Austrian Macroeconomics:
Lawrence H. White and the Austrian Tradition

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This work has benefitted from general discussions with Bruce Caldwell during my stay at the Center for the History of Political Economy. Views presented and all errors are my own. This is an early draft. Do not cite without permission.

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1. Austrian Macroeconomics: Lawrence H. White and the Austrian Tradition

An uncritical evaluation of Austrian commentary on macroeconomics might lead an observer to draw the incorrect conclusion that Austrian economists do not believe macroeconomics exists as a distinct field of study. Austrian economists focus on processes that underly markets and institutions more broadly complicate such a simple decision. This perception is reinforced by a stark division between micro and macroeconomics in the mainstream of each field. As one non-Austrian observer has acutely observed, "methodological individualism and subjectivism do not challenge the reality of social or aggregate entities; rather they insist that . . . the challenge is to provide an explanation of their characteristics which refers only to individuals and their subjective valuation (Hoover 1988, 234)." Good macroeconomics never loses site of methodological individualism.

There exists a distinct Austrian macroeconomics and often this work seeks to be in conversation with the mainstream of macroeconomics (White 2016; Luther 2021). This work is diverse, in some cases focusing largely on capital, finance, and monetary policy and in others emphasizing the evolution of institutions (see for example Lachmann 1956; Garrison 1978; 2000; Lewin 1998; Horwitz 2000; Lewin and Cachanosky 2019; 2020; Koppl 2002; Koppl and Luther 2012; Boettke, Salter, and Smith 2021; Salter and Young 2023). Contributions from over the

last few decades have often been led by Lawrence H. White or have involved one of his students.

Austrian macroeconomics does not follow the divisions that have largely defined micro and macroeconomics over much of the last century. To the extent that it does, emphasis is typically on linkages between these two realms. Work defining Austrian macroeconomics is concerned with relative prices, market process, institutional evolution, and capital allocation. In its most sophisticated form, theorists engage in causal reasoning, best exemplified by the theorizing of Carl Menger and F. A. Hayek, along with Hayek's mentor Ludwig von Mises (1892). This causal-genetic approach allowed Menger to confront, more generally, a theory of institutions (see Menger 1883). Often this approach is augmented by modern analytical methods. These emphases may seem alien to mainstream macroeconomists. Somewhat ironically, their content provides meaningful microfoundations that have eluded the mainstream of macroeconomics whose *microfoundations* are present but not substantive (Hoover 2001).

Austrian macroeconomic theory includes varied applications that typically trace their roots to Carl Menger. The most obvious is Austrian capital theory (Braun 2015). Work here tends to develop from the emphasis on capital heterogeneity and the structure of productive capital. During and immediately following his work with Mises, Hayek contributed to Austrian capital theory, laying the foundations for reasoning about the relationship between money and capital and attempting, in his last major work on the topic, to move beyond the average period of analysis (Hayek 1929; 1931; 1941). Across the following decades, F. A. Hayek spent significant energy elaborating the logic of monetary standards, the relationship between capital and monetary expansion, including both credit expansion and expansion from the monetary authority. Eventually, he applied his insights to competing national monetary standards and moneys generated by private financial institutions. Finally, Hayek developed Carl Menger's causal-genetic approach to theorizing. This approach is clear across his work, and includes his eventual adoption of a modern, computational lens that had served as the basis for analysis in *The Sensory Order*.

Researchers following the Austrian tradition have continued adding detail to these branches of Austrian macroeconomic theory. Perhaps the most prolific of these has been Lawrence H. White. White has developed each of the above mentioned lines of reasoning of Austrian macroeconomics. White has also resolved some tensions while leaving behind new puzzles to be resolved. I will focus here on themes that are largely embodied in the following questions:

1. How does Carl Menger's causal-genetic approach, and Hayek's development of it, provide appropriate microfoundations for macroeconomic theory?
2. How should we represent Hayek's intellectual geneology?

