A Reply to Aguilar

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INTRODUCTION

Most Austrians are familiar with Victor Aguilar's *Critique of Austrian Economics From 1930 to 1990*. He has long since thrown down the gauntlet, by publicly offering to pay $1000 for the best response to his critique. Although there were unusual, non-academic circumstances to possibly explain the neglect of this boast, even so I viewed it as an embarrassment that no one had addressed Aguilar's points. Inasmuch as his critique centers on capital theory—an area in which I too as a graduate student chafed against the "stubborn" Austrian orthodoxy—I decided that I would be an appropriate person to write just such a reply.

My overall conclusion is that the *Critique* contains some valid criticisms of the Austrian capital theory canon. However, the *Critique* itself does not convince the reader that Austrian capital theory is fundamentally wrong. It is possible that reading Aguilar's treatise on "axiomatic economics" would make his alternative clearer, but this shorter piece doesn't offer enough samples to compel the reader to obtain the longer work.

Before proceeding to the gritty details, I should mention that I will not necessarily deal with all of the points concerning Skousen's work. Although Skousen has done great work on macro issues—I used his *Economics on Trial* when lambasting GDP figures in intro classes—many Austrians, particularly those associated with the Mises Institute, would not consider him as a representative of Austrian capital theory. Since (I take it) the purpose of this contest is to defend the (theoretical) honor of the editors of the *Quarterly Journal of Austrian Economics*, it is far more appropriate for me to focus on Aguilar's criticism of Hayek and (especially) Garrison and Mises.

Part I: The Legacy of Friedrich Hayek

Section II: Wealth or Income?

One of Aguilar's major objections is that the Austrians are inconsistent in what their figures (and more generally, concepts) are supposed to mean. After some (valid) criticisms of Skousen's exposition, Aguilar moves on to Hayek:

> What did Hayek, the originator of the structure of production, intend it to represent: a yearly flow of goods or a distribution of wealth? These are, after all, very different things. Hayek (1967, p. 40, italics added) writes:
>
> > *The area of the triangle shows the totality of the successive stages through which the several units of the original means of production pass before they become ripe for consumption. It* also *shows the total amount of intermediate products which must exist at any moment of time in order to secure a continuous output of consumers' goods.*
>
> Also? In the first sentence, the word "pass" implies a flow of goods passing by during a certain amount of time. The second sentence refers to the total amount of goods that exist at a moment in time. It is highly irregular for a graph to mean one thing and *also* something else. (Aguilar p. 3)

As we shall soon see, I agree with Aguilar that canonical Austrian capital theory doesn't distinguish between "fixed" and "circulating" capital; I demonstrate the problems with reference to Rothbard below. This flaw is related to the quotation above.

Having said this, it seems that Aguilar clearly oversteps in the excerpt above. At the most basic level, there is nothing at all irregular about a graph meaning one thing "and *also* something else." For example, a physicist could graph the vertical displacement of an object against time, and say that the graph meant height *and also* the potential energy stored in the object.

We are thus forced to ask whether *in this particular case* the graph does indeed represent the two (conceptually distinct) items that Hayek believes. I believe the answer is obviously yes. The Hayekian triangle neatly captures the Austrian insight that (most) consumption goods are descended from 2nd order goods, which in turn are descended from 3rd order goods, and so forth. To maintain a perpetual yearly flow of *x* bottles of 20-year-old wine requires a structure of production comprised of *x* bottles of 19-year-old wine, *x* bottles of 18-year-old wine, and so forth. If we were to graph such a trivial capital structure (which would be a straight line, if we simplistically ignore what happens at the highest stage where the original bottles of wine are first corked), then the resulting picture would show us (a) how many bottles of wine would be ready for consumption each year *and* (b) the distribution of wine bottles among various stages at any snapshot in time.

Now Aguilar surely knows this; he understands what Hayek and others *think* they mean by these passages. However—if I follow Aguilar's point—Aguilar would respond that this is pure confusion. The trained mathematician would realize that the units are different. How can one talk of the *flow* of bottles per year, at the same time as the *stock* of bottles at a given moment?

