

A Hayekian Explanation of Hayek's 'Epistemic Turn'

Scott Scheall, F.A. Hayek Program for Advanced Study in Philosophy, Politics, and Economics at the Mercatus Center at George Mason University, USA and Department of Science, Technology, and Society, Arizona State University, USA
scott.scheall@asu.edu

Abstract

The present essay investigates the development of F.A. Hayek's thought concerning industrial fluctuations from the perspective of his methodology of sciences of complex phenomena and concludes that – to the extent this evolution is representative of Hayek's more general 'epistemic turn' away from technical economics towards philosophy – there is no mystery concerning the relationship between Hayek's early technical work and his later more philosophical work. According to Hayek's methodology, an inquirer who runs into phenomena too complex for adequate explanation on the basis of current knowledge must move to a more general, albeit less testable, explanation. This is precisely what happened in the evolution of Hayek's thought concerning trade cycles.

Keywords: Hayek, epistemic turn, business cycles, methodology, complex phenomena, explanation of the principle

1. Introduction

It has been often noted – including by the man himself ([1964b] 1967, p. 91) – that Hayek's career as a 'very pure and narrow economic theorist' came to a rather abrupt end sometime around the publication of 1941's *The Pure Theory of Capital* ([1941] 2007), and that his subsequent career led 'into all kinds of questions usually regarded

as philosophical' ([1964b] 1967, p. 91). The present paper considers whether Hayek's methodology of sciences of complex phenomena contributes to an explanation of his transition from 'technical' economics to philosophy.¹ Does what Hayek wrote about the difficulties of theorizing with respect to complex phenomena and the moves available to an inquirer confronted with complexity make sense of his shift away from technical economics toward philosophy?

The present paper builds an 'explanation of the principle' of Hayek's 'epistemic turn'² upon the premises that 1) Hayek's early career was dedicated to the investigation of some very complex phenomena, namely, those of the business cycle, using the tools of technical-economic analysis then available; this project ultimately failed, Hayek thought, in part because the complexity of the relevant phenomena outran the explanatory capacities of those tools; 2) Hayek spent much of his subsequent career developing a methodology of sciences of complex phenomena, according to which ([1964a] 1967, p. 29; also see [1961] 2014) the inquirer confronted with phenomena of a degree of complexity beyond cognitive tractability must take refuge in a system of 'higher-level generalities' that subsume some of the otherwise inexplicable complexities

¹ This paper is dedicated to my friend Gerardo Serra, who first suggested to me the need for and potential fruitfulness of an analysis of Hayek's work from its own perspective. It was only then that I realized that such was the nature of a project upon which I had, without fully appreciating its significance, already embarked. Gerardo's suggestion was an enormous aid in the development of the current project. Of course, the standard caveat applies, and neither he nor anyone else is in any way responsible for whatever errors of analysis the present essay leaves uncorrected.

² The earliest reference to the phrase 'epistemic turn' that I've been able to uncover in the secondary literature on Hayek appears in Birner (1999). It should be noted that, strictly speaking, the argument of the current paper contributes to an explanation of the development of Hayek's thought concerning industrial fluctuations and that it is only insofar as this development is representative of his broader intellectual evolution that the argument contributes to an explanation of his epistemic turn. No very robust argument will be offered here for connecting the changes in his thought concerning fluctuations with his wider epistemic turn. However, given the apparent centrality of Hayek's business cycle project to his early career and the obvious significance of the ultimate failure of this project to his subsequent movement away from technical economics, it seems not too presumptuous to link the development of his thought concerning industrial fluctuations with his broader epistemic turn.

of the relevant phenomena; 3) Hayek's post-turn writings indicate that his thought had moved from the theoretical plane of generalities about the phenomena of industrial fluctuations to the methodological plane of generalities about the latter kind of theoretical generalities. In other words, Hayek's methodology of sciences of complex phenomena contributes to an explanation ('of the principle') of the development of his thought concerning industrial fluctuations. According to this methodology, an inquirer who runs into phenomena too complex for adequate explanation on the basis of current knowledge must move to a more general, albeit less testable, explanation. This is precisely what happened in the evolution of Hayek's thought concerning trade cycles. To the extent these developments are emblematic of his wider epistemic turn, the explanation of the principle advanced here of the evolution of Hayek's thinking about economic fluctuations contributes to an explanation of this turn.