We will see that White consistently constructs his arguments using Mengerian foundations. His familiarity with the Mengerian approach, along with his training in monetary and macroeconomic theory position him to critically evaluate the

historical development of Austrian macroeconomics. When I read White's contributions, I get the sense that he seeks not so much to persuade but that he is attempting to make sense of Austrian economics, its history, and the world that it is intended to explain as means of sating his own curiosity. As the most fundamental of these developments is the evolutionary theory of Carl Menger, we will develop first from this approach and follow by elaborating his contribution to our understanding of F. A. Hayek's macroeconomics.

2. Causal-genetic Macroeconomics

Many of the methodological problems that trouble traditional microeconomics - such as the assertion of market equilibration and the costless availability of information and knowledge - are magnified in the realm of macroeconomics where diverse markets are typically modeled in aggregate. While aggregate supply and aggregate demand look suspiciously similar to the supply and demand curves from which their names are drawn, the composition of each is dependent on factors quite different from supply and demand in a particular market. Add to this confusion that, depending on the model, money may be treated as being wholly endogenized, being a function of real factors and expectations about those factors. Some macroeconomic theorists have, as a result, treated money and finance entirely passively. Price theory, in such formulations, is excessively adumbrated, with causation being essentially divorced from relative prices. While this is obvious with regard to modern macroeconomic models, this tendency predates modern macroeconomics (Baek, Caton, and Miljkovic 2025).

From the start of his career, White placed upon his own shoulders the heavy burden of navigating these methodological difficulties. In his discussion of Austrian methodology, White notes that:

> In particular he [Menger] includes within the realm of economic theory the determination of empirical regularities to be achieved through induction from a large number of cases. Such research is better categorized as a form of economic history. (White 1977, x-xi)

Menger sought to keep the development of economic theory in conversation with empirical reality, seeing, "a 'partially empirical-realistic' analysis entering into the selection of ideal-type theoretical assumptions, and empricial observation entering into the ascertainment of causal linkages *between ideal types* . . . (White 1977, xi)". This approach was an antidote to the "antitheoretical attitudes of the dominant Historical School (White 1977, x)." The job of the economist is not reduced to simply selecting or applying a supposedly correct model to a dataset. Though this may be part of the role of a theorist, to define task of the macroeconomist in this manner is to narrow the job of the theorist to that of a technician. The economist is charged with the task of identifying the abstractions appropriate for interpretting action and interaction within a particular setting. In the former case, the first step of the economist would be to reduce the context of the problem to a dataset, thereby asserting that the dataset itself embodies

information relevant to description of the historical setting or the theoretical problem under consideration. The latter approach of identifying the correct abstractions requires a vast complex of interpretive devices to be applied by the theorist as artisan. There is little choice but to defer to the judgment of the theorist.

White's work is consistent with the latter approach, placing him in the tradition of Nobel Laureate F. A. Hayek. While the inferences that he thought were of particular importance changed over the course of his career, F. A. Hayek consistently applied a Mengerian approach in that he envisioned individuals whose actions promoted an intended state that would satisfy the agent, thus promoting an equilibrium relationship between the agent and the environment, whether or not that equilibrium state is actually generated. Of course, Hayek was famililar with Menger's *Principles* and his theory of the emergence of money, having first read them in 1920, before being employed under Ludwig von Mises the following year (Caldwell and Klausinger 2022, 137). And in his essay dedicated to Carl Menger, he mentions that:

> The main Austrian achievement in this field is the consistent application to the theory of money of the peculiar subjective or individualistic approach which has a much wider and more universal singificance. Such an achievement springs directly from Menger. His exposition of the meaning of the different concepts of the value of moeny, the causes of changes and the possibility of a measurement of this value, as well as his discussion of the factors determining the demand for money, all seem to me to represent a most significant advance beyond the traditional treatments of the quantity theory in terms of aggregates and averages. (Hayek 1934, 414)

White recognizes Hayek's adoption of the "compositive method" developed by Menger (White 1977, 19-21). And although White is not perniciously self-conscious about his Austrian approach, he draws from this method robustly in describing the evolution of money and credit. We will, then, benefit from explicitly identifying the Austrian core of White's approach.