It is true that one needs to be careful about units, but even so the same graph can illustrate both meanings (after adjusting for the units). By the very same token, height is measured in meters while potential energy is measured in joules; the same graph can still "mean" both things at the same time, though. No one would accuse my hypothetical physicist of such a basic confusion. If anything, he is correct to stress the close interrelationship between the two (distinct) concepts. Now the purist could object after the lecture, and point out that the two are only related one-to-one if we assume that the object's mass, and the gravitational constant of the earth, are constant irrespective of height. But so what? Holding those things constant, the graph means *both* height and potential energy, measured in the appropriate units.

I thus see no logical flaw in the Hayekian treatment. Now this leads to a different question: Is the Hayekian triangle a *good* model of the capital structure? My answer is a qualified yes. I think the Austrian approach captures crucial features that mainstream models (not only of economic growth but especially of the business cycle) neglect, but it has led the Austrians to unrealistically ignore the distinction between so-called fixed versus circulating capital. To quote from my study guide to *Man, Economy, and State*:

> On pages 523-524, Rothbard writes that in "any equilibrium situation, net saving is zero by definition (since net saving means a change in the level of gross saving over the previous period of time)." These definitions are not entirely compatible with the mainstream approach. For example, standard growth models can certainly have an economy in long-run equilibrium with net investment every period. In this case, net investment would simply mean investment above the amount necessary to cover depreciation, i.e. net investment refers to a growth in the capital stock. Probably the reason for these differing definitions is that Austrians tend to view capital goods as "working capital" or "goods in process," whereas neoclassicals view capital goods almost exclusively as fixed capital: To maintain his output of bread, every period the baker needs to buy more flour, but not a new oven.

Beyond unorthodox nomenclature, this Austrian proclivity to view all current consumer goods as the heirs of nth order inputs of raw materials and labor may lead to serious mistakes in analysis. However, this possibility lies outside the scope of the present reply.

The final tantalizing suggestion in this section is Aguilar's proposed Distribution of Wealth over the Capital Structure, DWCS. Unfortunately, I cannot comment on whether this would indeed constitute an improvement, because I don't fully understand its construction. Perhaps there is a fuller description elsewhere in Aguilar's work, but from the *Critique* I can't determine whether the DWCS—which doesn't suffer from the drawbacks that Aguilar rightly notes in Garrison's approach—retains the essence of what *is* right with the Hayekian triangle.

Section III: Sideways and Backwards?

In this section Aguilar criticizes Hayek for originally depicting the structure of production flowing downwards, i.e. for placing time on the vertical axis. It seems that Aguilar can find no reason for this decision on Hayek's part, except that Hayek isn't familiar with mathematical conventions (of placing the independent variable on the horizontal axis) and/or did not fully understand the implications of the subjectivist revolution. Rothbard and Skousen are then faulted for carrying on with this initial mistake, even though "their master had himself rejected it" (Aguilar p. 8).

Rather than go through a sentence by sentence response, let me instead offer a completely different interpretation of what happened, one that casts the Austrian diagrams (as well as the quotes Aguilar uses in this section) in a much more positive light. First, it was perfectly natural for Hayek, and then Rothbard in *MES*, to place the higher order stages (terms used by Menger and Böhm-Bawerk, as Aguilar points out in an attempt to demonstrate the confusion in Hayek) higher on the diagram. Yes, this approach conflicts with the competing appeal of having time flow left to right on the horizontal axis (as Garrison's triangles work in his *Time and Money*[1]), but it certainly is defensible to place "higher order stages," well, *higher* on the graph.[2]

Second, Rothbard does *not* have "the numbers one through six on his graph printed backwards" (Aguilar p. 7). Those numbers aren't representing units of time, but rather the stages of production. Following Menger, the lowest order (consumer good) stage is the 1st order, the next highest stage is the 2nd order, and so forth. Had Rothbard followed Aguilar's advice, one could imagine a different critic lambasting the silly Austrian for labeling the 6th order stage with a 1, the 5th order stage with a 2, and so forth.

