid points and remind us that formalization requires continuous reflection and alertness by economists and philosophers. Regardless, the praxeological branch of Austrian economics in its current state stands to gain from partial formalizations.

3 Formalization as Translation

Before examining (Austrian) arguments for and against formalization in the social sciences, some clarification of the polysemous term 'formalization' is called for. Predominant meanings of terms like 'formal', 'abstract', 'rigorous' changed in the course of history and moreover the usages in different disciplines, e.g. mathematics and economics, sometimes differ (see Weintraub 1988; 2002, pp. 72-100). Accordingly, some criticisms which on a literal reading try to dismiss formalization or mathematics tout court, could be interpreted charitably as merely considering the formal methods imaginable to them at the time. Rothbard, for instance, seems to falsely assume that all formal languages are uninterpreted calculi. Thus, according to him, any formalization would "strip economics of all meaning" (1952/2009, see also 1976/2011). In comparison, Mises might at least have had a point when

he accused game theory of neglecting the cooperative core of a market economy in 1962 (pp. 87-90), not anticipating cooperative game theory at it.

If we adopted certain characterizations of “formalization”, it would be obvious that Austrian economists hold no objections whatsoever, indeed they wholeheartedly embrace some forms of formalization. Consider for instance Loasby’s characterization of formalist economics as a research program which “seeks to emulate mathematicians by the careful construction of watertight logical systems from a brief but comprehensive axiom set” (1976, p. 13). In this sense, formalism has nothing to do with formal languages but closely resembles a Misesian or Rothbardian depiction of praxeology.²

Backhouse outlines a helpful disambiguation of three variants of formalization:

These three processes - axiomatisation, mathematisation and methodological formalisation - are very different and should not be confused. What they have in common is the breaking down of a complex chain of reasoning into an explicitly stated series of steps, each of which is sufficiently simple for there to be an agreed procedure for dealing with it. The resulting chain of reasoning can then be believed with confidence. Clower (1995) has referred to this as 'trivialisation': rendering every step in an argument trivial. (Backhouse 1998, p. 1849)

Austrian economists champion the first component, axiomatization; in fact praxeologists deem it the only acceptable way of economic theorizing.³ The contentious component is what Backhouse refers to as mathematization, in which statements of natural language are translated into a formal language such as mathematics, predicate logic, or some modal logic. Then the inference rules of the formal system are deployed and yield certain conclusions in the formal language. These conclusions are then translated back into the natural language.⁴ One of the major advantages of formal system is that their inference rules, which ideally are purely syntactic, facilitate the creation of deductions and other steps of reasoning. Moreover, controlling deductive steps for validity becomes almost trivial – even computers can usually do it. Formalization of this kind was and is a main factor in the success

² Similarly, when the great logician Peirce views Ricardo (but not Smith) as a „mathematical economist“, he obviously does not have the use of mathematical symbolism in mind (see Hoover & Wible 2020, p. 525).

³ Note that praxeology rather resembles axiomatization in a logicist sense and not in the Hilbertian formalist sense of *prima facie* uninterpreted axiomatic systems. In contrast, Milford & Cerman (2011) identify Schumpeter as a champion of the latter position.

⁴ Of course, these two-time translation between a natural language and a formal language is, like any translation, not always straightforward and unproblematic. An in-depth discussion of problems of the philosophy of formalization extends far beyond the scope of this article though. See e.g. Brun (2003).

story of logic and mathematics, as well as other disciplines including parts of physics, biology, and analytic philosophy. The ill-intentioned ascertainment that “mathematics is a substitute for thinking”, sometimes attributed to Joan Robinson, seems to miss this point of (rightly understood and applied) formalization. Austrian economists, by contrast, should be naturally inclined to welcome the idea of limited capacity of individual human reasoning and the potential of partially delegating rationality to an external process.

The notion of formalization we will primarily be concerned with in the remainder of the paper is formalization as translation into a formal language as described above. Indeed, many statements regarding the use of mathematics in economics made Carl Menger, Karl Menger, Mises, Machlup, the harshest critic of formalization Rothbard, and other Austrian economists bear upon formalization as translation.

4 Austrian Economics as a Paragon of Anti-Formalism II: History Casts Doubts

Neo-Austrian economics usually venerates the main ideas and figures in the historical development of the School, especially Menger, Mises, and Hayek are often upheld as inspirations and even as authorities. All the more surprisingly, a closer look at some institutions and networks in the heyday of Austrian economics in interwar Vienna casts serious doubts on the School’s heroes’ alleged hostility towards formalization.