To understand the perspective that White has invigorated, it is helpful to consider Hayek's emphasis on competition. In his Nobel speech, Hayek argued against the "The Pretense of Knowledge" whereby policymakers, in their analysis, pretend to have access to knowledge that is only provided through the execution of market processes and, more generally, social processes. Consistent with his arguments developed in the socialist calculation debate and his famed article, "The Use of Knowledge in Society", prices only contain useful knowledge to the extent that they are the result of competitive market processes. The precise bits of knowledge that are contained within market generated prices are not typically available to the theorist. As Hayek reflects in his Nobel speech:

> It can hardly be denied that such a demand quite arbitrarily limits the facts which are to be admitted as possible causes of the events

> which occur in the real world. This view, which is often quite naively accepted as required by scientific procedure, has some rather paradoxical consequences. We know, of course, with regard to the market and similar social structures, a great many facts which we cannot measure and on which indeed we have only some very imprecise and general information. And because the effects of these facts in any particular instance cannot be confirmed by quantitative evidence, they are simply disregarded by those sworn to admit only what they regard as scientific evidence: they there upon happily proceed on the fiction that the factors which they can measure are the only ones that are relevant. (Hayek 1974)

Economic theory must, in humility, recognize the role of markets in generating information that will likely not be accessible to the theorist from his armchair in the ivory tower. This position was supported by Hayek's work on "Competition as a Discovery Procedure" (Hayek 1968). Following his Nobel lecture, Hayek applied this perspective to national and privately minted currencies (Hayek 1976a; 1976b). However, Hayek does not consistently walk the reader through the evolutionary logic supporting his analysis. Importantly, White has taken up this pedagogical task while adding detail to and advancing Hayek's causal-genetic apoproach and its domain of application. The reader, then, can better understand the link between Mengerian evoultionary theory and Hayek's inferences concerning the role of competition as a discovery procedure, specifically with regard to elaboration of the evolution of money and finance in a competitive system.

White has embraced this Austrian approach at both the level of theorizing and interpretation of history. In fact, his success earned the praise of Gerald O'driscoll who reflected that "there is no Austrian theory of banking, at least, not before White (1984) (O'Driscoll 1994, 127)." He immediately follows by stating that "[o]ne of the Austrian School's most important contributions was the development of an evolutionary theory of money" (O'Driscoll 1994; cites O'Driscoll 1986). Of course, White developed Menger's evolutionary theory of money to include lending and bank credit (White 1984; Selgin and White 1987; 1994; White 1999a; 2023).

Not coincidentally, White has been drawn to problems in economic history often employing the tool of Mengerian conjectural history. That this approach is fundamental to White's thought is evidenced by his elaboration and development of Mengerian evolutionary theory in his graduate textbook, *The Theory of Monetary Institutions* (White 1999a). White opens with a discussion of the Mengerian evolution of money. He follows this introductory chapter with an analysis of stocks and flows under a gold standard to help situate the reader with respect to monetary dynamics. The approach is not only intuitive, its memorable. It has guided my own analysis since I first learned from it early in my graduate studies.

White demonstrates two important features of the monetary system by this approach. He provides a convincing description of 1) money's emergence and

2) the self-regulation of the monetary system. The monetary system is an institution where roles of money producer and money user are self-enforcing. Money providers are incentivized by the growing value of the money commodity that corresponds with an increase in demand for the money commodity. The earliest adopters of money benefit from the reduction in transaction costs enabled by money, especially reduction in carrying costs and storage costs. Particularly acute observers will identify and employ a commodity that is generally desirable for trade, thus supporting its greater saleability relative to other commodities. As the network of buyers and sellers who employ the money commodity grows, the cost of finding a suitable trading partner (search costs) is further reduced for money users. Competition amongst entrepeneurs in a market will select for a money commodity that is relatively scarce, durable, divisible, portable, and saleable, thereby economizing on costs due to search for a trading partner and of storing, transporting, and dividing the money commodity.