[1] It's true that in the 1978 piece that Aguilar cites, Garrison had time flowing from right to left. To repeat, he switched it for his later book. For what it's worth, Garrison (in an email) said that there were no theoretical issues involved, it was just a matter of convenience of exposition. So I think Garrison would agree with Aguilar that the right-to-left flow of time was confusing, but he fixed the problem himself before (I presume) reading Aguilar's *Critique*.

[2] By the same token, apparently Alfred Marshall chose the familiar axes for price and quantity *not* because of mathematical ignorance, but because he thought quantities were the independent variable to which prices adjusted.

This raises the obvious question: Why not call the highest order stage the first, the next lowest the second, and so forth? There are (at least) two reasons for this. One is that we'd have to continually change the numbering based on what we included in the process. Menger's approach avoids this difficulty; the consumer's good is always the 1st order, regardless of how far back we push the analysis, even if we go back to axes carved by prehistoric men. A second benefit of Menger's numbering decision is that it *reinforces* the very subjectivist revolution that Aguilar accuses Hayek and Rothbard of abandoning. The consumer good is the *first* stage, i.e. the most important or fundamental one. Menger's scheme was designed for conceptual organization, not as a mechanical timeline of production.

My last objection to this section is Aguilar's treatment of Hayek's misgivings about the definition of capital. As Aguilar quotes Hayek, "The definition of capital as the produced means of production…is a remnant of the cost of production theories of value…Bygones are bygones in the theory of capital no less than elsewhere in economics. And the use of concepts which see the significance of a good in past expenditures on it can only be misleading" (Hayek qtd. in Aguilar, pp. 7-8).

Now in context, Aguilar thinks that here Hayek is finally recognizing his faulty decisions regarding the zero point of the time axis in *Prices in Production*. I think it is nothing of the sort. Hayek is here talking about the very *definition* of capital; his target is a much broader one than the choice of units on a Hayekian diagram.[3]

It is true that the use of Hayekian (or Rothbardian or Garrisonian) diagrams can lead to such (literally) backwards thinking, especially when the results are always couched in terms of the evenly rotating economy. Indeed I spend much of my dissertation chapter's critique of the pure time preference theory on just this issue.

[3] As a side note, Rothbard does give a better, forward definition of capital—it really should be the *reproducible* factors of production, the ones that earn no net rent in the evenly rotating economy.

Even so, I don't see how this subtlety relates to Aguilar's point in this section. Ironically, I think what has happened is that Aguilar accuses Hayek et al. of (a) failing to properly label time the way a mathematician should and (b) forgetting the insights of the subjectivist revolution. But really these criticisms cancel out! Precisely because they *weren't* arranging the diagram in the way Aguilar wants, their approach didn't commit them to backward-based definitions.

Hayek's main concern remains valid: If one wants to maintain a perpetual flow of consumption goods (however we define that), *going forward*, then one must have a currently existing stock of various capital goods and must maintain this stock over time. As I conceded above, it is certainly true that Hayek's and subsequent expositions sometimes glossed over the fact that the "biographies" of the currently existing capital goods are irrelevant, and that what is really important is how the capital structure must adapt *starting now*. But this is an understandable slip, since all of these complicated analyses assume that technology and other factors are held fixed. In any event, I do not find nearly the same ignorance or contradiction in the diagrams of Hayek, Rothbard, and Garrison as Aguilar perceives.

Section IV: The Average Period of Production

In this section, Aguilar once again intersperses substantive criticisms with ones that unfairly paint his foes as innumerate boobs. For example, he quotes Garrison's description of the Hayekian triangle where "the slope of the line is the (simple) rate of interest (profit) when the economy is in equilibrium." Aguilar then retorts, "No, it is not. Compound interest is exponential and interest is *always* compounded—there is no such thing as 'simple' interest" (p. 11). To make sure the reader understands just how ludicrous Garrison's statement is, Aguilar in a footnote continues: "Nobody accepts that the rate of interest can be represented by the slope of a straight line. That might have worked for a 1930 lecture, but today anyone with $20 can buy a calculator programmed to do time-value-of-money calculations. They may not understand the math, but they know very well it is not linear."

