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Joseph W.H. Lough*

THE SUBJECT OF RIGOROUS MATHEMATICAL ECONOMIC MODELING: CRITICAL REFLECTIONS ON GWF HEGEL AND ROBERT LUCAS, JR

PREDMET RIGOROZNOG MATEMATIČKO- EKONOMSKOG MODELIRANJA: KRITIČKI OSVRT NA G.W.F. HAGELA I ROBERTA LUCASA

Abstract

If neoclassical economic theory was born out of the conflict between Hegelian historical economic theory and rigorous Austrian mathematical modeling, the resolution of this conflict may presage the birth of a new phase in critical social and economic practice. In this article, Professor Lough critically reflects on the significance the comprehensive, rational integration of the global economy holds for theorizing social, political and economic emancipation and freedom.

Key words: *mathematical economic modeling, Robert Lucas, Hegel, Karl Marx, End of History.*

Sažetak

Ako su neoklasične ekonomske teorije rodene iz sukoba između Hegelove povijesne ekonomske teorije i rigoroznog austrijsko matematičkog modeliranja, rješavanje tog sukoba može nagovijestiti rođenje nove faze u pristupu kritičnom društvenom i gospodarskom praksom. U ovom članku, profesor Lough se kritički

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*** Joseph W.H. Lough, Ph.D., Lecturer, Department of Economics University of California, Berkeley**

osvrće na značaj sveobuhvatne, racionalne integracije globalnog gospodarstva i teoretiziranje socijalne, političke i ekonomske emancipacije i slobode.

Ključne riječi: matematičko ekonomsko modeliranje, Robert Lukas, Hegel, Karl Marks, kraj historije.

1. INTRODUCTION

In his *Lectures on Economic Development* (2003), University of Chicago economist Robert Lucas Jr. shows how, in the long run, all economies, no matter the current level of their economic development, grow and are integrated into the global economy. While there may be many reasons to find fault with the details of Lucas' argument, I am drawn to its overall Hegelian form. Lucas is suggesting an eventual convergence, sometime around the year 2100, between global capitalism, as a thoroughly integrated, comprehensive, rational system of laws, markets, and institutions, and all merely local, partial and particular economies. Nor does Lucas propose this ultimate meeting of Absolute Spirit and Substance as a mere exercise in macroeconomic theory. As Lucas himself put it at the end of a chapter titled "Some Macroeconomics for the Twenty-First Century:"

My conjecture is that these predictions are not simply a consequence of the mechanical character of the model I have developed here, that on the contrary they will hold up as our theories of growth and development are refined, as explicit preferences, technologies, and market structures are introduced, and economic equilibria calculated (106).

How well will they hold up? Lucas answers: "If you are reading this in the year 2100, I ask you: Who else told you what the macroeconomics of your century would look like, in advance, with such accuracy and economy" (106-107)?

2. CLASSICAL AND NEOCLASSICAL FOUNDATIONS

Lucas' predictions of eventual global economic convergence presume a society where relations among social actors lend themselves to rigorous mathematical modeling. This presumption has lain at the root of classical economic science since its earliest beginnings in the late eighteenth century, when Adam Smith boldly asserted that all productive human action was, like any other commodity, subject to the laws of supply and demand. "It is in this manner that the demand for men, like that for any other commodity, necessarily regulates the production of men; quickens it when it goes on too slowly, and stops it when it advances too fast" (*Wealth of Nations* I.viii.41). But it was not until the elaboration of mathematically-based marginal utility theory a century later, in the 1870s, that economists began to feel that their models actually captured and conveyed the full complexity of human behavior. Here is how the William Stanley Jevons put it in his 1871 *Principles of Political Economy*:

It is clear that Economics, if it is to be a science at all, must be a mathematical science. There exists much prejudice against attempts to introduce the methods and language of mathematics into any branch of the moral science. Many persons seem to think that the physical sciences form the proper sphere of mathematical method, and that the moral sciences demand some other method – I know not what. My theory of Economics, however, is purely mathematical in character (415).

Similarly, Leon Walras, in his 1874 *Elements of Pure Economics*: What we have in mind throughout this volume is not to pose and solve the problem in question as if it were a real problem in a given concrete situation, but solely to formulate scientifically the nature of the problem which actually arises in the market where it is solved empirically. From our point of view, not only is the algebraic solution as good as the geometrical solution; but we may go so far as to say that in adopting the analytical form of mathematical expression we are using a form that is general and scientific *par excellence* (467).