Although we learn that the monetary system essentially bootstraps itself into existence through incentives that arise naturally in the marketplace, it is not obvious that the quantity of money will be regulated in a manner that tends to promote long-run stability of prices or stability in the path of total expenditures. That is, how can we be certain that the quantity of money will not endlessly expand? And if there is a shortage of money, would we not face persistent economic depression? White argues diagramatically, consistent with Mazumder and Wood (2013), that the production of gold slows (quickens) as the price level, denominated in gold, rises (falls). As a result, the quantity of gold supplied to the market will, all else equal, increase during a recession generated by a fall in the velocity of gold. Notice that in the Mengerian theory of the origin of money, producers who respond to an increase in the price of the commodity used as money by increasing the quantity produced are, in fact, alleviating a shortage of money that will otherwise only be offset by a sustained increase in the price of money. Thus, an increase in transcations demand due to a general increase in productivity (i.e., improvement in the technical efficiency of capital) or an increase portfolio demand for money will generate a higher price of the money commodity, thereby promoting production of money.

White's presentation of the dynamics of the gold standard (see chapter 2 of White 1999) cleverly uses a Marshallian presentation of gold markets in a manner implied by traditional aggregate analysis, with the price of money being represented by the inverted price level ($\frac{1}{P}$). That is, the Marshallian presentation of the supply and demand for money interfaces the Mengerian theory of money with monetary aggregates. And since the market for the money implies an aggregation of all markets, this approach is consistent with the "total equilibrium" theorizing, a point that I will develop in the next section.) White infers from this analysis the direction of gold flows between monetary and non-monetary uses depending on the discrepancy between the price of monetary gold and the value that it fetches for non-monetary use. Further, this approach also allows White to consider the relationship of depository institutions to demand for base money. By implication, then, the supply of credit both alleviates demand

for base money and can generate demand shocks to the money commodity, especially, for example, during a banking crisis. This is consistent with Menger who identifies the distinction between the use value and exchange value in his theory of money's emergence. The emergence of money creates a two-fold demand for money that promotes its exchange value: portfolio demand and transactions demand (both in addition to demand to use the money commodity as a non-exchange input). In a world where money is no longer backed by a commodity, we can treat this as representing the entirety of demand for money.

The automatic regulation of the supply of money is a feature that central bankers often attempt to emulate, thought with greater swiftness than occurs under a commodity standard. Countercyclical policy is automatic under a gold standard that is not distorted by excessive intervention, for example policy driven by doctrines that drive procyclical monetary expansion and contraction of the kind observed during the Great Depression (White 2008b; 2012, 95-98; Selgin 1989; Timberlake 2007; Sumner 2015; Humphrey and Timberlake 2019; Caton 2023). And, supposing that the price level falls significantly such that gold is extremely profitable to mine due to a growing scarcity of money, producers are incentivized to find new sources of gold and to develop new technologies that improve the efficiency of extraction. The historical facts appear to bear this out. After major price deflation that accompanied growing transactions demand and portfolio demand for gold during the decades that following international convergence to the gold standard (and that included demonetization of silver), swelling production enabled by the cyanide process generated price inflation that offset the previous deflation over the course of the next two decades (Friedman and Schwartz 1963, 91; Bordo 1984; Rockoff 1984; Friedman 1992, 104-125).

Likewise, White's analysis helps us to understand how excessively tight monetary policy led to the end of the gold standard. White observes that:

> The episode should not be blamed on the gold standard, but on the combination of a weak banking system and a befuddled central bank. The U.S. banking system was prone to runs and panics in the late 19th century and continued to be so through the 1929-33 episode in which the Fed stood by and did not supply replacement reserves to keep the money stock from contracting (2008a, 4).

White is referring to unit banking laws that restricted interstate branch banking in the United States. The consequence of monetary policy in this context can be conceptualized as a contraction of the supply of credit or a negative shock to the velocity of gold. White and Hogan (2021) argue that "the collapse of the US credit boom in 1929 and ensuing bank runs" are consistent with Hayek's theory of depression, acknowledging that "the contrast between them [explanations emhasizing gold hoarding by central banks vs. explanations emphasizing contraction in the United States] is a matter of focusing on different aspects of the Depression (White and Hogan 2021, 241)." The credit contraction can be viewed as a positive shock to portfolio demand for monetary gold that only reinforced the dysfunctional situation caused by central bank gold hoarding. By emphasizing

Hayek's interpretation that "the interwar period to attempts by central banks and Treasuries 'to make the mechanism of the gold standard inoperable (White and Hogan 2021, 244 citing Eichengreen 1992, 9)'", White and Hogan clarify the mechanism driving the shift in demand for gold. By recognizing this as a positive shock to portfolio demand for gold, driven simultaneously by central bank gold hoarding *and* the resulting, widespread runs on banks - the authors clarify that monetary policy both directly and indirectly drove up demand for gold and, therefore, also drove up the price of gold.