The Austrian Center for Business Cycle Research, founded by Mises and Hayek as well as headed by Hayek and Morgenstern was in firm Austrian hands in its early years. Yet, the Center produced empirical studies (which already clashes with some standard accounts of the Austrian approach) and relied heavily on mathematical and statistical methods. After having earned his doctoral degree in mathematics with supervisor Karl Menger, the Center also employed one of the great masters of these formal methods, Abraham Wald.⁵

Wald also attended the *Mathematisches Kolloquium*, which Karl Menger organized between 1928 and 1936, in part as a platform for exchange between the Austrian School of economics founded by his father on the one hand and mathematical economics on the other hand. The meetings and subsequent publications allowed for a fruitful exchange between mathematicians, one of the pioneers of computer science Franz Leopold Alt, world-renowned logicians like Kurt Gödel, Alfred Tarski, and Adolf Lindenbaum, as well as scholars within or in close vicinity to the Austrian School: Ewald Schams, Karl Schlesinger, Karl Popper, and

⁵ For Wald, see Düppe & Weintraub (2016) and the references therein.

John von Neumann. In these years, Karl Menger's decision theory ("logic") for ethical norms and social associations was published as one of the first highly formalized monographs in the social sciences outside economics (1934/1974).

Many of the scholars who attended the colloquium regularly participated in Mises's Viennese private seminar too. There, Alt, Menger, Morgenstern, Schlesinger, and Wald discussed economics and its philosophy together with Felix Kaufmann who inter alia published on philosophy of mathematics and Gerhard Tintner who was co-responsible for the establishment of econometrics. All these mathematicophilic scholars must have received personal invitations to the otherwise exclusive Mises Circle by its host. Another incident does not square well with Mises's purported hostility against formalization either. Reacting to the proofs of Karl Menger's "Remarks on the Law of Diminishing Returns", Mises sent the author a personal letter. The quite formal paper provides a logical analysis of suggested proofs of laws of diminishing returns and investigates logical relations: Which assumptions are necessary to proof which version of the law? A reoccurring constituent of Menger's paper are the translations between natural language and mathematical language which we are concerned with. Instead of methodological criticism or a lack of interest expected from a hero of Neo-Austrian economics, Mises replied that he "read [the paper] with great benefit and learned a lot from it" (Mises 1936, my translation) and that he was looking forward to discussing these matters in person.⁶ It was the chief editor Hans Mayer, the protege of Friedrich Wieser, who blocked the publication of the paper in the *Zeitschrift für Nationalökonomie* until Morgenstern joined the editorial board and urged Menger to submit the manuscript (see Menger 1979, p. 259). We will return to Wieser's (and Mayer's) position in section 8.

On a less anecdotal and more substantive level, Mises's methodological writings about the use of formal languages are quite explicit. He affirms that mathematical equations of equilibrium analysis "say no more and no less" than what can be said in natural language (1938/2000, p. 28). Similarly, the algebraic expressions of probability calculus are perfectly legitimate, according to Mises. Probability calculus does not add anything new to the previous knowledge of a gambler, but "it translates it into mathematical language" (1949/1998, p. 108).

⁶ Having said that, on December 31, 1935, one day after Menger's presentation of the paper to the *Nationalökonomische Gesellschaft*, Morgenstern noted in his diary about Menger's „brilliant presentation“ which „demonstrated the necessity for exact thinking in economics“ that Haberler did not really understand „these exact matters“ and that „Mises uttered pure nonsense“ (Morgenstern, my translation from Gehrke 2019). Still, Mises never showed any tendency to pussyfoot or spare somebody from polemic criticism and yet wrote a kind and supportive letter about Menger's mathematical and formal paper.

Analogously, Mises explains the formation of prices in natural language but concedes the equivalent possibilities of drawing and intersecting curves and of “expressing it in mathematical symbols” (ibid., p. 330).

The highly formalized nature of game theory serves as another, albeit only circumstantial, clue that Austrian economics can be conciliated with formalization. The relation between Austrian economics and game theory is controversial, both historically and systematically. In any case, to the extent to which Morgenstern contributed to the foundation of game theory and to the extent to which he is regarded a proper Austrian economist despite his ardent support of mathematization of economics, there is an overlap. Moreover, a focus on the (logic of) choices of individuals, on their interplay, and on the subjective framing of the choice framework as studied by behavioral game theorists has always been at the center of the Austrian research program (see also Streissler 2002).