Or Eugene von Böhm-Bawerk in his 1888 treatise *The Positive Theory of Capital*, who showed why and how our subjective valuation of goods in exchange becomes their objective value in practice: “Here we come to our last duty in this book: to show how the ratio that obtains between present and future goods in subjective valuations is transferred to their objective exchange value” (539). Or, finally, Carl Menger, who famously introduced his 1871 *Principles of Economics*: “All things are subject to the law of cause and effect. This great principle knows no exception, and we would search in vain in the realm of experience for an example to the contrary” (51). Thus economic *science*.

My aim here however is not to fault economics for being or, in any event, striving to be a science. My aim is to explore the kind of society that lends itself to rigorous mathematical modeling and to critically interrogate the models that strive to characterize that society. What I believe we will find is that GWF Hegel’s immanent ontology – his immanent explanation for how Absolute Spirit or Mind and Substance shape one another – comes fairly close to theorizing the kind of society that lends itself to comprehensive, rational systemic integration that is contemplated in today’s rigorous economic mathematical modeling. Moreover, insofar as GWF Hegel’s theory of contemporary society can be understood as a misrecognized reading of how the abstract value form of the commodity shapes contemporary society, this suggests that Robert Lucas’ convergence theory too might be grasped as a powerful illustration of how this Absolute Spirit — which is to say *Capital* — actually unfolds in history, at least up to the year 2100.

3. THE MATHEMATICAL MODEL FOR CONVERGENCE

Briefly, Lucas’ demonstration begins with a restatement of the simple production function:

$$\frac{dk(t)}{dt} = \delta(1 - u)k(t)$$

where “the growth rate of both capital and production per worker is $\delta(1-v)$, the rate of human capital growth, and the *ratio* of physical to human capital converges to a constant.” He then elaborates this simple function across a world economy whose nations are held to enjoy technology with a common intercept A . The world return (r), Lucas observes, would then resolve into $r = \alpha A \left(\frac{K}{H}\right)^{\alpha-1}$, “where $H = \sum_i u_i h_i$ is the world supply

of effective labor devoted to goods production.”

Here Lucas assumes a constant rate of saving across countries, which, in turn, seeds technological growth. Lucas’ problem with this simple model is that it assumes “that human capital accumulation in anyone economy is independent of the level of human capital in other economies,” which, Lucas observes, “conflicts with the evident fact that ideas developed in one place spread elsewhere, that there is one frontier of human knowledge, not one for each separate economy.” And so the Absolute Spirit makes its entrance.

Lucas initially seeks to resolve this problem by introducing “some convergence into the model I have sketched is to modify the human capital accumulation technology . . . so as to permit anyone country's rate of human capital growth to be influenced by- the level of human capital elsewhere in the world.” To reach this point, he replaces the human capital equation reproduced above with a more nuanced function,

$$\frac{dh(t)}{dt} = \delta(1-u)h(t)^{1-\theta}Z(t)^\theta$$

where $H(t)$ is the “world effective labor variable” and $Z(t)=H(t)/\sum_i u_i$ is considered “the world average human capital level.”

Lucas then supplements this expanded model to include variable levels of educational achievement, collective and serial on-the-job training and learning, learning spill-over, urban aggregation and open-boarder effects. Clearly the list is not exhaustive. Nevertheless, it indicates the potentially unlimited range of functions we might include in order to bring our model into line with observable differences among nations.¹ The end result is astonishing. With remarkable accuracy, Lucas is able not only to model growth in the United States, Europe, and Japan, but also several seemingly anomalous developmental paths in Asia, south Asia, and the south Pacific.

4. LUCAS AND HEGEL’S ABSOLUTE SPIRIT

No doubt others will want to subject Lucas’ fully elaborated model to further interrogation, a challenge with which Lucas would no doubt be in full sympathy. My point is not to challenge or propose tweaks to Lucas’ model, but rather to cast light on the

¹ Lucas builds his successively more elaborate models upon the work, among others, of Allan D. Searle 1945; Leonard A. Rapping 1965; Kenneth Arrows 1962; The Boston Consulting Group 1968; Grossman and Helpman 1991b; Harberger 1990; Krugman 1987; Boldrin and Scheinkman 1988; Matsuyama 1992; Young 1991; Stokey 1988, 1991a.