Now this is really too much. The absolute *most* Aguilar could fairly have said, is that using simple interest is so unrealistic as to render Garrison's diagram unsuitable for its intended purpose. Other than that, Garrison's claim is perfectly true. Simple interest *does* mean just what Garrison says; if Aguilar doubts this he should Google the term. Moreover, Garrison and other Austrians are perfectly aware that simple interest isn't used in actual business transactions (especially over several years), but then again Garrison explicitly *acknowledges* this unrealism when discussing the triangle (and Aguilar quotes him doing just this in the conclusion to the *Critique*). Garrison knows that the spot price of a bond grows exponentially over time, not linearly, but feels (perhaps incorrectly) that this extra realism wouldn't shed much light on the burning issues of capital-based macroeconomics. Not only do I excuse Garrison on this point, but I would go further and say that even the audience members at the LSE in the 1930s knew that exponential growth isn't linear.

But on to the more substantive disagreements. Aguilar recommends that Hayekians stop using the word *average* because it doesn't mean what they think it means. This too I find largely a semantic quibble; I have heard plenty of people use *average* as a general term, which could include the mean, median, and mode under its umbrella. In any event, Aguilar thinks that what the Hayekians *really* mean to say is "the midpoint, half the range." (I note that under the conditions Hayek specifies—namely "in which the original means of production are applied at a constant rate throughout the whole process of production"—his terminology and calculation are perfectly correct.) This is problematic, according to Aguilar, because "neither average nor range [has] any meaning in the context of a continuous distribution defined out to infinity" (p. 12).

It seems that here Aguilar is arguing that his own preferred construct, the DWCS, is constructed from time = 0 to infinity, and since average and range are undefined on such a beast, therefore the Hayekians are in trouble. Again, a quick way out of the difficulty is to realize that *average* and *mean* can be interchanged without too much violence to

mathematical purity; for the simple (and unrealistic) case Hayek is considering, the mean will work, and this can be defined on a distribution with an infinite domain.

Yet this response overlooks the real problem with Aguilar's formulation. Although he may be right that the Hayekian approach is bankrupt, even so Aguilar's suggested fix doesn't fit the bill. Again, Hayek is trying to describe the entire capital structure that must be maintained if one is to yield a constant stream of consumption goods. This capital structure *cannot* be defined from the initial time to "infinity," for the simple reason that people can't wait forever to eat (or drive cars or watch TV).

It's true that in the simplest baseline case, what Mises and Rothbard would call the ERE, the periodic output of TVs, cars, apples, etc. would be extended out to infinity. Even so, the structure of production *supporting* that constant, periodic flow would be finite. In the Böhm-Bawerkian framework, labor and natural factors flow into the production process at the higher stages, flow down to the lower stages, and are finally "released" in the act of consumption. His notorious concept of the average period of production was designed to quantitatively assess how long a unit of factor inputs was "tied up" in the pipeline. Whatever Aguilar's other objections, he can't condemn Hayek for relying on something that is finite in scope. The original factors are necessarily tied up for only a finite time.

Aguilar next goes on to demonstrate the superior precision of his own approach, and in particular his ability to determine precisely where the "fulcrum" point is when interest rates change. In contrast, the Austrians know that there must be *some* intermediate stage that is unaffected by the change, yet they can't really say which one.

On this point I am in total agreement with Aguilar. If Austrians are going to go to the trouble of using geometry to aid in their exposition, it's not such a qualitatively worse heresy to use algebra and calculus, either. Having conceded the methodological point, though, I would suggest that Aguilar read further in the literature, for there are much more mathematically elegant treatments of Böhm-Bawerkian capital theory than those of

Hayek. In particular Samuelson's famous paper, "A Summing Up,"[4] as well as Dorfman's graphical exposition,[5] would be good places to start if he hasn't read them already.[6]

Section V: Roundaboutness

In this section Aguilar makes the strong claim that Böhm-Bawerk was "unclear (and perhaps confused himself) about the concept, making it seem that longer processes were more productive *because* they were longer" (p. 15). Aguilar goes on to quote passages from Hayek and then Skousen where this ambiguity is cleared up, so that even though "Böhm-Bawerk's opacity…had everyone going around about what he meant," by now "modern Hayekians seem to have this concept pretty well nailed down" (p. 16).