Like most Austrian economists, Hayek hardly used mathematics in his writings. His slightly timid steps towards mathematization by means of graph theoretical explorations of the general means-ends relationship (see Caldwell 2016) or by means of triangles depicting the capital structure and the process of production were hampered by Hayek’s lack of effort to thoroughly acquire the respective mathematical skills.⁷ He did supervise and appreciate the doctoral thesis of mathematically highly proficient Abba Lerner, in which Lerner integrates the rate of interest to Hayek’s triangles by adding a third dimension (Giraud 2021, pp. 12-19). In any case, neither Hayek nor Robbins, who suggested a formalization of Hayek’s *Prices and Production* to Hicks (see Giroud 2021, p. 12), had any principled objections against the use of formal methods in economics. On the contrary, as one would expect from somebody keenly interested in complex systems, Hayek declared mathematics probably “absolutely indispensable” for certain purposes in economics (1952/1964, p. 214).

Given Mises’s, Morgenstern’s, and Hayek’s acceptance of partial formalization as well as Fritz Machlup’s (1991, p. 330) encouragement of “polylinguistic scholarship”, i.e. economists should strive for fluency in natural as well as in formal languages, it becomes increasingly dubious whether Austrian economics has any grounds for rejecting formalization tout court as the received view maintains. The following non-exhaustive lists of potential

⁷ See Caldwell & Klausinger (2022) for Hayek’s increasingly contentious relationship with Nicholas Kaldor at the London School of Economics. Hayek later acknowledged that had he wanted to continue trying to engage people like Kaldor that it was “a serious mistake” not to have acquired the command over mathematics needed to do so.

benefits (section 5) and drawbacks (section 6) of formalization aims at reassessing the Austrian stance towards formalization.⁸

5 Potential Benefits of Formalization

5.1 Communication: As supposedly common languages, logic and mathematics can partially bridge different schools of thought and even different disciplines. Koopmans (1957), himself a physicist by training, was particularly optimistic in this respect. A few scholars sympathetic to the Austrian School have endorsed formalization as a means to overcome communicative boundaries to other schools (Backhouse 2000, Holcombe 2014, Hudik 2015, Linsbichler 2017, 2019).

5.2 Potential Precision and Clarity: There is (at least) potential for more precision and more clarity when formalizing. Karl Menger (1972), who as a mathematician developed the first clear and applicable definitions of ‘curve’ and ‘dimensions’, stresses the potential for precision and clarity but also mentions a rare counterexample in which the natural language formulation is more precise than the mathematical formulation.

A related worry is raised by Morgenstern and von Neumann: “There is no point in using exact methods where there is no clarity in the concepts and issues to which they are to be applied.” (1944/1953, p. 4) For a more comprehensive discussion, see e.g. Mayer (1993) who accuses many papers in mainstream economics of creating an impression of clarity and rigor by focusing on the technical mathematical part, while relegating the often ambiguous relation between the mathematical symbols and relevant ‘real world phenomena’ to a few passing remarks in the introduction or the conclusion.

5.3 Efficiency: In many situations, the use of a formal language is more efficient. Karl Menger (1972) provides examples how cumbersome the expression of even most simple mathematical equations in natural language becomes. A translation is always possible but often overly inefficient, especially in more complex systems.

5.4 Control of Arguments: As mentioned in section 4, formal systems with syntactic rules enable and simplify scrutiny of arguments and purported proofs. Rules for manipulating diagrams might be interpreted as an intermediate step between syntactic rules of logical inference and verbal reasoning. Since even sympathetic interpreters like Caldwell (1984) identify and highlight severe problems with “verbal chains of logic”, I maintain that improved

⁸ The lists draw on Hudik (2015), who also cites further illustrating examples.

control of deductive arguments is highly relevant for the praxeological branch of Austrian economics. By elaborating an actual example of a formalization of a part of praxeology, Oliva Cordoba (2017) indicates the viability of the proposed enterprise.