variables that he considers central to the quest for comprehensive integration into the global market. These variables we might take as Hegelian *particularities*, individualities whose resistance to assimilation into the system frustrates their rational incorporation into the whole – into what Hegel called Absolute Spirit or Mind. In this sense, we might think of local customs, laws, oligarchies, war lords, religious leaders, peasant movements, and the like as economic distortions, personal or institutional agents that introduce disequilibria into what will eventually, by 2100, unfold and advance in the clean, crisp, and smooth trend lines to which Lucas introduces us in chapter four of his study, “Some Macroeconomics for the Twenty-First Century.” Formally accounting for these distortions through rigorous mathematical modeling helps us to think through what might be entailed in eliminating or disarming their agencies, replacing them with the kinds of universal laws, institutions, and practices that lend themselves to integration into the global system as a whole. Or, as Lucas himself puts it at the end of chapter three: This inventive, model-building process we are engaged in is an essential one, and I cannot imagine how we could possibly organize and make use of the mass of data available to us without it. If we understand the process of economic growth – or of anything else – we ought to be capable of demonstrating this knowledge by *creating* it in these pen-and-paper (and computer-equipped) laboratories of ours. If we know what an economic miracle is, we ought to be able to *make* one (96).

It is not only the correspondence between Absolute Spirit or Mind and Substance that ought to attract our attention in Lucas’ conclusion, but also and more importantly the rational, creative, intending, unfolding *process* “of anything” that, once understood, invites us to bend Substance into conformity with Mind.

The problem Lucas seeks to solve is not dissimilar from the problem that GWF Hegel wished to solve in his 1807 *Phenomenology*. Much like the generation of classical economists that preceded his, Hegel was fascinated by the seemingly logical and rational character of the social world, including the economic world. To what does the world owe its comprehensive, rational, integrated, and directionally dynamic form? Hegel rejected mechanistic interpretations of the world’s rationality since they failed to grasp the apparent goal-directed character of the rationality that he discerned in the world. Likewise did he reject rationalistic explanations, such as Immanuel Kant’s, that seemed to treat rational coherence in the phenomenal world as though this coherence existed only in the interpretive categories themselves and not also in the world as such. What Hegel was looking for was an integrated rational Agent or Subject, but a Subject that is highly differentiated and therefore capable of producing a world that is also highly differentiated, yet rationally integrated.

One possible explanation for this comprehensive rational integration was advanced by eighteenth century economic theorists. The market place itself provided the locus for rational integration. Since all participants in the market were seeking to maximize utility, they argued, wherever they reached agreement, this agreement could always be grasped rationally at the point of exchange. Elaborated in a model that

theoretically comprehended all exchanges in all markets and all market participants, this gives us a comprehensive, rational and integrated social totality.

Translated into Lucas' model, when communities and agents or actors are motivated by principles or act in ways that are contrary to the networks of laws, regulations, and institutions that structure the global economy, their societies will display distortions that frustrate integration. Ultimately, however, Hegel was not satisfied with this explanation. For this explanation, in Hegel's view, merely pushed the question back a level. Why should all social actors come to adopt an identical metric of needs satisfaction? If it is hard-wired into all of them, then market choice is illusory. If it is arbitrary, then this should lead to market chaos.

Particularity in itself [*für sich*], on the one hand indulging itself in all directions as it satisfies its needs, contingent arbitrariness, and subjective caprice, destroys itself and its substantial concept in the act of employment (Hegel §185).

And, yet, the anticipated market chaos does not appear. Which is why Hegel postulates a greater-than-individual Spirit that, although highly differentiated, is nevertheless integrated, rational, and comprehensive. Acting through the individual choices and actions of social agents, this Self-Moving Substance that is Subject draws all of these choices forward toward ever greater systemic integration, but never itself dissolves or becomes lost in the process for which it is itself responsible. Hegel describes the movement of this Subject as follows: The living Substance is being which is in truth Subject, or, what is the same, is in truth actual only in so far as, it is the movement of positing itself, or is the mediation of its self-othering with itself. This Substance is, as Subject, pure, simple negativity, and is for this very reason the bifurcation of the simple; it is the doubling which sets up opposition, and then again the negation of this indifferent diversity and of its antithesis [the immediate simplicity]. Only this self-restoring sameness, or this reflection in otherness within itself – not an original or immediate unity as such – is the True. It is the process of its own becoming, the circle that presupposes its end as its goal, having its end also as its beginning; and only by being worked out to its end, is it actual. Thus the life of God and divine cognition may well be spoken of as a disporting of Love with itself [*ein Spielen der Liebe mit sich selbst*] (10).