2. The Implications of Hayek's Methodology of Sciences of Complex Phenomena for His Epistemic Turn

Hayek's methodology of sciences of complex phenomena bears two implications for an explanation of his epistemic turn. In the first place, there is the notion that, given our cognitive limitations, it becomes progressively more difficult to develop satisfactory explanations as the phenomena under investigation grow increasingly complex (Hayek, [1964a] 1967). Any attempt to theorize about complex phenomena using analytical tools which, though they may be appropriate for the study of simpler phenomena, are

inappropriate for the investigation of more complex processes, is unlikely to succeed. In other words, Hayek's methodology as applied to the complex social phenomena of scholarly theorizing³ predicts that we should expect to observe patterns of failure where scholars apply to analyses of complex phenomena tools appropriate only for the analysis of simpler phenomena.

Hayek ([1945] 1948, p. 80) defended a bifurcated epistemology. He argued that there are two varieties of knowledge: '[A] little reflection will show that there is...a body of very important but unorganized knowledge which cannot possibly be called scientific in the sense of knowledge of general rules: the knowledge of the particular circumstances of time and place'. This distinction between theoretical knowledge (of 'general rules') and empirical knowledge (of 'particular circumstances') is essential to Hayek's methodology of sciences of complex phenomena. The possibility of a 'full' explanation (or a detailed prediction of particular events) requires that the inquirer possess both kinds of knowledge to a sufficient extent: '[s]uch prediction will be possible if we can ascertain...all the circumstances which influence those events. We need for this both a theory which tells us on what circumstances the events in question will depend, and information on the particular circumstances which may influence the event

³ A system of phenomena is *complex* in Hayek's sense if and only if it consists of a large number of elements interconnected (both to each other and to the external environment) in such a way as to give rise to an emergent order that possesses 'certain general or abstract features which will recur independently of the particular values of the individual data, so long as the general structure...is preserved' (Hayek, 1964a [1967], p. 26). I take it that the phenomena of scholarly theorizing, both for the individual inquirer and a community of inquirers, are complex in this sense. For an individual scholar, the relevant elements are mental neurons and various physical stimuli, and the order that emerges is a theory or, more generally, a belief. For a community of scholars, the relevant elements are individual inquirers, theories (beliefs, including methodologies and ontologies), and various physical (including 'social') stimuli, and the order that emerges is a research tradition (or, if you prefer, 'paradigm'). Obviously, much more could be said about the respects in which theorizing is a complex phenomenon, but this sketch will have to suffice for present purposes.

in which we are interested' (Hayek, [1961] 2014).⁴ However, in the disciplines that investigate more complex phenomena, it is comparatively difficult to uncover all of the relevant theoretical parameters (not to mention the internal interrelations between the proper subsets of these variables and the external relations between the subsets of parameters and the environment) and it is more difficult to discover the respective data.⁵ If there is a mismatch here – if, for example, the complexity of some phenomena outruns our capacity for (either theoretical or empirical) knowledge of the phenomena – then resulting explanations will simply fail to reflect the unaccounted aspects of the phenomena.

There is reason to believe that Hayek recognized such an incongruity between the complexity of the phenomena and the limited explanatory capacities of the extant analytical tools to be a problem for his early business cycle project. Hayek came to think of all economic phenomena as complex in the relevant sense ([1964a] 1967, pp. 34-36). But, more specifically, as he acknowledged in the introductory sections of *The Pure Theory of Capital* ([1941] 2007), despite its tremendous complexity, *The Pure Theory* was not nearly elaborate enough to express the intricacy of the phenomena under investigation. In order to appreciate this point, it is important to consider the difficulties Hayek encountered in the development of the business cycle project that was so very central to his early career as an economic theorist.

