

# Temporality and Value in Marxian Economic Theory

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## Abstract

The “temporal single system” (TSS) interpretation of Marx’s theory of value proposes that labor values are to be determined in each period of production from the historical cost of inputs and direct labor, and that prices of production are to be determined in each period of production by equalization of profit rates across sectors on the historical cost of inputs. Using the device of the Monetary Expression of Labor Time (MELT) to translate between labor values and money prices, this TSS interpretation conserves the value of the gross and net products, and surplus value. These comments raise three questions about this interpretation. First, a theorem of Kliman’s shows that TSS labor values and prices of production converge dynamically from arbitrary initial conditions to the same prices of production arising from the “New Interpretation” (NI) with the same MELT, raising the question of whether the TSS interpretation differs by more than a transient period from the NI. Second, the TSS interpretation has been articulated only in the case of the pure circulating capital model without joint production, raising the question of its generalizability to more realistic models of production involving fixed capital. In particular, the concept of gross product on which the TSS literature lays great weight is not well-defined for models of production cast in continuous time. Third, a reading of the context of Marx’s exposition of the concept of prices of production in Volume III of *Capital* suggests that Marx adopted the “long-period” method of Smith and Ricardo, which sees the equalization of the rate of profit as the average of fluctuations over many periods of production, raising the question of the adequacy of the TSS method of equalizing the rate of profit in each period of production to express Marx’s conception.

# 1 Introduction

The literature stemming from the “temporal single system” (TSS) interpretation of Marx’s theory of value put forward by Carchedi, Ernst, Freeman, Kliman, and others, has raised important issues of the treatment of time and technical change in Marxian economics. In this paper I will argue that a deeper conceptualization of the embeddedness of capitalist production in time requires a re-thinking not only of the “simultaneist” representation of the determination of embodied labor coefficients and prices of production, but of the TSS representation as well. Looking at capitalist production from the point of view of Marx’s circuits of capital (as Ramos also proposes) we see that the problem of the determination of values or prices of production arises from subtle considerations of the temporal nature of competition among capitalist producers, which are obscured by situating the problem in the circulating capital model most frequently employed for this purpose. In a context where circuits of capital are continuous and intertwined, commodities produced under various price-of-input conditions in the past (and indeed in the future) effectively compete in the formation of a price (or value) on the market. The determination of the prices that actually rule in some average or long-run sense depends on the exact nature of this competition, which inherently involves speculative elements. When the technology is stationary (with unchanging coefficients of production, or coefficients that are subject to a stationary stochastic process) all commodities of all vintages that participate in this complex competitive process have the same average input costs. In this case the “simultaneist” equations determining prices of production appear to be valid, not because inputs are revalued at the time of the sale of the product, as some TSS critiques of “simultaneist” methods allege, but because the historical prices of inputs are (stochastically or on average) constant. In the stationary case, in fact, there is strong reason to believe that the TSS methods of determination of values or prices of production are identical to “simultaneist” methods.

The situation becomes more problematic when we consider non-stationary technological change (where coefficients of production have a trend, for example). Not surprisingly, TSS advocates tend to situate their examples in this setting, which they view as constituting a decisive critique of the “simultaneist” conception. But a careful analysis of price formation under conditions of non-stationary technical change suggests that the typical TSS formulation, which assumes profit rate equalization in every period of production in a circulating capital model, is subject to some of the same limitations as “simultaneist” methods. This raises questions about the appropriate conceptual generalization of Marxian and classical conceptions of competition when technical change is non-stationary and evolves on a time scale comparable to the time scale of the competitive process itself.

## 2 Continuous and intertwined circuits of capital

In Volume II of *Capital*, Marx undertakes a sophisticated and deep analysis of the actual temporal process of capitalist production. Each unit or particle of capital travels through distinct phases in the circuit of capital, taking the form of money capital, of productive capital (including stocks of partly finished commodities whose cost includes the wages of the labor already bestowed upon them), and of commercial capital (finished commodities awaiting sale on the market). In some cases external factors enforce a degree of synchronization on the circuits of capital (for example, when seasonality synchronizes the period of production for certain types of agricultural production). But the more general case (as Marx notes) is that every individual capitalist firm has many distinct circuits of capital operating at any moment, each in a different phase of the circuit, and that the circuits of different capitalist firms are unsynchronized. In this circumstance the commodities effectively “on the market” at any moment include commodities produced at different times in the past. A moment’s thought suggests that even commodities “in the pipeline” can effectively compete on the market at given time. This phenomenon of competition of commodities of different vintages (even negative vintages!) arises because of the possibility of producers storing commodities (or the capacity to produce commodities) and of consumers adjusting their temporal pattern of demand. The existence of stocks of commodities in the form of commercial capital indicates that producers as sellers have some ability to adjust the time lag in realization to respond to market conditions. A similar adjustment on the part of buyers is also possible, either by deferring direct consumption of commodities, or because buyers hold stocks of commodities they consume productively or as final users.