In Lucas, this *process* that “presupposes its end as its goal, having its end also as its beginning” is the comprehensive integration of all merely particular, local, and individual social forms into the global system. This is “the miracle” that, once recognized and understood “pen-on-paper,” can then be *created* and *made* in reality, can become *actual*. And who could deny that this correspondence between a rigorous mathematical model and the substantive social formation that it grasps is the nearest we come to “the life of God” where “love plays with itself”?

This final point should not be overlooked. As anyone who has played and enjoyed playing with mathematical models will readily admit, there is a joy to rigorous mathematical modeling – to finding that correspondence between Substance and Absolute Mind – that extends beyond the numbers themselves. And so there is a playfulness to the model-building that is often lost on those who, without mathematical

training or without any interest in the correspondence between their models and the world, may be inclined to dismiss rigorous mathematical modeling as self-indulgent or obscurantist. As Hegel himself noted, rigorous model-building is of course both. But it is *also* playful. And this should not be lost.

5. LUCAS AND THE END OF HISTORY

With this playfulness in mind, we are now ready to proceed to chapter four of Lucas' *Lectures*, "Some Macroeconomics for the Twenty-First Century." For it is here that Lucas lays the groundwork for his critique of Malthusian dynamics in chapter five of his *Lectures*. Briefly, Lucas is aware that Thomas Malthus and present-day Malthusians are likely to contest his convergence hypothesis on the grounds that, were unlimited economic growth to encompass the entire planet, it would quickly exhaust its resources since, by definition, the earth's resources are not unlimited. Lucas does not ignore this argument. Instead, he explores whether, since its articulation in the late eighteenth century, Malthus' projections have proven accurate and, if they have not, Lucas is curious why they have not.

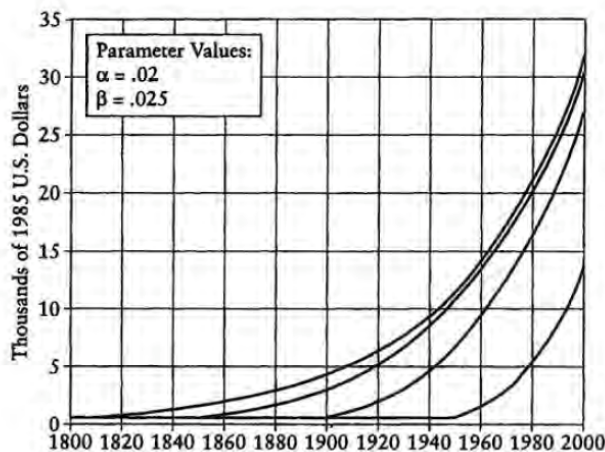


Figure 4.1 Income paths, selected economies

To lay the groundwork for this question, Lucas explores in chapter four what has happened to those undeveloped or underdeveloped regions of the globe that in the eighteenth and nineteenth centuries appeared incapable of joining or in any case unlikely to enjoy full integration into the global system. Here the figures Lucas deploys in support of his model speak volumes.

Figure 4.1 illustrates the growth rate, in terms of dollars per capita, of four entrants into the world system: Great Britain in 1800 and then three additional entrants, one in 1850, one in 1900, and another in 1950. Lucas admits that the accuracy of the model is rough and not exact. It presumes a constant .02 growth rate for the first entrant and an additional .025 for each subsequent entrant for each fifty years that separate it

from the first entrant (so, for example, the 1850 entrant “grows initially at the rate of $\alpha + \beta = .02 + .025 = .045$. Every 50 years, this late-entrant bonus increases by another .025, so that the entrant in 1900 begins growth at $\alpha + (2\beta) = .07$, the 1950 entrant begins at $\alpha + (3\beta) = .095$, and so on” (99-100)). In this way, each successive entrant approaches, but never surpasses the initial entrant, an expectation that fairly nearly matches the available real-world data.

Lucas, however, was not satisfied. Wishing to better understand the triggers that draw each successive entrant into the world economy, Lucas consulted a model of the diffusion of the industrial revolution proposed by Tamura (1996). Tamura’s model is for our purposes provocatively predicated on growing and expanding levels “of the world stock of knowledge” (100). Building upon Tamura, Lucas assumes that the economy’s hazard rate ($\lambda(t)$) is a weighted average of two hazard rates λ_m and λ_M , “where the weight that applies to the high hazard rate AM is assumed to be an increasing function of the average level of income in the world at that date” (101). Using this information, Lucas then plots “the fraction of economies that have begun to develop against time,” which yields Figure 4.2:

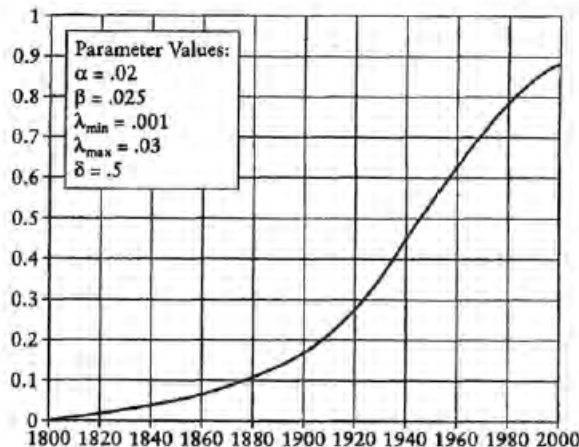


Figure 4.2 Fraction of economies growing, by year

Lucas’ goal, however, is not merely to plot the fraction of the world’s economies that have entered the world system. His goal is to accurately predict the future of the world system. This he does by assuming that the growth rate in world production peaked in about 1970 at 3.3 percent, after which it began to decline. Alongside the peak and gradual decline of the rate of growth in world production, Lucas also plots the log standard deviation of incomes from 1800 to 2100, a trend line that shows that differences in income from nation to nation globally are declining and will eventually decline to zero.

Such would be a reasonable assumption considering that the individual differences among nations – their laws, customs, traditions, and institutions – are also

being subsumed into the world system; or, to use Hegel's language, their particularity is being subsumed into the universal Substance.

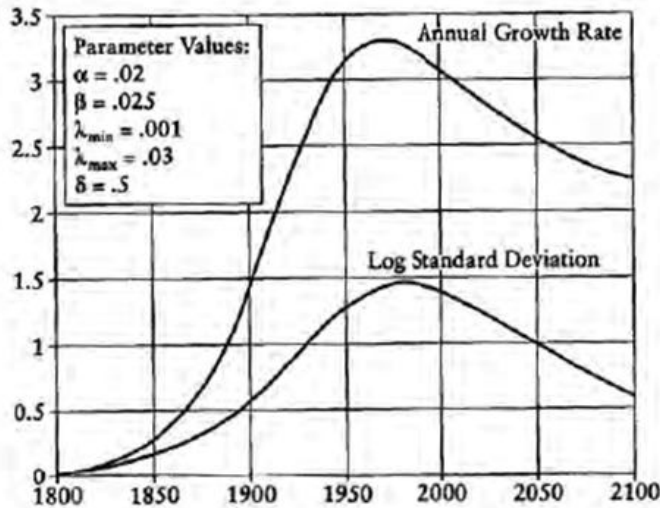


Figure 4.3 World growth rate and income variability

Having achieved the comprehensive, substantive and rational integration of all individualities into the whole, we are now in a better position to take up Lucas' handling of the Malthusian dynamic. Here it should be noted that Lucas does not dismiss concerns raised by this dynamic. Rather does he observe how social actors, as their incomes increase, have tended over time not to expand the number of mouths that the world has to feed, cloth, transport, house, and entertain, but has tended instead to limit and reduce the number of mouths and devote more attention, individually, to their intellectual, spiritual, and cultural enrichment.

As family income rises, spending on children increases, as assumed in Malthusian theory, but these increases can take the form of a greater number of children or of a larger allocation of parental time and other resources to each child. Parents are assumed to value both increases in the quantity of children and in the quality of each child's life ("The Industrial Revolution: Past and Future, 11; see also *Lectures*, "The Industrial Revolution: Past and Future," 124).

To be sure, acknowledges Lucas, under some economic systems – where wealth is reserved for a thin oligarchy or plutocracy occupying the top tier of income – aggregate income may increase while the vast majority of economic subjects are deprived of any opportunity to transition from biological to cultural propagation.

Thus, admits Lucas, "for a landless family in a traditional agricultural economy, the possibilities for affecting the quality of one's children's lives are pretty slight" (12). Nevertheless, as the world system unfolds and eliminates the particularities and differences that differentiate communities from one another, Lucas believes that we can

anticipate the kind of transition from extensive growth to intensive growth that we find in families and in communities that are today fully incorporated into that system.

People are moving out of traditional agriculture, where the necessary adult skills can be acquired in on-the-job child labor. More and more people are entering occupations different from their parent's, occupations that require skills learned in school as well as those learned at home. New kinds of capital goods require workers with the training to operate and to improve upon them. In such a world there are many things a parent can do with time and resources that will give a child advantages in a changing economy, and the fewer the children one has the more such advantages can be given to each one (12).