⁴ An explanation 'can never explain everything to be observed on a particular set of events' (Hayek, 1952, p. 182). Explanatory 'fullness' is context-sensitive.

⁵ For more on these difficulties – i.e., the 'theory problem' and the 'data problem' – and their implications for the 'predictive degree' of theories that suffer from them, see Scheall (Manuscript A).

Hayek's earliest writings in technical economics⁶ aimed to clarify the foundations of the theoretical framework upon which he subsequently built the trade cycle theory expounded in the companion pieces *Monetary Theory and the Trade Cycle* ([1933] 2008; originally published in German in 1929) and *Prices and Production* ([1931, 1935] 2008). It was the development of an appropriate concept of equilibrium and, later, a theory of capital adequate to the problem of industrial fluctuations that would prove most intractable in this regard.

Hayek ([1928] 1984) was aware that Walras' static general equilibrium framework was an imperfect tool upon which to base a theory of the cycle in a dynamic, money- and capital-using economy. Nonetheless, when he came to consider the methodology of cycle theories in *Monetary Theory*, he argued that the goal of unifying an explanation of the cycle with the then-accepted corpus of economic theory required the Walrasian framework (Hayek, [1933] 2008, pp. 18-19). The uniqueness of Hayek's early theory lies in the fact that, with the introduction of assumptions concerning money and the activities of bankers in the creation of credit, cyclical fluctuations can be generated out of the otherwise perfectly-adjusting equilibrium framework.

However, in the 1933 essay 'Price Expectations, Monetary Disturbances, and Malinvestments', Hayek ([1933] 1984, p. 136) argues against this view that the superimposition of monetary assumptions upon the skeleton of Walrasian equilibrium suffices to generate an adequate explanation of the cycle; this latter method is 'to press the problems into the strait-jacket of a scheme which does not really help to solve them'. Instead, what is needed is 'a development of our fundamental theoretical apparatus

⁶ These essays have been translated and anthologized, either in Hayek (1984) or in the relevant volumes of Hayek's *Collected Works*.

which will enable us to explain dynamic phenomena...I am now more inclined to say that general theory itself ought to be developed so as to enable us to use it directly in the explanation of particular industrial fluctuations' (Hayek, [1933] 1984, pp. 137-138).

Hayek ([1937] 1948) subsequently developed a unique concept of economic equilibrium according to which equilibrium exists to the extent that the relevant beliefs of individual market participants are both inter-subjectively consistent and accurate with respect to external conditions. He employs this framework throughout *The Pure Theory of Capital*, but 'repeatedly apologizes for doing so. Although he clearly considers the new definition to be an advance over those found in earlier models, he also suggests that equilibrium analysis in general is, at best, *preparatory* to a more advanced causal analysis of economic phenomena' (Caldwell, 2004, p. 224; italics in the original; also see Chapter Two of Hayek, [1941] 2007, pp. 31-51). That is, Hayek judged his epistemic concept of equilibrium, more complex though it was than the traditional treatment, to be still too simple for an adequate causal explanation of the phenomena of the cycle.

With respect to capital theory, *Prices and Production* places Böhm-Bawerk's capital theory at the heart of an explanation of industrial fluctuations. It was this element of Hayek's early cycle theory and especially Böhm-Bawerk's concept of the 'average period of production' – a measure of the temporal duration of the capital structure – that was to receive the harshest criticism from both Hayek and his peers in the years immediately following the book's publication. As Hayek came to recognize, an average period of production can be non-circularly defined only under severely restricted assumptions. When these conditions are relaxed, the definition of the average

production period becomes circular in that it both depends upon and is a determinant of the interest rate (Hayek, [1936] 2008, pp. 497-498; White, 2007, p. xxii).