Although monetary policy could serve to alleviate the effects of volatile demand for gold, if unconstrained this power also allows for increasingly severe swings in demand for gold caused by the monetary authority. Consistent with the position that I have just described, Hayek regretted that "those countries which command already abundant gold reserves . . . should use that position to keep the price [of gold] artificially high (Hayek 1937, 86)." However, the result was that higher demand for gold led to a significant increase in the quantity of gold produced during the Great Depression (United States Gold Commmission 1982, 207). Despite significant response from gold producers, a relatively centralized standard enabled policy makers to generate persistent deflation of the gold-denominated price level (i.e., meaning sustained inflation of the price of gold). Likewise, a major contraction in bank financing under the gold standard not driven by a negative shock to the supply of monetary gold, despite being linked to a contraction of gold reserves deposited in the banking systemn, is consistent with a negative shock to the velocity of monetary gold. All of this is consistent with White's stock-flow presentation of the gold market under the gold standard.

White and his student George Selgin, continued developing evolutionary logic beyond commodity money. Under the gold standard, gold coins and bullion serve as reserve that support lending in the financial system. The extension of the Mengerian narrative, again reinforced with modern economic tools, outline forces that promote stability in the financial system by restraining lending. White notes that competition between private mints: "Deliberately issuing substandard coins would earn a greater profit per coin, but only until the ruse was discovered. . . . Once newspapers reported substandard assay results, merchants refsed or heavily discounted the underweight coins. . . (White 2023, 27)".

This train of logic can be likewise developed for banks whose depository notes serve a similar function as "[b]anknotes largely displaced coins where their denominations overlapped (White 2023, 31)." This displacement is only possible if either money users are coerced by the state to use banknotes or, under less nefarious conditions, they are persuaded by perceived reliability of the bank providing the notes. White's student George Selgin explains:

> The discounting of notes outside the neighborhood of the issuing bank's office provides an opportunity for arbitrage when par value exceeds the price at which they can be purchased for commodity money or local issues in a distant town, plus transaction and transportation costs. With the growth of interlocal trade, note brokers

> with specialized knowledge of distant banks can make a business . . . of buying discounted non-local notes and transporting them to their par-circulation areas (or reselling them to travelers bound for those areas). (Selgin 1988, 24)

Confidence in notes issued by reliable banks can enable bank reserve ratios to fall to well under 10%. And as a banking system grows, with multiple banks, banks themselves form a lending consortium, the clearinghouse, to aid in settlement of interbank accounts (Timberlake 1984). The clearinghouse plays a special role as the small number of "customers" makes oversight of member activities a relatively low-cost endeavor (Salter and Young 2018a; 2018b; Salter and Tarko 2019). Selgin and White describe that "member banks of a laissez faire clearing system would jointly agree to conform to clearinghouse solvency and liquidity standards, and to allow their enforcement via audits, because each bank wants credible assurance that notes and deposits issued by the other members (which it is accepting at par) will be redeemed in full (Selgin and White 1994, 1732)." And even as the system of banks expands in concert, risk averse banks who would like to minimize risk will offset this variance through precautionary demand for reserves. Unlike for a bank that overexpands relative to other banks in the system, however, this requires prudence on the part of individual banks that is not driven by enforcement of the clearinghouse itself. Thus, the constraint promoting optimal reserve ratios is looser in the case of in concert expansion than relative overissue of depository notes by an individual bank, but this and adverse clearings for banks who have expanded credit the most serve to discourage reckless expansion from banks in a common system of clearing.