In this paper I take the concept of “price of production” to be a generalization of the concept of “value” reflecting the competition of capitals and similar to the classical concept of “natural price”. I would argue that Marx, like the classical political economists, saw values as emerging from the uncoordinated and fundamentally chaotic behavior of individual buyers and sellers. The “laws of value” assert themselves, in this view, as statistical laws reflecting regularities that arise in markets through the competition of buyers and sellers. In the case where the profit rate is zero (or where produced capital is a negligible or unappropriated input to production) or where “organic compositions of capital” are the same for all commodities, the anarchy of the market will tend to force prices to proportionality with the socially necessary labor embodied in each commodity. This process takes place, and becomes visible, only over many market periods, which, as we have seen, comprise many circuits of capital (or periods of production). In my own view, the “abstract labor” which Marx identifies as the “substance” of value is also an emergent phenomenon, reflecting the ceaseless movement of concrete labors among different employments as workers and capitalists seek competitive advantage.

In this perspective, the exact determination of values or prices of production is the reflection of this process of competition. Of course, at their heart values express, as Marx says eloquently, the inherent laws of production. It is because

products take the form of commodities, and labor takes the form of labor-power sold for a wage, that the competition of capitalists and workers “enforces” the underlying laws of capitalist production and exploitation.

### 3 Competition and prices of production with stationary technologies

In analyzing this complex process, Marx, like his classical predecessors, often makes use of the fiction that technical conditions of production are unchanging, or changing slowly relative to the competitive processes that enforce the laws of value. This is, of course, a fiction, since there is in reality constant turbulence in the conditions of production, and Marx shows that the capitalist system is inherently a technically progressive system, which constantly revolutionizes the technical conditions of production. But it is a useful fiction for two reasons. First, as a tool of abstraction it allows us to isolate the tendencies of competition. Second, it provides the analytical grounding for an understanding of competition that could be generalized to more realistic conditions of technical change. The modern economic tool of analysis that corresponds to the assumption of unchanging technical conditions of production is the concept of a stationary stochastic process, in which the coefficients of production vary over time, but with a constant mean and higher moments.

Now let us consider the problem of the determination of values (or prices of production) in a stationary capitalist economy (or one in which the non-stationary components of technical change are moving slowly relative to the processes of competition governing the formation of prices on markets). Each capitalist comes to the market with commodities produced at various points in the past, under various cost conditions. Each capitalist strives on the market to realize the maximal profit on the actual historical costs of these commodities. (Final buyers and other capitalists for whom the commodity is an input strive equally vigorously to minimize their costs.) Over many market periods, intertwined with many circuits of capital, capitalists in any one sector will *ex post* realize a certain profit rate. If it is higher than profit rates in other sectors, so much the better, but if it is lower, they will, according to the classical theory of competition enunciated by Smith and elaborated by Marx, tend to seek alternative employment for their capital in sectors with higher profit rates. (It may take a while for them to extricate their capital from one sector, if the circuit of capital has a long-lived fixed capital component.) The result of such a process of exit and entry will be *ex post* the tendential equalization of profit rates (or in the case of equal organic compositions of capital, proportionality between prices and embodied labor), and the emergence of prices of production as centers for the fluctuation of market prices.

In this process input prices will *on average over time* be equal to output prices for the same commodities. This is not due to some miraculous or mystical revaluation of historic costs when commodities are actually sold, but simply due

to the *assumption* of stationarity. The equations for prices of production will be:

$$\bar{p} = (1 + \bar{r})(\bar{p} \cdot \bar{A} + \bar{w}\bar{l}) \quad (1)$$

in the usual notation where  $p$  is the vector of prices of commodities,  $r$  is the profit rate,  $A$  is the matrix of input-coefficients,  $w$  is the wage, and  $l$  the vector of labor input coefficients in a circulating capital model. I have written  $\bar{p}$  to emphasize that these are statistical averages of prices over many market periods. Though this set of equations has the same form, it *not* conceptually the same as the “simultaneist” equations as presented by TSS critics:

$$p_t = (1 + r_t)(p_t A_t + w_t l_t) \quad (2)$$

where  $p_t, r_t, A_t, w_t,$  and  $l_t$  are taken to describe production in a *particular* period (which is at the same time the synchronized period of production and the market period in the simplified circuit of capital model).

There are two conceptual difficulties with this second equation. One, on which TSS critics have put the greatest emphasis, is that it is not clear why input prices and output prices should have the same time subscript when inputs are purchased and outputs sold in different market periods. Equation (1) are *not* subject to this objection, because they arise from considering many intertwined circuits of capital in which input prices *on average* equal output prices, despite the fact that in every individual period of production input and output prices may be distinct and different.

The second problem with equation (2) is that it envisages the equalization of the rate of profit as taking place in *each* production period separately. But the consideration of the intertwined circuits of capital make clear that this is an unwarranted reification of the concept of equalization of profit rates through competition which is foreign to the thinking of the classical political economists and Marx.