Now it's true that Böhm-Bawerk could at times be difficult. However, on this particular point I always found him to be crystal clear. For starters, Aguilar commits the popular mistake of conflating *roundabout* with *longer*. In practice the two will be interchangeable, but they are in fact different in the Böhm-Bawerkian scheme; he himself gives an example of a shorter process that is more roundabout and more productive than a longer one.[7] Beyond this pedantic quibble, I demonstrate (with the quotation below) that Böhm-Bawerk was quite explicit in his response to an objection leveled by Fisher (which is similar to Aguilar's):

> Fisher denies the existence of an objective rule that is based on technical facts; I maintain that such an objective rule exists. According to Fisher, the appearance of a rule is the consequence of selection. I maintain that the regularity lies in existing facts before and independent of our selection. Fisher concedes a regularity merely in the production

[4] *Quarterly Journal of Economics*, 1966.
[5] *Review of Economic Studies* Feb. 1959.
[6] He might also keep an eye out for my own "Interest and the Marginal Product of Capital: A Critique of Samuelson," forthcoming in *The Journal of the History of Economic Thought* probably sometime in late 2007.
[7] Specifically, he contrasts one process of apple production, in which one cuts a pole from another tree, versus the more direct (i.e. less roundabout) process of climbing the apple tree and plucking them by hand. See *Capital and Interest*, II, p. 82.

> processes actually *selected*. I maintain that such a regularity exists in all processes *eligible for selection*…
>
> Now let us assume, and I am convinced the facts are such, that at a certain state of technology the objectively most productive among the 1-year methods is excelled in productivity by the objectively most productive among the 2-year methods, which in turn is surpassed by the best 3-year method…Thus we arrive at a rule of increasing productivity of the best possible processes, a rule based on objective facts [that is] valid before and independent of every selection… (III, pp. 49-51, italics original)

If anything, it is *Aguilar* who is unclear, for he (following Keynes, who lampooned Böhm-Bawerk by inventing a productivity theory of "smelly" processes) makes it sound as if the higher productivity of longer processes is purely due to a selection argument. As the quotation above reveals, Böhm-Bawerk thought the correlation was far deeper than that, and that is why he maintained (despite Fisher's attacks) that his notorious "third ground" for the higher valuation of present goods was a genuinely independent one.

After this discussion, Aguilar then simply asserts that roundaboutness is the same thing as the specificity of capital goods, and that this in turn "is the only nail holding [the Austrian] theory down" (p. 16). I'm not sure that these terms really are so interchangeable, but fair enough. Aguilar then quotes Skousen who makes a common Austrian argument that the boom-bust cycle is crucially dependent on the specificity of capital goods. Aguilar replies:

> It sounds as if we can refute all of Hayekian business cycle theory with one counter-example, the boom and bust of a non-specific capital good—for instance, the dot.com bubble. Websites are capital because they are not valued directly but only as a means for obtaining the products they advertise. The dot.coms are highly non-specific, facilitating the sale of products at every stage of production….When one can obtain anything on the internet that one desires, from machine tools to pornography, I defy Garrison to tell us in which of his five stages…the dot.coms belong. (p. 16)

It's not clear to me how this example in any way refutes Skousen's point. It is still the case that if all capital goods were perfectly non-specific, then there couldn't possibly be a

boom-bust cycle. Market actors might have to revise their expectations and consume fewer goods than they originally planned, but the adjustments would be immediate and the losses would only be in a relative sense.

The dot.com bubble in no way contradicts this. Were it not for the specificity of tangible capital goods, the Fed's gross mishandling of the monetary base (to stave off a Y2K panic) could not have caused the recession that occurred. If there is a sudden fad interest in Don Mattingly rookie cards, and then the interest soon drops just as quickly as it arose, the volatility in price for the cards wouldn't constitute a "boom-bust cycle" in the way Austrians use the term. To demand that Garrison place *all* dot-coms into one stage is as nonsensical as demanding that he so classify all tools or (more absurdly) all capital goods. Each *particular* website could classified, more or less.[8]

Section VI: The Natural Rate of Interest

Although our objections differ, I too have been a harsh critic of the "natural" rate of interest. In the interest of brevity I move on.