Again, a tribute to the explanatory power of the Mengerian causal-genetic approach, modern financial innovations, including Bitcoin and growing decentralized financial systems that faciltiate intermediation using cryptocurrency, follow this same pattern (Caton 2020; Caton and Harwick 2022; Harwick and Caton 2022; Cachanosky 2022). New innovations provide new sources of liquidity that lower the cost of investing savings just as checking accounts in a fraction reserve system lower the cost of holding money at a bank (for systematic presentation, see White 2023, 153-212).

White has consistently used and developed this approach, however, aside from his students, there has been little interest in adopting this method. Despite the intuitive nature of this approach, the mainstream of monetary theory recognizes Menger as a source of inspiration, but are not attracted to his method. Perhaps most interesting, the wave of papers on monetary evolution from Kiyotaki and Wright cite Menger as one of several sources of inspiration but do no cite Dr. White (Kiyotaki and Wright 1989; Kiyotaki Wright 1995; Kiyotaki, Lagos, and Wright 2016; see also Marimon, McGrattan, and Sargent 1990). In their *AER* publication, Menger is not even mentioned (Kiyotaki and Wright 1993). Of course, this work has garnered a fair share of attention. According to *Google Scholar*, the following works that focus on or employ Menger's evolutionary theory have received over 100 citations: *Free Banking in Britain* (1146), "How

Would the Invisible Hand Handle Money?" (512), *The Theory of Monetary Institutions* (479), "Competitive Payment Systems and the Unit of Account" (295). And White's more recent book, *Better Money: Gold, Fiat, or Bitcoin* builds from Mengerian microfoundations to compare the monetary standards referenced in the book's title. With regard to causal-genetic macroeconomics, Dr. White is *all-in*.

3. Defining Hayek's Macroeconomic Legacy

In developing his Austrian macroeconomics, White has been afforded the opportunity to authoritatively define Hayek's perspective and contribution to macroeconomic theory. This later work by Hayek concerning the role of competition in generating knowledge and information was quite abstract. And when applied to currencies, the Mengerian background supporting these ideas was not clearly elborated. Likewise, the evolution of Hayek's thought has been a source of tension as sometimes the goal of tracing the course of an author's thought is guided not so much by a desire to document as an effort to delineate pedigrees of existing schools of thought.

In his introduction to the authoritative edition of *Capital and Interest*, White begins with one of these points of tension: the relationship of Hayek's thought to Friedrich von Wieser. This relationship had not received significant attention until J. Salerno argued that Wieser was a general equilibrium theorist, thereby placing his thought closer to that of Leon Walras (Salerno 1999). However, Bruce Caldwell was fast to clarify that Salerno conflated what I shall call piecemeal partial equilibrium analysis - what Mark Blaug calls "total equilibrium" - with Walrasian general equilibrium:

> The Austrians in general were aware of the interdependence of markets. As good marginalists it was hard for them not to be, but this does not make them general equilibrium theorists. And even if one insists on using that language, there is no reason to use the criterion to distinguish Wieser from the other Austrians. (Caldwell, 2002, 8)

Salerno even argues that Hayek "still clung to the belief that 'the pure logic of choice,' which could be represented by the timeless equations of general equilibrium, played a role a central role in economic theory", a curious statement since Hayek, in the same article, argues that the appropriate formal logic needs to be much more rigorous which must be interpreted as a critique of the shallowness of the status quo in formal modeling (Salerno 1999, 45).

White appears to be in agreement with Caldwell's view, although he does not adopt the Blaug's language of "total equilibrium", which may be a source of confusion. He notes that, in a comment at the end of his article on the "Imputation Problem", Hayek notes that "under Walras' leadership, the mathematical school of economics has already tackled successfully a similar set of tasks (Hayek 1926, 19)". Critically, Hayek concludes that "it [the school] too has failed to solve the imputation problem so far" and does not provide further supporting detail (19).

These statements may seem quite unusual given Hayek's position in the Socialist Calculation Debate that in order for prices to convey meaningful information requires that they are generated in the process of production and exchange.