On this basis, Lucas feels confident that production can expand and will continue to expand into the indefinite future.

6. KARL MARX AND THE CRITIQUE OF SOCIAL TOTALITY

We are now in a much better position to appreciate Karl Marx's appropriation and modification of GWF Hegel's initial model. Traditional Marxist economic theory holds that Marx took the qualities that Hegel had misattributed to the Spirit, grounded them historically, and identified them with the industrial working class. In this case, it was not the Spirit that was objectifying itself in history, driving it forwards to its goal, but workers. It was not the Spirit that was dialectically differentiating and then reconstituting itself as the universal Subject, but the dialectically unfolding working class. And, in this latest stage of historical development, it was not the bourgeoisie that formed the universal class destined seize the reins of power, but the industrial working class.

The main problem with this reinterpretation of Hegel's historical dialectic is history's failure to validate it. The industrial working class has not reconstituted itself, it has not emerged as the universal Subject, and it has not seized the reins of power. The industrial working class reached its greatest concentration in the 1960s. But since the 1960s it has steadily lost numbers, both in absolute terms and as a percentage of the population, not to mention the political power that came with those numbers. Lucas' account of economic development, by contrast, which takes Capital in the broadest sense as the Subject that is unfolding in history, is both far closer theoretically, but also more accurate historically, than this traditional Marxist reinterpretation of Hegel's historical dialectic.

Yet, it turns out that this reinterpretation of Hegel's historical dialectic bears only a surface resemblance to Karl Marx's actual appropriation of Hegel. As Moishe Postone has pointed out, this surface resemblance appears only insofar as the industrial working class is determined by the value form of the commodity or Capital. Where this holds true, as it did during the 1960s, the industrial working class appears to be the driving force of history. Yet, as high industrialism began to decompose or as it retreated from the global north and migrated to the global south, so too did the industrial working class appear less and less the Subject of history. At a much deeper level, it was not the industrial working class, but Capital itself that deserves credit for driving history forwards. And, in fact,

when we closely examine the passages in which Marx made greatest use of Hegel's dialectical interpretation of history, we discover that they are not about the working class, but about Capital.

Take, for example, the passage in Volume One of Capital where Marx shows how Capital expands by tracing the movement of abstract value through its many phases, from money into commodities and back into money.

It [value] is constantly changing from one form into the other, without becoming lost in this movement; it thus becomes transformed into an *automatic subject* [ein automatisches Subjekt]. If we pin down the specific forms of appearance assumed in turn by self-valorizing value in the course of its life, we reach the following elucidation: capital is money, capital is commodities. In truth, however, value is here *the Subject of a process* [das Subjekt eines Prozesses] in which, while constantly assuming the form in turn of money and commodities, it changes its own magnitude, throws off surplus-value from itself considered as original value, and thus valorizes itself independently. . . . As the *dominant Subject* [das übergreifende Subjekt] of this process, in which it alternately assumes and loses the form of money and the form of commodities, but preserves and expands itself through all these changes, value requires above all an independent form by means of which its identity with itself may be asserted. . . . Value suddenly presents itself as a *self-moving substance* [eine prozessierende, sich selbst bewegende Substanz] which passes through a process of its own, and for which commodities and money are both mere forms [Marx 255-256, *emphasis added*].

Clearly the Self-Moving Substance that is Subject in this passage is not the industrial working class, but is instead the value form of Capital itself. Nor was Marx celebrating this movement. Rather was he showing how Capital creates and sustains a comprehensive, integrated, and rational social totality; a directionally dynamic and highly differentiated social whole that shapes, constrains and dominates all merely partial and particular social individuals, *including the working class?*

7. THE END OF THE METHODENSTREIT

I draw two conclusions from the close proximity of Robert Lucas' rigorous mathematical model of economic growth to GWF Hegel's — and perhaps more astonishingly Karl Marx's — theory of history. The first conclusion is that the original *Methodenstreit* or methods controversy, joined between Gustav von Schmöller and Carl Menger one and a quarter centuries ago can now, at least unofficially, be declared "over." The long-winded speeches and even longer monographs faulting the German Historical School for imposing a "Hegelian" or, still worse, "Darwinistic" reading upon History can finally be laid to rest because, in fact, the two sides in this debate were never really as far from one another as their rhetoric suggested.