The theory of fluctuations offered in *Prices and Production* was intended to be – and, given the circumstances of its rushed preparation, could only be – a mere sketch of an elaborated explanation of the cycle.⁷ But, as it became clear that the simplifications of the latter book, especially with regard to the temporal element embodied in the period of production concept, ‘evaded so many essential problems that the attempt to replace it by a more adequate treatment...raised a host of new questions which had never been really considered and to which answers had to be found[,]’ Hayek was unable to proceed immediately to a more detailed account of the cycle. He came to believe that the capital theory upon which the analysis of *Prices and Production* was founded was too simple: ‘I can see in the simplified form in which I had to use it in my former book it may be more misleading than helpful’ (Hayek, 1939, p. 7; quoted in White, 2007, p. xxii). The consequences of the simplifications of *Prices and Production*, especially with regard to capital, could not be ignored (Hayek, [1941] 2007, p. 4).

The theoretical gaps in *Prices and Production* include, but are not limited to, a theory of the bust or depression phase of the cycle, or as Hayek calls it, a theory of the ‘economics of decline’ ([1932] 1984, p. 137), and a theory of what it means to maintain capital intact over time.⁸ Hayek attempted to settle this latter question on a number of

⁷ On the circumstances of the hurried preparation of Hayek’s invited LSE lectures in 1931 (ultimately published later in the same year as *Prices and Production*), see Hayek ([1931, 1935] 2008, pp. 191-196) and Caldwell (2004, pp. 171-173).

⁸ As argued in Scheall (Forthcoming), perhaps the most important lacuna in Hayek’s early business cycle theory, at least from the perspective of philosophy of science, is its lack of implications for the temporal spans that separate the causes posited from their purported effects. In the absence of these temporal parameters, the theory offers no guidance as to which phenomenal patterns qualify as instances of economic-cyclical processes. In other words, the absence of temporal considerations makes the theory untestable. Of course, Hayek was well aware of the fact that economists cannot (and should not try) to

occasions ([1935] 1939, [1936] 2008, [1941] 2007). Indeed, he dedicated the better part of the 1930s to reconstructing Böhm-Bawerk's theory of capital so as to make it a more appropriate basis for an explanation of the cycle.

However, Hayek was far from satisfied with the results of this endeavor. The preface to *The Pure Theory of Capital* is little more than an apology for the inadequacies of the theory *despite its massive complexity*. In particular, Hayek perceived the flaws of *The Pure Theory* to lie 'in the fact that...it leaves some problems of real importance unsolved' ([1941] 2007, p. 5). Though '[i]t would undoubtedly be highly desirable...that this should be done once and for all...I can only plead that I have grappled honestly and patiently with what even now appears to me to be by far the most difficult part of economic theory, and that the present book with all its shortcomings is the outcome of work over a period so prolonged that I doubt whether further effort on my part would be repaid by the results' ([1941] 2007, p. 5). Indeed, the limited discussion of the trade cycle such as it appears in the fourth part of *The Pure Theory* remains 'condensed and sketchy' ([1941] 2007, p. 5) despite the fact that an elaboration of an improved theory of the cycle was the original motivation for writing the book! For all intents and purposes, from that point forward, Hayek-the-technical economist was dead—long-lived was Hayek-the-philosopher.

For Hayek, in the last analysis, theorizing about the dynamics of the cycle meant either constructing an overly simplified theory which, given the complexity of the phenomena, would be 'probably of necessity false' (Hayek, [1964a] 1967, p. 28) or

say sooths of a temporally-indexed variety, so this is not intended as a criticism; however, as argued in *Ibid.*, this non-testability, together with a similar non-testability of the theory of Hayek's great rival, Keynes, has profound consequences for the prospects of settling disagreements between defenders of the respective theories.

developing a highly elaborate theory – like the one he constructed in *The Pure Theory of Capital* – ‘so damned complicated it’s almost impossible to follow it’ (Hayek, 1994, p. 141). In an effort to defend the original cycle theory of *Prices and Production* from the criticisms directed at its capital-theoretic core, Hayek expounded a theory that was ultimately too complicated to serve as the basis of an extended explanation of cyclical phenomena and yet, at the same time, was too simple an explanation of the phenomena of capital.