Hayek's concern was with the imputation of the value of production factors. His analysis isolates this from exchange processes in order to abstractly trace out the path from productive factors to final consumer goods that conveys the logic of imputation. Even in *The Pure Theory of Capital*, "Hayek used the "simple economy" device - exposition in terms of the optimizing principles to be observed by an omniscient and benevolent planner of a non-exchange economy" (White 2015, xv). Hayek's use of this sort of optimizing agent in later work clarifies that he did not restrict such deterministic, optimizing behavior to a scheme utility of CES utility functions but imagined complex behavior structured by evolving systems of rules consistent with his work that followed the publication of *The Sensory Order*. White argues that "[t]he non-Wieserian marginal productivity theorists such as Mises, and the 1945 Hayek, were talking about an economy of many entrepreneurial minds containing various bits of knowledge and conjectures about efficient production techniques (xv)." If we consider White's presentation of Hayek while also interpretting White's references to "general equilibrium" as referring to a marginalist "total equilibrium" approach, we can conclude that the development of Hayek's view across his career was not radical but, rather, was dependent upon the question he sought to answer and was consistent with the general marginalist view of the Austrian school. We can accept this while still recognizing that Wieser's employment of "interpersonally comparable" utility was a feature that Hayek quickly discarded in favor of the more appropriate subjectivist view of his mentor Mises (White 2015, xvii).

White has also been a tremendous advocate of Hayek's employment of the average period of production in Austrian capital theory. This advocacy is consistent with his reflections on the difficulty faced by Hayek's *Pure Theory of Capital* that the "book's notorious complexity was due to replacing the APP with more sophisticated concepts" (White 2007, xxiii). The reader might be amused to learn from White that, in the debate with Knight over his Crusonia plant, George Stigler declared Knight's victory over his adversaries because the "'period of production' concept receives little discussion by that name, outside of studies in history of economic thought (White 2015, xxviii)." Of course, many have been influenced by Hayek's early capital theory, including Jack Hirshleifer and, even more straightforwardly, Roger Garrison (Hirshleifer 1970, 187-192; Garrison 2001). More recently, Peter Lewin and Nicholas Cachanosky have fromally elaborated the significance of the average period of production in capital theory using discounting (Lewin and Cachanosky 2016; 2018). And White cites "Time to Build" of Kydland and Prescott as containing "[t]he nucleus of the period of production concept (xxviii)." To be fair to Knight, however, the logic of the Crusonia plant takes on a marginally more complicated form in the Solow Model as real income is costlessly transformed to capital via investment. There is little to differentiate between agents consuming resources, say as food, and using those same resources as capital. And the more complicated presentations of capital

growth tend to be advances from the Solow model.

As already mentioned in the context of the stock-flow analysis of the gold standard, White maintains that the initiation of the Great Depression can be explained via the Austrian Business Cycle Theory while its persistence is well explained by a series of negative aggregated demand shocks. White, consistent with Mises and Hayek, argues that credit expansion leads to the misallocation of capital:

> The problem caused by the distortion of the interest rate is a mismatch of the plans of savers and investors. As Hayek sometimes put it, the distorted interest rate fails to equalized the supply with the demand for real capital. The artificailly lowered interest rate no long meshes the time-profile of output for which businesses are making their investment plans - to produce so much for the present and so much for various future periods - with the public's planned time-profile of saving and consumption across the same periods. Instead it skews investment too much toward the "higher stages" of production, meaning projects such as mineral extraction, heavy industry, and building construction that will yield consumable output predominantly in the distant future, leaving too little consumable output int he near future. . . The "misdirection of production' leads to "a consequent crisis". (White 2012, 75-76)

Having explained the theory, White goes on to interpret the economic data of the mid to late 1920s as being consistent with the Austrian view proported by Mises and Hayek (2012, 76-77).