The TSS version of profit rate equalization:

$$p_t = (1 + r_t)(p_{t-1} A_{t-1} + w_{t-1} l_{t-1}) \quad (3)$$

escapes the first criticism, but falls afoul of the second. Equation (3), like the “simultaneist” equation (2), represents the equalization of profit rates as occurring completely within each period of production. This is inconsistent with the vision of intertwined circuits of capital in Marx’s work, and with the discussion of the emergence of prices of production which surrounds the tableau in Chapter 9 of Volume III of *Capital*.

In fact, if one applies the temporal insight of the TSS view to the case of stationary technology, it is hard for me to see that it would not lead directly to equation (1), not because of any arbitrary assumption that input prices are determined in the same market as output prices (thereby eliminating the element of time from production altogether) or because of an arbitrary revaluation of the elements of constant capital to the prices ruling in the output market, but

because of the effect of averaging of input and output prices over time in a stationary context.

The reason for working with equation (1) in the stationary case is that in this case it is wholly reasonable to assume that capitalists will average out the short-term gains and losses on stocks of inputs and outputs in deciding whether or not to shift their investment to more profitable sectors. While each individual circuit of capital will experience its own idiosyncratic profit rate on historic costs of inputs, the decision of whether to change one's line of business is at a different level from the decision to initiate production in any particular line of business.

## 4 Competition with non-stationary technical change

But what of the certainly more realistic case in which technical changes are not stationary, but have a trend? First, at the risk of repeating myself, let me emphasize that the question is really not whether there are trends in technical change—there are, for example, in the secular increase in the productivity of labor in developed capitalist economies—but whether these trends are sufficiently rapid to take place on the same time scale as the competition among capitals. If the non-stationary components in technology are very slow-moving compared to the process of the movement of capitals between sectors in search of higher profit rates, then equation (1) would still be an appropriate analytical tool.

I myself believe that this is one of points in which there has been a significant historical change in the patterns of capitalist production. In the nineteenth century the underlying shifts in productivity coefficients may well have taken place at a slower pace, and the movement of capital may well have taken place at a faster pace, than in the contemporary capitalist world economy. If this were true there would really have been no reason for the classical political economists and Marx to confront the complex and difficult question of analyzing competition with changing technology. This is true, even given Marx's emphasis on the technologically revolutionary character of capitalist production, *if* the evolution of technology moves at a much slower pace than the competition of capitals.

In the case where technology is non-stationary, it is clear that *none* of the equations above will be an adequate representation of competition and the emergence of prices of production and an average profit rate in a capitalist economy. The problem of finding a suitable generalization of the concept of prices of production for the case of non-stationary technical change remains an open area for further theoretical research. It may be worthwhile, however, to put forward some very preliminary suggestions toward solving this problem

The actual economic effect of non-stationary technical change presumably arises at the point at which capitalists consider moving their capital from low to high profit rate sectors. Capitalists producing in a given sector under these conditions will experience capital gains or losses on the stocks of inputs tied up in production. (National Income Accounting attempts to allow for these changes through the Inventory Valuation Adjustment.) From the point of view of the reproduction of the individual capital, these gains and losses look exactly

like profits. Thus we might expect competition, to the extent that capitalists anticipate such gains and losses, to adjust equalize profit rates in different sectors to compensate including anticipated gains and losses on stocks of inputs and outputs. This is in the spirit of the TSS approach, though from a formal point of view the TSS method of calculating prices of production would have to be modified to take account of the time-averaging effect over circuits of capital described above, since the same considerations of the emergence of equal profit rates would apply whether technology is stationary or non-stationary. If this is indeed an important issue for contemporary capitalist competition, it might be possible to measure it empirically.

From a doctrinal point of view, however, it seems desirable to distinguish that part of capitalist profits that arises from the direct exploitation of labor in production and that part of capitalist profits that arises from the revaluation or depreciation of stocks of inputs and outputs over the production period. The first component represents surplus value in Marx's sense, and corresponds to the unpaid labor time of contemporaneous production. The second component is more like the revaluation of land or of government debt in the capital markets, which give rise to capital gains and losses on assets that do not arise from the exploitation of labor. In this sense, the introduction of non-stationary technical change is a further modification of the law of value in the same way that profit-rate equalization with stationary technology is, and the other topics such as rent, interest, and commercial profit, which Marx discusses in Volume III of *Capital*.

## 5 Gross output and continuous production

In the context of the vision of continuous, intertwined circuits of capital it is not as easy to define "gross output" as it is in the context of the circuit of capital model with a single synchronized production and market period. The difficulty is that production always involves numerous intermediary stages. As the accounting period becomes very short, the number of these intermediary products, which will appear as components of the gross product vector, expands without bound, and gross output and its value also expand without limit. As a result there is no very convincing definition of gross output in a continuous time production model, although the definitions of net output and value added remain completely stable and invariant to changes in the accounting period.