Section VII: The Severity and Recalcitrance of Depressions

In this section Aguilar raises conundrums that are, ironically, easily solved by remembering the specificity of capital goods. In particular, on page 23 Aguilar asks, "How do [Austrians] explain the fact that we have seen depression/recession conditions long after a spike in interest rates was brought back down to more normal, low rates?" and "But, after interest rates came back down, would not the structure of production have just lengthened again and the laid-off workers re-hired?"

[8] I grant that Callahan and Garrison's own article on the dot-com "boom and bust" is not entirely compatible with my arguments above. Even so, I'm sure they would both agree that if all capital goods were totally non-specific, then whatever happened after Y2K would not have been a true business cycle. To give another nod to Aguilar, I *do* see a problem for Callahan and Garrison: Unless the dot-coms all fall to one side of the fulcrum point in the capital structure, then shouldn't some (e.g. Amazon.com) have moved inversely from others (e.g. Mines4U.com)?

What is particularly ironic is that Aguilar considers himself to have found a novel solution that the Hayekians overlooked: "The key to explaining the longevity of recessions is that capital has been *wasted*….The nation is doomed to recession until they can liquidate their foolish ventures…" (pp. 24-25). This is certainly correct, but it is exactly what Skousen was getting at in his quotation (which Aguilar criticized). Come to think of it, why doesn't the dot-com "counterexample" refute Aguilar's explanation of recessions? After all, how can a website be "wasted"? Why wouldn't it just be relocated to a more appropriate use?

Part II: The Legacy of Ludwig von Mises

Section X: The Severity and Recalcitrance of Depressions Explained

Here Aguilar contrasts Mises' focus on malinvestment with Hayek's apparent focus only on capital rearrangement:

> There is nothing in Hayek's triangle about the *quality* of investments, only about the relative *quantity* allocated to the several different stages. Hayek and his followers focus on the lengthening and shortening of the period of production and on talking around the fact that they do not know how to measure it. (p. 30)

Although Hayek's *Prices and Production* and the *Pure Theory of Capital* were quite difficult reading, and could understandably lead the reader to miss the big picture, the same cannot be said of Garrison (whom Aguilar classifies as a follower of Hayek in this context). In his *Time and Money* and Power Point demonstration (available on his website), Garrison explicitly discusses a Hayekian triangle that is "unsustainable" (it is two overlapping triangles where a dashed line near the fulcrum point shows the crisis area).

Section XII: The Originary Rate of Interest

Once again Aguilar attributes rank error to an Austrian when merely a difference in word usage is involved. He first quotes Mises, who contrasts the money spent on consumers' goods versus the total amount spent on the factors that produced them. Mises concludes, "This difference is the originary interest." To this Aguilar is incredulous: "Difference? Interest is a ratio. In any case, one cannot compare an apportioned sum with a price since they have different units" (p. 31).

Now *this* objection is just silly. In the first place, if we are to be entirely merciless with terminology, it is Aguilar, not Mises, who is mistaken. *Interest* is indeed measured in money; e.g. "I earned $1000 in interest in my bank account last year." The interest *rate* is a ratio, namely the amount of interest divided by the principal.

Having defended Mises on this minor issue, I grant that Aguilar's more substantive criticism has some validity. Aguilar basically asks how one can derive the originary *rate* of interest from the vast array of prices in an actual structure of production. I too raised a similar objection in my dissertation, where I said that there is no reason for a single own-rate of substitution to arise among all goods and over all time periods outside of the evenly rotating economy. Thus the Austrian theory of interest is only sensible in the ERE; even if there were no entrepreneurial errors but the data of the market changed over time, then the pure time preference theory of interest would be inapplicable.

Section XIV: Mises' Pseudo-Axiomatic Praxeological Method

In this section Aguilar makes many sweeping statements about the value of Mises' approach and his ignorance of mathematics. I certainly agree that Mises never *formally* lays out his praxeological system the way he says it should be done; a pithy summary would be to question whether Mises' method agreed with his methodology. It is also humorous when Aguilar asks, "Who ever heard of an axiomatic system with only one axiom?" (p. 35).