Stated plainly, it seems that Hayek’s early business cycle project failed to bear the fruit he expected of it (at least in part) because, while still failing to express the complexity of the phenomena, the analysis he developed started to outrun his cognitive capacity to keep track of it. Hayek had taken the extant tools as far as he could – which may have been as far as they could have been taken by anyone – but not far enough to complete the capital theory project, much less the elaborated theory of the cycle.⁹ Of course, given Hayek’s methodology, failure is what we should expect when tools appropriate only for the analysis of simpler phenomena are applied to more complex phenomena. That is, Hayek’s later methodology of sciences of complex phenomena implies an explanation of the failure of his earlier business cycle project and, to the extent this failure was a prerequisite for his epistemic turn, contributes to an explanation of the latter.

⁹ This raises the interesting question, which, unfortunately, cannot be addressed at length here, whether Hayek would have adopted the more sophisticated analytical tools of, say, modern complex systems theory, had they been available at the time. This is a difficult counterfactual to evaluate if for no other reason than that Hayek did not seem to possess the competency required to fruitfully apply the most sophisticated mathematical tools of his own day, much less some yet more refined tools that would not be developed for a half-century following his emigration from the field of technical economics. Who knows what Hayek would have done if *both* he had been sufficiently proficient and more advanced tools had been available during the 1930s?

The second element of the methodology of sciences of complex phenomena that is relevant to an explanation of Hayek's epistemic turn concerns his ([1964] 1967, p. 40) argument that moving to a system of 'higher-level theories' that subsume some of the otherwise inexplicable complexities of the relevant phenomena is a necessary response to the difficulties of theorizing about complex phenomena:

'Though we may never know as much about certain complex phenomena as we can know about simple phenomena, we may partly pierce the boundary by deliberately cultivating a technique which aims at more limited objectives—the explanation not of individual events but merely of the appearance of certain patterns or orders. Whether we call these mere explanations of the principle or mere pattern predictions or higher-level theories does not matter. Once we explicitly recognize that the understanding of the general mechanism which produces patterns of a certain kind is not merely a tool for specific predictions but important in its own right, and that it may provide important guides to action (or sometimes indications of the desirability of no action), we may indeed find that this limited knowledge is most valuable'.

Hayek ([1961] 2014) considered 'those systems of equations in which mathematical economists describe the conditions of market equilibrium' to epitomize such a higher-level theory. But, of course, the methodology of sciences of complex phenomena, which takes as its elements the relations between theories and *their* elements is of a yet

higher order than the theories it encompasses.¹⁰ In Hayek's case, the move to a higher-level theory involved a shift from the theoretical plane of generalizations about economic phenomena to the methodological plane of generalizations about the former kind of theoretical generalizations.

I have argued elsewhere that Hayek's methodology implies an explanation of industrial fluctuations that includes (the substance, but not the methodology, of) his earlier theory of the cycle as a special case.¹¹ This move (which I'm *not* arguing was a deliberate one on Hayek's part—recall the role of tacit knowledge in Hayek's epistemology¹²) to the methodological plane lead to an explanation of industrial fluctuations that allowed Hayek to rise above the very intricate details that weighed so heavily upon his early account. The methodological explanation attributes episodes of disequilibrium to action under a 'pretence' that the complexities of economic phenomena are cognitively tractable. More to the point, Hayek's ([1975] 1978) argument is that action – usually, political action – intended to maintain (or restore) a state of economic equilibrium, or of 'full employment', which is founded on belief in a simpler-than-required theory of the economy, is likely to interfere with the equilibrating tendency of the price system and, thus, lead away from rather than toward equilibrium. Whatever the possible demerits of such an explanation of economic fluctuations, it certainly abstracts from many of the theoretically-intractable intricacies that undermined Hayek's technical-economic account of the cycle. Thus, the methodology of sciences of complex

¹⁰ 'The term "higher level regularities" which I have used to describe the content of such statements about the general character of an order is meant to indicate that it does not refer to relations between particular elements of such an order, but only to relations between relations, or even relations between relations between relations between the elements' (Hayek [1961] 2014)

¹¹ See Scheall (Manuscript B)

¹² It is possible for there to be knowledge of which we are not 'explicitly aware', but which we 'merely manifest...in the discriminations which we perform' (Hayek, 1952, p. 19). This is 'tacit' knowledge (Polanyi, 1966) or 'knowledge how' as opposed to 'knowledge that' (Ryle, 1946).

phenomena both explains and can be read as a reaction to the failure of the business cycle project.