One might be surprised after learning of White's vote of confidence for Hayek's business cycle theory, that White also defends Hayek agains the charge of being a liquidationist (2008b). Although Hayek viewed the bust as a consequence of misallocation during the boom, he also recognized the role of monetary policy in influencing the level of total expenditures (aggregate demand). Hayek believed that, in the least, that the central bank should maintain a constant broad monetary aggregate. Thus, in the face of a contraction of the broad money stock, even Hayek's early policy norm recommended expansion of the monetary base by the monetary authority. In *Prices and Production* Hayek recognized that, ideally, a central bank would stabilize total expenditures (Hayek 1931; White 2008b; see also White 1999b). While this remained only a theoretical norm, as early as 1935 Hayek was calling upon central banks to with a large proportion of the world's gold reserves to ease demand for gold (Hayek 1935). And White notes that, in his *Monetary Nationalism and International Stability*, Hayek "declared (1937, p. 84) that the central bank's duty lay in 'offsetting as far as possible the effects of changes in the demand for liquid assets on the total quantity of the circulating medium (White 2008b, 755).'" Hayek was, in fact, concerned macroeconomic aggregates. He simply refused to reduce analysis to those aggregates alone.

Thus, from a straightforward review of Austrian themes and influences in White's

work, it is no stretch to claim that White cares about microfounded analysis in the spirit of Carl Menger and that White takes seriously the macroeconomics of F. A. Hayek, even maintaining and applying Hayek's early-career Austrian capital theory. White's development in the UCLA tradition - typically represented by Armen Alchian, Jack Hirshleifer, Harold Demsetz, and Axel Leijonhufvud - brought into conversation Mengerian theorizing with broadly framed and piecemeal partial equilibrium analysis that is consistent with the "total equilibrium" theorizing of Carl Menger and his descendants. This flavor of Mengerian theorizing coherently integrates macroeconomic aggregates with microeconomic foundations.

4. Conclusion

This returns us to our initial line of inquiry. How can a scholar who appears to be engaged in macroeconomic analysis be a leading Austrian economist? An investigation of the influence of Hayek upon the work of Lawrence H. White leads us through macroeconomic theory that looks fairly traditional, but it also maintains meaningful microfoundations that differentiates his approach from mainstream macroeconomics. As Steven Horwitz noted concerning White's response to the Black-Fama-Hall proposal, which "attempted to divorce the medium of exchange from the unit of account", White's assertion that the proposal required three unlikely scenarios to maintain - that "demand deposits are unlikely to disappear, outside money is unlikely to disappear, and it is also unlikely that the medium of exchange could ever be divorced from the unit of account" - were all "based on an evolutionary understanding of the emergence of money and various monetary institutions." (Horwitz 2000, 219, 221).

Like Hayek, White has maintained concern that the assertions of macroeconomic theory can easily disregard market processes that influence macroeconomic aggregates. Hayek worked using piecemeal logic consistent with "total equilibrium" theorizing. This is another way of saying that Hayek was a practitioner of the Mengerian compositive method, or what has more recently been referred to as the causal-genetic method. In this manner, the job of the economist is to use the idealized abstractions of economic theory to reason through the chain of effects that occur given some exogneous economic change (as in the case of Hayek's business cycle theory) or given powerful incentives that drive institutional innovation whereby profit-seeking by entrepreneurs leads to novelty that disrupts the former equilibrium. Dr. White operates within and has developed the same Mengerian mould.

While Hayek's elaboration of the role of competitive forces in generating new knowledge and extracting and conveying information, his employment of causal-genetic reasoning is often implicit and not geared for engaging the reader pedagogically. White, on the other hand, uses this as his starting point. I recall as a student being struck by the fact the White actively constructs the economic setting by first elaborating its foundations. As I have gotten more familiar with White's work across my career, it has become clear to me that he writes in

the same manner that he teaches. His recent book on Bitcoin, *Better Money: Gold, Fiat, or Bitcoin*, is an idyllic example of his elaboration of a problem using causal-genetic reasoning, though the same can be said about *The Theory of Monetary Institutions* or *Competition and Currency* (1999a; 1989). White follows in the Mengerian approach of "total equilibrium" theorizing, using compound partial equilibrium analysis to convey impacts across related markets, writing in the style of Carl Menger using modern tools to convey an theoretically refined narrative. With this approach he has both clarified and developed Hayek's theoretical contributions to macroeconomic and monetary theory. In the process, he has also brought to our attention important puzzles about the context of Hayek's work that deserve further investigation. His willingness to confront these tensions in economic theory and in the history of economics has carved a path that I hope many more will tread. In the least, if one wishes to develop a Mengerian intuition, they ought to be reading the work of Lawrence H. White.

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