This is a huge dispute even within the broad Austrian community; plenty of Austrians think we should stop harping on "philosophy" and stick to "real economics." I myself used to think along these lines. However, more and more I think there is far more to the Misesian approach, and that the action axiom is *not* "really just a platitude" (p. 35) as Aguilar claims. I encourage Aguilar to reread Chapter IV of *Human Action*. Here Mises shows that the very concept of action *implies* the economic categories of value, cost, profit, and loss. Say what you will about this, it is *not* something that all mainstream economists already know and consider too obvious to discuss.

Before leaving this section I must object to Aguilar's footnoted assertion that "the utility of a given stock is measured by the quantity of money which stands beside it on one's value scale" (p. 34). A value scale is an ordinal ranking; it makes no sense to say one thing is beside another on the value scale. Consequently, utility cannot be measured. Every action is a choice, a demonstration of higher preference for one thing over another. If a man buys a total of two boxes of cereal at $4 each, that shows that he valued the first box more than his last $4, the second box more than his (new) last $4, and his (even newer) last $4 more than the third box.[9] There is no question of saying how much money stands beside a box of cereal on his value scale.

Part III: Conclusion

In this section Aguilar elaborates on his preferred DWCS instead of the clumsy and vague Hayekian triangles (or histograms) that pepper orthodox Austrian works. Again, I do not fully understand Aguilar's proposal, since it is not fully elaborated in this *Critique* (though perhaps it is elsewhere). Even so, I see some serious difficulties with it, if it is to serve as the new foundation of Austrian capital theory.

First, as I have already discussed, the total (not average) period of production with the DWCS is infinite. Aguilar might respond that this is a harmless simplification, since the

[9] As Caplan and presumably Aguilar could point out, if we assume infinitely divisible units of goods, we only avoid paradox by assuming a point of indifference. But surely the purist Austrian needn't worry about the implications of an impossible assumption.

height of his graph goes to zero as we go out to infinity on the time axis. Even so, the "lengthening" of the DWCS in Aguilar's framework would apparently mean simply a shifting of probability mass to the higher stages. This seems less intuitive to me than the (perhaps equally simplified) current Austrian approach of showing *new* stages being created at the highest end of the triangle.

Second, Aguilar has little flexibility because he has committed to the exponential function, in particular $f(t) = Are^{-rt}$ for $0 \leq t < \infty$. I do admit that this is quite "neat" in that he can take the derivative with respect to r in order to find the precise point on the time axis where the "fulcrum" pivots, and that he can also explicitly show how changes in the interest rate affect the distribution of wealth among the "stages" (which are here continuous). He can also set A equal to the total wealth so that the integral of this function over its domain sums to the total value of the capital stock. Very clever indeed.

However, what if we wish to depict an economy that does *not* have the smoothness inherent in this function? Surely there are differences between the capital structure of current America and Bangladesh, that cannot be attributed merely to different A and r. It is true that Hayek too made some simplifying assumptions, but that was merely in order to facilitate computations (which Aguilar scorned). It seems that once we want the DWCS to more accurately represent an actual capital structure, we would be forced to abandon the elegant mathematical construction and end up drawing a histogram.

Finally, I point out the grave defect that Aguilar's suggested construction breaks down if the (real?) interest rate exceeds 100%. As Aguilar informs us, "So, as the interest rate advances from zero to 100%, we move along the PPF from a situation of all investment and no consumption to the other extreme of all consumption and no investment" (p. 39). But why should this be so? We can certainly imagine preferences such that the equilibrium interest rate is, say, 115%. The Austrians can handle such a case in their framework, but Aguilar would apparently need to use a different function or at least make an ad hoc adjustment to his current one.

In conclusion, I agree with some of Aguilar's criticisms of the Austrians, in particular their sloppiness in exposition. However, his *Critique* alone would not have convinced me to abandon Austrian capital theory, and moreover his suggested improvements raise just as many problems as they solve.