The second conclusion we can draw is that for Marx the industrial working class was itself an historically specific embodiment of *the movement of Capital*. In his mature writings, labour never stands outside this movement but is always an element within it.

Indeed, from the perspective of Marx's mature critical social theory, it is the action of labour, that produces both the abstract value form of the commodity as well as its material form of appearance, that constitutes the comprehensive, integrated, and rational totality that dominates all social being under the conditions of capitalist modernity.

This is not to deny the "historical role" of the industrial working class. It is however to deny that the role of this class was to create a "working class society." Quite to the contrary; the role of this class was to abolish itself, eliminating the mediating practice by which the two-fold commodity is composed. Thus the significance of Marx's insistence in Volume Three of *Capital* that the single-most important task the industrial working class can perform would be to reduce the time it allocates to productive activity.

In fact, the realm of freedom actually begins only where labour which is determined by necessity and mundane considerations ceases; thus in the very nature of things it lies beyond the sphere of actual material production. Just as the savage must wrestle with Nature to satisfy his wants, to maintain and reproduce life, so must civilised man, and he must do so in all social formations and under all possible modes of production. With his development this realm of physical necessity expands as a result of his wants; but, at the same time, the forces of production which satisfy these wants also increase. Freedom in this field can only consist in socialised man, the associated producers, rationally regulating their interchange with Nature, bringing it under their common control, instead of being ruled by it as by the blind forces of Nature; and achieving this with the least expenditure of energy and under conditions most favourable to, and worthy of, their human nature. But it nonetheless still remains a realm of necessity. Beyond it begins that development of human energy which is an end in itself, the true realm of freedom, which, however, can blossom forth only with this realm of necessity as its basis. The shortening of the working day is its basic prerequisite (Marx 807).

We cannot examine in detail all that deserves our attention in this passage. No doubt it opens up a rich discussion of the distinction Marx wished to draw between the natural and necessary relationship human beings bear to nature, no matter their social formation, and the peculiar relationship they have recently adopted wherein they are ruled by this interchange as though they were "being ruled by it as by the blind forces of Nature"; which, of course, means that under the conditions of capitalist modernity, we now experience "labour" as a quasi-natural force beyond our control, outside of us, regulating us and our relations, rather than an activity we choose depending upon our wants and desires. In traditional Marxist theory, instead of presenting the object of Marx's critique, labour becomes the vantage-point or stand-point of critique. Here, by contrast, Marx is eager for workers to *stop being workers*; to extricate themselves from this comprehensive, quasi-natural system of domination and self-domination by enacting legislation shortening the work day. Why?

The answer, surprisingly, is already contained in Robert Lucas Jr's *Lectures on Economic Growth*. For we would like to believe — it is natural to believe — *both* that

economic growth knows no limits *and* that it is limited. But these two outlooks of *classical* economic theory in fact refer to the two dimensions of the commodity form itself. Insofar as commodities must find expression in the material world, Malthus and neo-Malthusians are correct. Unending growth is, by definition, materially unsustainable. And, yet, since abstract value is not a measure of the commodity's material dimension, but only measures its value relative to the values of all other commodities to which it is related, *regressio ad infinitum*, value is always infinitesimally recalibrated socially to the new mix of commodities and their values. This means that value never tells us when we have added too many zeros to the end of any value-signifying integer. Nevertheless, endless growth in abstract value entails endless growth in the commodities that bear these values forward and outward into the world. Not coincidentally, this also explains why Hegel's prediction that ever greater efficiency would eventually allow human beings to step aside and install machines in their place will never, in fact, be realized. Hegel was assuming a world in which commodities were produced to satisfy human desires, which, following Aristotle, Hegel knew could not be infinite. Neoclassical economic theory says otherwise, showing that there is no point along any trend line, short of singularity itself, where value will or can level off or decline without there being universal economic catastrophe.

Aware that this was the sword fixed above human societies composed by commodity production and exchange, Marx also saw that the most effective way to wean human society from its addiction to abstract value was to gradually eliminate the *human* source of abstract value. Eliminating the *human* source will have two immediate consequences. Obviously it will dramatically reduce operational costs for non-labor intensive production. It will also, however, *caeteris paribus*, reduce the consumer side demand for such products. Only if the reduction in abstract labour time is accompanied by no reduction in real wages will the demand remain constant. Still, in order to bring this quasi-natural form of self-domination under control, it is also necessary for human beings to critically assess how their "needs" and "desires" are themselves manufactured in order to generate ever greater value. Clearly Marx was contemplating more than a simple change in bookkeeping. Expanding the "realm of freedom" — a realm no longer dominated by abstract labour and value — would also redirect the attention of producers away from the "treadmill effect" immanent to mature capitalism and bring them to focus on the kinds of activities that can only take place in this "realm of freedom," where Marx discerned the front edge of "that development of human energy which is an end in itself."