All four potential consequences of formalization in the list above satisfy the requirements of “nondogmatic methodological critique” (Caldwell 1982/2003, p. 129), i.e. constitute benefits from the perspective of Austrian economics. Austrians want to communicate with non-Austrians; Austrians want to be precise, clear, efficient; and - most emphatically praxeologists, but also other Austrians - want to avoid gaps and hidden assumptions in their deductions.⁹

6 Potential Drawbacks of Formalization

Contemplating the list of benefits of formalization, the reader might be tempted to concur with Maurice Allais, whose exuberant enthusiasm is worth quoting:

Mathematical thinking is the wonderful tool that, by freeing the spirit of darkness, confusion and helplessness of the verb, helps overcome gradually, and without exceptional effort, any difficulty in an unparalleled flow of light and clarity. Only those unaware may persist without it. They do not know what they're missing! As for those who undertake the journey of initiation, they will never think again to return to the land of verbal metaphysics and they will pursue an ever more fruitful route to an ever greater light. (Allais 1947, quoted from translation in Assaf&Duarte 2020, p. 870)

Allais' rose-colored glasses might trigger even readers generally approving of formalization to ask for its flipside. So, what are potential drawbacks of using formal methods?

6.1 Communication (flipside): Understanding formal languages requires training which not every intended reader might have. An abundance of formulas in the language of symbolic logic or mathematics while perhaps sometimes perceived as a seal of scientificity, may undermine the goal of reaching a policymaker or the general public. Even intra-scientific communication might sometimes be compromised by over-formalization.

⁹ There might be one exception to the assessment of preciseness as a benefit. Rothbard (1976/2011, pp. 62-64) curiously maintains that since individual human reasoning and behavior is imprecise it should ideally be described by likewise imprecise natural language. In opposition to Rothbard's „historicist“ approach, one might want to describe, explain, or predict imprecise reasoning and behavior as precisely as possible. See also Hudik (2015) for a criticism of Rothbard's plea for impreciseness from the standpoint of methodological individualism.

6.2 Shift of Attention: A discipline can develop an appetite for formalization – and mainstream economics arguably has. Such a self-reinforcing tendency manifests itself in academic training and in requirements for publications in high-impact journals. However, if formalized work is considered the most prestigious or the only path to tenure, marginal scholars will shift their attention away from problems and topics they consider relevant towards problems and topics the concepts of which are easier to formalize or give rise to more intellectually stimulating formal systems. As a special case, quantitative formal methods shift attention to phenomena which can be measured and regarding measurement both Kelvin („When you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind.”) and Viner („Yes, and when you *can* express it in numbers, your knowledge is of a meagre and unsatisfactory kind.”) have a point (quoted from Higgs 1987, p. 20). In any case, by granting formalization the role of a threshold which respectable scientific work must pass, a discipline as a whole implicitly distorts its focus on relevant issues.

Many components of the research agenda of Austrian economics indeed pose serious obstacles to formalization. Pivotal concepts of Austrian investigations like meaning assignments, entrepreneurship, subjective interpretative knowledge, radical uncertainty, non-physicalist time, heterogeneous capital structures, and institutional considerations seem to resist straightforward formalization or meaningful quantitative measurement. It creates even more confusion and misunderstandings, when in the course of appropriations by mainstream economics, some Austrian concepts such as ‘knowledge’ are substantially altered to ‘information’, which lends itself to formalization (see Boettke & O’Donnell 2013). Hence, Austrian economists might be pragmatically justified to by and large refrain from using formalization. Whether a concept, idea, or theory is capable of being formalized of course always depends on the stage of development of formal methods. Perhaps “altogether new mathematics has to be invented in order to cope with manifold forms of economic problems” (Morgenstern 1963, p. 3).

6.3 Detachment from ‘Reality’: A shift of attention to other, less relevant issues is already regrettable. Even worse from the perspective of prior priorities, economists might become completely detached from ‘real world problems’. Induced by the beauty of the formal apparatus (or by career considerations combined with the disciplinary incentives of an overblown prestige of mathematical methods in economics), an economist might become fully absorbed by the investigation of the properties of the formal systems themselves. Such glass bead games with theories, models, or entire formal languages pay no heed to empirical

data or ‘real world phenomena’. Economists like geometers search for elegant proofs of theorems (see Rosenberg 1992, pp. 239-248). The ensuing collective theorem proofing enterprise is wittily satirized by the “Metatheorem on Hyperspaces of Assumptions”:

For each and every assumption A implying a conclusion C and for each alternative conclusion C' arbitrarily far from C [...], there exists an alternative assumption A' arbitrarily close to the original assumption A, such that A' implies C'. (McCloskey 1991, p. 10)

Many criticisms of mathematical methods advanced by Austrian economists are in effect merely criticisms of the detachment from realisticness incidental - but not inherent - to formalization. Consider for instance Mises, who after praising the respective mathematically advanced economics of Auspitz and Lieben (1889) as “brilliant” puts the Austrian School in contrast to their equilibrium analyses:

The Austrian School aims to account for prices actually paid in the market, and not just prices that might be paid under certain never-realizable conditions. It rejects the mathematical method, not because of ignorance or an aversion to mathematical accuracy, but because it does not place importance upon the detailed description of the condition of a hypothetical and static equilibrium. (Mises 1940/2009, p. 28)

In hindsight (and contrary to separate restrictions posed by Mises’s epistemological position), one could read this as a plea for the development of statistical and econometric methods capable of addressing more complex pricing situations. In any case, Mises and many other (Austrian) critics actually do not argue against translations into a formal language but against the content of certain unrealistic statements, regardless of whether they are formulated in English or predicate logic.¹⁰

More recently, Peter Boettke aptly subtitled one of his papers “Modern economics as a flight from reality” (1997). Similar concerns, especially about general equilibrium theory, have been raised by many non-Austrian economists as well.¹¹ Even Allais, otherwise perhaps even overly supportive of mathematization as we have indicated, in his Nobel lecture admonishes economics’ “detachment from reality”.

One might counter the apprehensions of heterodox economists by two studies which indicate that the discipline of economics takes care of itself and does not approach the status

¹⁰ See e.g. also Keynes (1936/2018, p. 266) who detects “a great fault of symbolic pseudo-mathematical methods of formalizing” if (!) they “expressly assume strict independence between the factors involved”.

¹¹ See e.g. Morishima (1991), Mayer (1993). Although an ardent critic of excessive over-formalization himself, Mayer (1998) blames Austrian economics for overstating its respective case against mainstream economics.

of a glass bead game. Hamermesh (2013) analyzed the top three journals from 1960 to 2011 and found a decreasing proportion of purely theoretical papers (see table 4). A similar paper by Angrist et.al. (2017) categorized the publications in the top eighty journals from 1980 to 2015 and verified an increasing proportion of empirical work (see figures 6 and 7). In a sense, these two papers indicate that the discipline of economics, contrary to fashionable but exaggerated demurs, is not becoming more “detached from reality”.

TABLE 4
PERCENT DISTRIBUTIONS OF METHODOLOGY OF PUBLISHED ARTICLES, 1963–2011*

Year	Type of study				
	Theory	Theory with simulation	Empirical: borrowed data	Empirical: own data	Experiment
1963	50.7	1.5	39.1	8.7	0
1973	54.6	4.2	37.0	4.2	0
1983	57.6	4.0	35.2	2.4	0.8
1993	32.4	7.3	47.8	8.8	3.7
2003	28.9	11.1	38.5	17.8	3.7
2011	19.1	8.8	29.9	34.0	8.2

* A type could not be assigned to seventeen of the articles published in 1963.

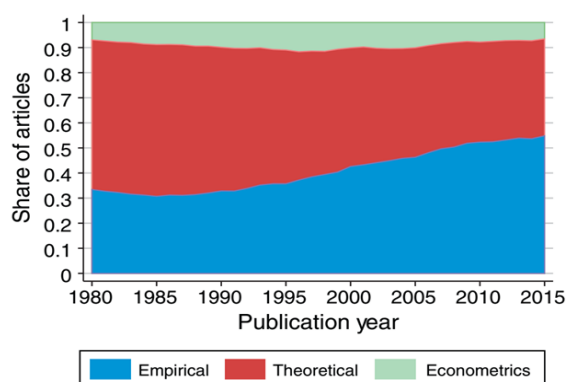


FIGURE 6. WEIGHTED PUBLICATIONS BY STYLE

Note: Five-year moving averages of weighted publication shares in each style.

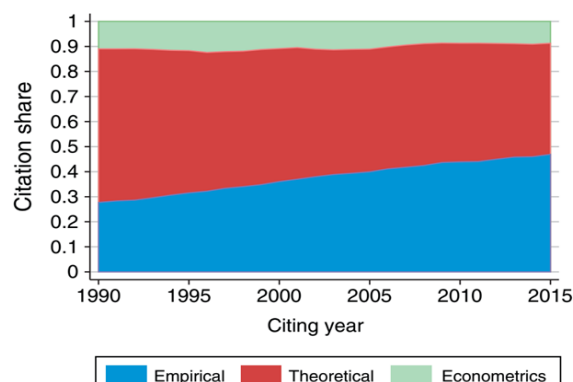


FIGURE 7. WEIGHTED CITATIONS BY STYLE

Note: Five-year moving averages of weighted citation shares in each style.