3. Concluding Remarks

It is important to emphasize that the current argument does not terminate in a full-fledged historical explanation of Hayek's epistemic turn, but rather in (what Hayek called) an *explanation of the principle* 'on which a certain mechanism operates' ([1964] 1967, p. 37). The relevant mechanism is the one by which Hayek 'turned' from technical economics to philosophy; more generally, it is the mechanism by which such 'turns' might occur in any scholar's career. Stated another way, the present explanation is a *theory* (which neither aspires to nor attains comprehensiveness) of the circumstances that might lead to such transitions in a scholar's approach over time.

In keeping with Hayek's methodology of sciences of complex phenomena, the distance in logical space that separates this explanation of the principle from a historical explanation must be filled in with the relevant empirical data (and, given the non-exhaustiveness of the aforementioned principles – i.e., given that the current explanation instantiates the 'theory problem'¹³ – additional theoretical considerations that I've failed to uncover). It is the business of the historian of ideas – rather than that of a *theoretician* of the history of ideas (the guise I've implicitly adopted here) – to discover and populate with empirical details a theoretical model like the one offered in the current paper. I've traversed a bit of the distance to a full-fledged historical explanation by adducing evidence that Hayek was indeed disappointed that his early

¹³ See Scheall (Manuscript A).

theory failed to reflect the complexity of the relevant phenomena and that Hayek's methodology refers to higher-order generalities than does his early cycle theory. Nonetheless, the 'data problem' remains: this evidence could surely be strengthened, and more and different evidence could be adduced, in the form of further relevant details from Hayek's biography. However, if Hayek's methodology is correct, a comprehensive enunciation of the relevant data, which, in the present case, might even include, e.g., specific neuronal firings in Hayek's brain in response to various physical stimuli,¹⁴ is beyond our cognitive abilities—all explanations are circumscribed relative to the events they aim to explain.

What is especially interesting about the current paper is that Hayek both experienced *and* offered materials relevant to a theoretical explanation of such a 'turn'. The principles offered in the present paper seem to fit Hayek's career well or, more exactly, the facts of Hayek's career do not falsify the posited explanation of the principle. It would be a further test of the theory to consider in the light of the present explanation the careers of other scholars (e.g., Hayek's distant cousin, Ludwig Wittgenstein) whose beliefs are alleged to have 'turned' over time.

Acknowledgements

I would like to thank Paul Lewis for his helpful comments on an earlier draft and the audience members of a session at the 2014 History of Economics Society conference in Montreal.

¹⁴ See footnote 3 above.

References

- Birner, J. (1999). The Surprising Place of Cognitive Psychology in the Work of F.A. Hayek. *History of Economic Ideas*. 7(1-2), 43-84.
- Caldwell, B. (2004). *Hayek's Challenge: An Intellectual Biography of F.A. Hayek*. Chicago: University of Chicago Press.
- Friedman, J. (2013). Hayek's Two Epistemologies and the Paradoxes of His Thought. *Critical Review*. 25 (3-4), 277-304.
- Hayek, F.A. [1928] (1984). Intertemporal price equilibrium and movements in the value of money. In R. McCloughry, (Ed.) *Money, Capital, and Fluctuations: Early Essays*. Chicago: The University of Chicago Press, 71-117.
- Hayek, F.A. [1931, 1935] (2008). Prices and production. In J. Salerno, (Ed.) *Prices and Production and Other Works*. Auburn, AL: Ludwig von Mises Institute, 189-329.
- Hayek, F.A. [1932] (1984). Capital consumption. In R. McCloughry, (Ed.) *Money, Capital, and Fluctuations: Early Essays*. Chicago: The University of Chicago Press, 136-158.
- Hayek, F.A. [1933] (1939). Price expectations, monetary disturbances, and malinvestments. In *Profits, Interest, and Investment*. New York: Augustus M. Kelley, 135-156.
- Hayek, F.A. [1933] (1984). On 'neutral money'. In R. McCloughry, (Ed.) *Money, Capital, and Fluctuations: Early Essays*. Chicago: The University of Chicago Press, 159-162.