But this also helps to explain why the *Methodenstreit* has come to an end. For now we can see how the directionally dynamic historical movement that GWF Hegel discerned and that neoclassical economic theorists found so disturbing was generated by a social form — the value form of the commodity — with which the heirs of neoclassical theory are now fully at peace. So, why did the neoclassical theorists bristle so at the directionally dynamic historical movement and or at the highly differentiated social totality described by members of the German Historical School? The answer is as simple as it is disturbing.

Members of the German Historical School, such as Gustav von Schmöller, were inclined to believe that economics did not in fact compose a comprehensive, fully integrated, rational social totality. To the contrary, they were inclined to bring religion, philosophy, culture, and history itself to bear on the policy decisions they recommended in their lectures, monographs and speeches. Neoclassical theorists recognized, of course, that were the German Historical School theorists correct and were economic life, in fact, shaped decisively by factors completely outside the sphere of economics; then it would follow that their rigorous mathematical modeling could not grasp social reality. It would not be until the middle of the twentieth century that these models would be sufficiently sophisticated and nuanced to show how, for example, religion, culture, ethnicity, race and gender could be captured in variables with economic significance. In short, by folding all of social reality into their rigorous mathematical models, contemporary neoclassical theorists have shown how the fears articulated by their nineteenth and early twentieth century over the independent variables introduced by members of the German Historical School were for the most part unfounded.

CONCLUSIONS

All of which suggests an interesting set of new problems for economic theorists. If Robert Lucas Jr. falls closer to GWF Hegel than to Carl Menger, and closer still to Karl Marx, then is it time for economic theorists to revisit the problem of social totality? The original marginal utility theorists hedged their bets on social totality by implicitly, or sometimes explicitly, adopting a Kantian notion of human freedom. All of social reality could be determinate, lending itself to rigorous mathematical modeling, and, yet, human beings could be free since, by its very definition, human freedom falls completely outside of the kinds of things that economists measure. Increasingly, however, as economists have flexed their multivariate muscles and shown how there are, in fact, no independent variables in their science, we might well wonder why our social formation lends itself so readily to the kinds of rigorous mathematical modeling that economists now practice. Is it only because that is the way society works, end of story? Or might society *now* work this way because of the specific form of social domination that shapes our actions?

While there are no easy answers to these questions, it surely must raise some concerns that economic theorists display very little curiosity over the character of the science they have created. No one, of course, wonders when astrophysicists or molecular biologists insist that the objects of their research lend themselves to such rigorous mathematical modeling. And, yet, we are not talking about molecules or light particles, but human beings. If human beings do behave the ways that economists presuppose they do, should we not at least show some curiosity over why this is the case, or whether it has always been the case?

Ever since 1917, when the Russian Revolution showed that it was possible, if not in fact, at least rhetorically and politically, to suspend or reverse the “natural” functioning of markets, one of the most effective tools wielded by economists in favor of free

markets was to criticize the totalizing and totalitarian nature of state controlled economies. Now that neoclassical economists are showing that their own “free market” economies lend themselves to the kinds of totalizing theories that once were the unique provenance of communist economic theorists, is it not time for us to wonder openly about the kind of society created, however freely, by commodity production and exchange? And, might not the time also be ripe for reconsidering the kind of open society Marx contemplated in his mature theoretical writings?

If as a provisional answer to these questions economists could begin to reflect critically on open societies in which the actions of social actors were no longer mediated by abstract labour time expended, then we might also begin to take steps toward resolving not merely the *Methodenstreit*, but more importantly the debate between neoclassical economists who hold that their interpretive categories are universal and transhistorical and those economists who believe that these categories are historical, contingent, and limited. Such a resolution might help us to move beyond the acrimony with which non-Marxian neoclassical theorists have held Marxian neoclassical theorists in contempt of their science. We could then begin together to resolve some of the more pressing economic problems, such as climate change and income inequality, calling for our attention.

In the alternative, we could continue to act as though the kind of totalized and totalizing society that economic science presupposes is wholly consistent with the open society after which all or most of us aim. It is this latter presupposition that seems to many of us to be increasingly untenable.

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