Nonetheless, all-clear signals might be premature from an Austrian perspective. Speaking less about highly idealized model worlds but extensively employing so-called empirical data instead does not guarantee an article’s relevance for ‘real world problems’. The trend towards empirical - often quantitative - methods comes with its own cloven hoofs, such as: incentives for data mining and consequent bland papers; academic curricula shifting from comprehension-oriented history and methodology of economics towards technical training in quantitative methods. From a Neo-Austrian perspective, neither formal economics proofing theorems holding in idealized models nor empirical economics employing statistical methods on objective data contribute much to a proper understanding of market processes. These two

perceived contemporary trends of mainstream economics insufficiently account for crucial factors such as institutions and subjective, interpretative knowledge of individuals. The Neo-Austrian reflex against formal languages and statistics is relatable but sometimes misses the real target – the theories and ideas expressed in mathematical terms.

6.4 Errors and inadequate Formalization: Austrian and non-Austrian economists provide a plethora of arguments to the effect that specific uses of a formal method involve an error or are inappropriate for the given purpose.¹² Granted. Economists should not commit errors of any kind, whether they use formal methods or not. And if certain methods are inappropriate or formalizations inadequate for a given purpose, then one should refrain from using them. Reflections and discussions regarding the appropriateness and adequacy of a formal method or of a specific formalization are often non-trivial and ought to be engaged on a case-by-case basis.

However, while the arguments presented in section 6 often convincingly target specific formalizations in particular circumstances, they all fall short of justifying the rejection of formalization tout court, which some Neo-Austrian economists and other heterodox economists advocate.

7 Invoking Realisticness against Formalization tout court?

One special case of criticisms of inappropriate formal methods is particularly pressing from an Austrian perspective. Austrian economists regularly claim that their School “has consistently adhered to the postulate of [realisticness]” (Hülsmann 1999, p. 3).¹³ Austrian economists’ criticisms of idealizations (precise abstractions) in economic theories and models are indeed ubiquitous. In all theories and models that are maintained to aim at describing or explaining the ‘real world’, many Austrians reject idealizations and assumptions

¹² Examples with an Austrian flavour include the following claims: (1) Inductive logics, Bayesianism, and other inductive methods are inapplicable in the social realm (see e.g. Linsbichler 2017, pp. 10-13 for Mises’s rejection of induction). (2) Certain models suggest determinism and are thus deceptive. (3) The use of index numbers without proper understanding of their definition and composition is misleading (see e.g. Haberler 1927). (4) Discrete processes cannot be studied with continuous functions.

An infamous non-Austrian example is Mirowski’s (1990) claim that the core of neoclassical economics is spoiled by its mimicry of inappropriate mathematical methods of 19th century physics (and the metaphors purportedly associated with it).

¹³ The perhaps slightly overstated quote is from Hülsmann (1999, p. 3). See also the references provided by Hülsmann on p. 1 as well as e.g. Caplan (1999) for objections.

known to be false.¹⁴ By contrast, non-precise abstractions are permitted and prominent in Austrian economics, i.e. if certain criteria are deemed irrelevant in a context, they can be left unspecified. Non-precise abstractions are indeed unavoidable for almost any theory in empirical science as Mises acknowledges (1929/2011, p. 57).

Suppose an economist seeks realisticness in this sense and suppose she adopts the definition of formalism from the *Elgar Companion to Austrian Economics*, according to which “the formalist approach starts with the formulation of simplifying assumptions” (Klamer 1994, p. 48). If idealization is directly linked to formalization, then she must indeed reject formalization. Contradicting his own assertions cited above, Mises seems to commit the same error of assemblage: “[The mathematical method] is an entirely vicious method, starting from false assumptions and leading to fallacious inferences.” (1949/1998, p. 347)

While it might in fact be typical for mathematizations to involve idealizing assumptions, the association is by no means necessary. Formalization as translation can be applied to true natural language statements just as well as to false ones. Conversely, (false) idealizing assumptions can be and often are expressed in natural languages or in formal languages. A few pages after his misapprehension, Mises also seems to realize that the potential problem lies with the content of the propositions and presuppositions and not with their translation from one language to another (1949/1998, p. 352).

If the goal is realisticness, then idealizing assumptions are to be avoided, regardless in which language they are stated. Once again, Austrian economists caution against certain, perhaps typical, uses of formal methods, but a repudiation of simplifying assumptions does not entail a rejection of formalization tout court.