- Hayek, F.A. [1933] (2008). Monetary theory and the trade cycle. In J. Salerno, (Ed.) Prices and Production and Other Works. Auburn, AL: Ludwig von Mises Institute, 1-130.
- Hayek, F.A. [1935] (1939). The maintenance of capital. In Profits, Interest, and Investment. New York: Augustus M. Kelley, pp. 83-134.
- Hayek, F.A. [1936] (2008). The mythology of capital. In J. Salerno, (Ed.) Prices and Production and Other Works. Auburn, AL: Ludwig von Mises Institute, 487-520.
- Hayek, F.A. [1937] (1948). Economics and knowledge. In Individualism and Economic Order. Chicago: University of Chicago Press, 33-56.
- Hayek, F.A. (1939). Profits, interest, and investment. In Profits, Interest, and Investment. New York: Augustus M. Kelley, 3-71.
- Hayek, F.A. [1941] (2007). The pure theory of capital. In L. White, (Ed.) The Collected Works of F.A. Hayek, vol. 12, The Pure Theory of Capital. Chicago: University of Chicago Press.
- Hayek, F.A. [1945] (1948). The use of knowledge in society. In Individualism and Economic Order. Chicago: University of Chicago Press, 77-91.
- Hayek, F.A. (1952). The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology. Chicago: University of Chicago Press.
- Hayek, F.A. [1961] (2014). A new look at economic theory. In B. Caldwell, (Ed.) The Collected Works of F.A. Hayek, vol. 15, The Market and Other Orders. Chicago: University of Chicago Press, page numbers unavailable.

- Hayek, F.A. [1964a] (1967). The theory of complex phenomena. In *Studies in Philosophy, Politics, and Economics*. Chicago: University of Chicago Press, 22-42.
- Hayek, F.A. [1964b] (1967). Kinds of rationalism. In *Studies in Philosophy, Politics, and Economics*. Chicago: University of Chicago Press, 82-95.
- Hayek, F.A. [1975] (1978). The pretence of knowledge. In *New Studies in Philosophy, Politics, Economics, and the History of Ideas*. Chicago: University of Chicago Press, 23-34.
- Hayek, F.A. (1984). *Money, Capital, and Fluctuations: Early Essays*. (Ed.) R. McCloughry. Chicago: The University of Chicago Press.
- Hayek, F.A. (1994). *Hayek on Hayek: An Autobiographical Dialogue*. (Ed.) S. Kresge and L. Wenar. Chicago: University of Chicago Press.
- Marsh, L. (2013). Mindscapes and landscapes: Hayek and Simon on cognitive extension. In (Ed.) R. Frantz and R. Leeson. New York: Palgrave Macmillan.
- Polanyi, M. (1966). *The Tacit Dimension*. Garden City, NY: Doubleday & Company, Inc.
- Ryle, G. (1946). Knowing How and Knowing That'. *Proceedings of the Aristotelian Society*. 46, 1-16.
- Scheall, S. (Forthcoming). Slaves of the Defunct: The Epistemic Intractability of the Hayek-Keynes Debate. *Journal of Economic Methodology*.
- Scheall, S. (Manuscript A). Lesser Degrees of Explanation: Some Implications of Hayek's Methodology of Sciences of Complex Phenomena.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2375313

Scheall, S. (Manuscript B). Hayek's Epistemic Theory of Industrial Fluctuations.

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2327202

White, L. (2007). Editor's introduction. In L. White, (Ed.) The Collected Works of F.A.

Hayek, vol. 12, The Pure Theory of Capital. Chicago: University of Chicago

Press, xiii-xxxvi.