8 Friedrich Wieser: Invoking *Sprachgeist* against Formalization tout court

Critics of formal methods provide ample argumentative resources to remain cautious about the limitations and detriments of formalization. Yet, none of the arguments so far suffices for the dismissal per se which many praxeologists, most notably Rothbard

¹⁴ See Long (2006). Notwithstanding their pleas for realisticness, Austrian economists heavily rely on unrealistic models. These „imaginary constructions to which nothing corresponds in reality“, although „prone to fallacies which ill-considered employment [...] can entail“, are vindicated as „an indispensable tool of thinking“ (Mises 1949/1998, pp. 202-203). Mises does not contribute much advice how to avoid said fallacies, but economists and philosophers have been discussing unrealistic models and counterfactual scenarios in thought experiments vividly for decades. See e.g. Linsbichler & Cunha (2021) for Neurath’s and Mises’s thought experiments and Tokumaru (2016) for Wieser’s.

(1952/2009, 1956/2011, 1976/2011), advocate. According to him, a translation between English and a formal language “would be likely to lead to grave errors”. Since Rothbard does not account for the superior proof checking properties of many formal languages he contends that a translation “makes little sense” and should “have to fall with one slash of Occam’s Razor” (see 1952/2009; 1956/2011, pp. 292-293).¹⁵

Boettke (1996), a Neo-Austrian economist usually more balanced than Rothbard, invites the interpretation that he endorses an equally radical position regarding formalization: “[M]athematical economics cannot capture the essence of the economic problem individuals confront in the world” since “the language of mathematics is not designed to deal with issues of semantic meaning”. Yet, Boettke’s more moderate formulations suggest a condition for the use of formal methods, an “understandability criterion” the origins of which he traces back to Wieser. This can be read as a judicious reminder of Morgenstern’s and von Neumann’s warning that precision within the formal language often obscures the ambiguous relation of the terms of the formal language to the supposed ‘objects in the real world’. Moreover, the meaning assignments of the individual actors described by economic theory play a crucial role in Austrian economics, hence the need for a social scientific language capable of describing meaning assignments.

Although Boettke rightly highlights these hazards and limitations of many formal methods, his point should not be overstated. Insofar as Boettke concurs with Rothbard and aims to reject formalization tout court, his argument fails. First, many linguists argue that they successfully employ highly formal methods to study, reconstruct, and explicate meanings and meaning assignments. Second, the relation of natural language terms to the putative objects in the ‘real world’ is often highly ambiguous as well. Attempts to formalize sometimes just reveal the blur as anyone who has done coding knows: making a computer “understand” your idea sometimes helps you realize that your idea was hitherto unclear and has to be rendered more specific or discarded.

Mises, Hayek, and arguably Carl Menger do not qualify as authorities for the intended rejection of formalization tout court.¹⁶ I submit one unlikely candidate in the history of

¹⁵ Traditionally, Occam’s Razor refers to ontological entities and not to steps or products of scientific practice as in Rothbard’s appropriation.

¹⁶ Carl Menger did not use mathematics in his writings. Whether he refused to do so “out of principle” (Jaffe 1976, p. 521) is difficult to determine given we are confined to one single letter to Walras and a segment of a review article as the only first-hand sources for what Boettke refers to as the “Mengerian essentialist critique of the use of mathematics in the social sciences” (Boettke 1996). We can only briefly touch upon the ongoing

Austrian economics who could provide the argumentative resources to do so: Friedrich Wieser.¹⁷ In his first monograph, Wieser set up what I will, using Wieser's term, call a *Sprachgeist* ["spirit/essence of language"] argument (1884).

After his first monograph, Wieser attenuated his position. While he continued trying to uncover the essence of value, he abandoned the references to *Sprachgeist*. He used mathematical language when writing down systems of equations as well. Yet, Wieser's protege Mayer's turndown of Menger's formal paper (1936) corresponds with the anti-formalist underpinnings of their research program.¹⁸ Since Wieser's deliberations on *Sprachgeist* have neither been translated to English nor received any attention to speak of, let me sketch why they might foster a rejection of formalization:

Resembling German historicist Leopold Ranke's notion of *Volksgeist* ["spirit/essence of a people"], Wieser maintains that over centuries, a people, e.g. the German people, accumulates and stores knowledge in the essence of its natural language. In contrast to the natural sciences, the knowledge laid down in the *Sprachgeist* tends to be more reliable than observation of phenomena, as far as the sciences of human action are concerned. In some areas, such as theory of value, *Sprachgeist* even provides necessarily true knowledge, according to Wieser. Consequently, the economist investigating the theory of value need not bother with empirical data but can remain in her armchair, study the German language, and still learn about empirical laws governing the phenomena. If this sounds far-fetched, direct quotes from Wieser will not help to improve his position:

discussion in which sense Menger was an essentialist (see e.g. Linsbichler 2021a). An only mildly essentialist interpretation of Menger's research program would separate it from Wieser's (see Schweinzer 2000; Milford 2010, 2012; Menger 1888). Hayek and Karl Menger concurred with this interpretation (see Schumacher & Scheall 2020, Morgenstern et al. 1972) and regarded formalization fully compatible with his father's position. In any case, Carl Menger explicitly allowed mathematics as an auxiliary tool and a method of presentation. What he denied was any special faculty by which mathematical methods as a means of research could directly grasp causal relationships underlying the observable phenomena (see Jaffe 1935, K. Menger 1972/1973). This position seems very similar to Mises's but different from "some later Austrians" who deny even the role as a method of presentation, as Karl Menger comments (ibid., p. 52). Rather than contradicting our approach to consider formalization merely as a translation between different languages, Carl Menger even corroborates it. For a more detailed discussion of Menger's position regarding formalization, see Linsbichler (2021b).

¹⁷ Wieser is a quite unlikely candidate because many praxeologists who vehemently criticize formalization distance themselves from Wieser due to his early acquaintance with the German Historical School, his not strictly libertarian political positions, and his perceived tendency towards equilibrium analysis (see e.g. Hoppe & Salerno 1999, but also Caldwell 2011 for objections). Wieser and Rothbard share a strongly essentialist epistemology though (see Linsbichler 2017, 2021a).

¹⁸ For Mayer and his research program, see Klausinger (2015) and Milford & Rosner (1997).

[We should] reawaken the great sense of the basic words of our mother tongue. Some names, i.e. some notions associated with the sound of the names, are so correct and sound so pure in us, that the scientific investigator is allowed to restrict herself to the analysis of language in order to determine the essential characteristics of a phenomenon. [...] The ear often judges better than the mind. (Wieser 1884, p. 6, my translation)

If one accepted the claim that necessarily true knowledge is “deeply rooted” in the sound of the natural language of a people and will remain true so long as the language persists (Wieser 1884, p. 7), then a translation into a formal language might pose an insurmountable problem. The essential features of the sound of the language might get irrevocably lost. Note however, that according to such an essentialist position regarding the sound of language, a translation between German and English is *prima facie* equally problematic as a translation between German and a formal language. By studying the German *Sprachgeist* as an emanation from the German *Volksgeist* we learn only about the laws governing the German economy. The laws of the Anglo-Saxon economy might be quite different.

Adopting Wieser’s essentialist notion of language might help to preclude formalization. This ‘achievement’ comes at a high price though. We ultimately end up with an oddly relativistic economics and might fuel nationalistic leanings which Wieser indeed sympathized with in his later years.

9 The Prospects of Partially Formalized Austrian Economics

Those readers not convinced by Wieser’s *Sprachgeist* argument hopefully accept that, from an Austrian perspective, there is no principled justification to reject formalization altogether and that, historically speaking, the School’s main representatives did not actually do so. Many Neo-Austrian economists might nevertheless consider the extent of mathematics in their journal articles and textbooks pragmatically adequate. To be clear, hardly anything in this paper suggests otherwise.

Having legitimated formalization, the only specific proposal where to implement it pertains to parts of the praxeological branch of Austrian economics. Bearing in mind the many pitfalls of formalization, the concrete content of the fundamental axiom “Man acts.” as well as some more contested verbal chains of praxeological deduction would arguably benefit from explication and proof checks in a formal language. If however, there is in fact no ambition to detect gaps or hidden assumptions in purported deductive proofs, perhaps the rejection of formalization has merely been a handy immunizing strategy for preconceived conclusions all along.

Austrian economics, which does not depend on an untenable extreme apriorism (see Linsbichler 2019) and cautiously permits formalization, will hopefully substantiate how fruitful exchange and comparative evaluations between different schools of thought are possible. Unless we adopt a *Sprachgeist* argument, we may not be confronted with a detrimental plurality of mutually untranslatable scientific languages and incommensurable, ideologically biased theories. Non-polemical communication across schools of thought may ultimately even promote public trust in economics as a scientific endeavor.

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