The Tendency of the Rate of Profit to Fall as Society Progresses[1]

> If one accepts the cynical definition of a classic as a work that everyone talks about and no one reads, there is certainly no better classic than Marx's work in economics

Introduction

According to Marx's analysis,[2] all social institutions [3] including capitalism develop under the propulsion of inner contradictions.[4] Capitalism as a historically specific institution manifests these inner contradictions in its mode of production whose outcome in Marxian interpretation took the form of his famous four " laws of motion" : i) the law of the tendency of the rate of profit to fall, ii) the law of the increasing misery of the working class, iii) the law of concentration and centralization of capital, and iv) the law of the increasing severity of cyclical crises as the capitalist system chronologically matures.[5]

These laws of motion pertain to 'certain historically specific conditions' and as such reflect their validity only if they are examined in the context of these historic conditions, namely, competitive capitalism or pure capitalism. Marx's analysis of pure capitalism rests on this particular form of economic organization, excluding, a) government - hence has no public expenditure, taxation and debt policy - and b) abstracts from market imperfections - such as oligopolistic or monopolistic behavior of firms in the market place.

Accordingly, Marx's laws of motion, resting on the workings of competitive capitalism over time could not be refuted or defended under a specific period, such as contemporary capitalism. The institution of capitalism is not static, but it constitutes a dynamic system of economic change which in its pursuit for increasing profits evolves continuously through time. Its evolutionary character manifests with innovations, new methods of production, new forms of industrial organization, and new markets for the creation of more profitable products and services. It is the "perennial gale", as J. Schumpeter calls it, of the capitalist enterprising that transforms across different time periods the structure of the system from within.[6]

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[1] The Essay constitutes an unpublished thesis proposal of the PhD program in Economics at the University of Toronto. It was submitted to Professor Samuel Hollander as a partial requirement to his postgraduate course in the History of Economic Thought given during the academic period 1977-78. He rated it B+ and recorded an A- for the course, but politely declined to assume responsibility of supervising it. In the present edition (July 2014), certain improvements were made without revising the content and conclusion of the original paper.

[2] The title of the essay has been adopted from a letter of Marx to Engels written in April 1868, in which Marx outlined the general features of the method that explain the notion of the rate of profit and its tendency to fall over the long term. In particular, he claimed this tendency of profit rate to fall is one of the greatest triumphs over the *Pons asinorum (Bridge of donkeys - Euclid's Fifth Proposition in Elements of Geometry: the theorem of isosceles triangle which was used as a metaphor for a problem to separate the sharp thinker from the slow)* of all previous economics. (Marx & Engels, Selected Correspondence, p. 194, Progress Publishers, 1975).

[3] Social institutions bearing the meaning of historically limited, i.e., having a beginning and an end.

[4] Marx spoke of contradictions in terms of "conflicting elements"; as a source of movement and change and not in the conventional sense of "logical error" or "logical impossibility". See Karl Marx Theories of Surplus Value, Parts I, II, III, 1955, 1958, 1971, Progress Publishers. In addition, see, Sowell T., "Marx's Capital after one hundred years", Can. Jour. Econ. and Pol. Sci., pp. 50-74, 1967; and M.A. Lebowitz " Marx's Falling Rate of Profit : a dialectical approach", Can. Jour. of Econ. and Pol. Sci., pp. 232-54, 1976.

[5] 1) Marx Karl, Capital, Vol.III, part iii, Marx Karl, 2) Marx Karl, Grundrisse, p.750, 3) Marx Karl, Capital, Vol. I, chap. 25 and 32, 4) Marx Karl, Wage Labour and Capital, and 5) Marx & Engels, Communist Manifesto

[6] J.A. Schumpeter, Capitalism, Socialism and Democracy (1942), pp. 82-84, 3rd Edition, Harper, 1975.

Indeed, not only the economic conditions of today are not identical with those of the 19th century, but also the stages of the capitalistic process, i.e., competitive vs. monopoly capitalism, of the socio-economic system differ. The essential point is that capitalism can never be stationary due to the evolutionary character of its process which in turn changes the economic life in a social environment and thereby alters the parameters of economic action.

Consequently, it would be incorrect to criticize or defend Marx's laws of motion- in particular the one under consideration in the present paper which requires continuous and objective data over the business cycle, and not fragments - by using empirical evidence from the function of capitalism at a particular point in time in economic life.[7] Unfortunately, this approach to 'prove' whether or not Marx's conclusions on his critique of capitalism are "right or 'wrong' [8] is sterile, as it resembles the approach of one biologist to criticize another's theory of metabolism of insects with evidence from the metabolism of mammals.

In addition, these laws of motion were thought by Marx as expressing tendencies[9] which might be counteracted by other tendencies or forces. And here we run into the risk of interpreting the 'intention' of the dead which is always a questionable undertaking.[10] Since Marx spoke of it just as a tendency [11] to which there were present a number of counteracting tendencies, not making crystal clear that it is not a 'prediction' having a definite (secular) movement. He based fundamentally the law of the tendency of falling rate on his theory of value, where the phenomenon occurs in the mode of production because of a comparative increase of the organic composition of capital relative to the rate of surplus value. However, Marx explicitly stated that the effect of the law may be mitigated even annulled by inter-connected counteracting influences and thus give it merely the characteristic of a tendency. [12]

Although the law of falling profit rate did not originate with Marx, undoubtedly for him it was the most important law that governed the economic system of capitalism.[13] What in fact was original with Marx was his explanation of the law. He distinguished it, i) as a tendency related to the *long-run* development of the capitalist mode of production, i.e., as a tendency related to the inherent dynamics of capital accumulation, and ii) as a tendency related to the *short-run* phenomena linked with crises which were deemed as temporary breakdowns in the accumulation process and thus applicable to the analysis of economic crises. Crises - that have a fairly regular occurrence in the last two centuries of capitalist development - according to Marx's apparatus of economic analysis, result from increases in

[7] Some of the works falling in this category include, 1) Sweezy P., The Theory of Capitalist Development, Ch. IX, Modern Reader, 1942; 2) Gillman J., The Falling Rate of Profit, Cameron Ass., 1958; 3) Morris J. " Spurious Capital and the Rate of Profit ", Science and Society, pp. 302-322, vol. 31,1967; 4) Walker A., " Karl Marx, the Declining Rate of Profit and British Political Economy" Economica, pp.362-377, Nov. 1971; 5) Hodgson G., The Theory of the Falling Rate of Profit, New Left Review, pp.55-82, Mar-Apr, 1974.

[8] Baran P. & Sweezy P., Monopoly Capital, An Essay on the American Economic and Social Order, MRP, 1966.

[9] In this essay by 'tendencies' we do not adopt Maurice Dobb's interpretation as 'mere' tendencies with a number of counteracting tendencies (The falling rate of profit, Science and Society, 1959), since there is no statement by Marx about the anticipated relative strength of 'tendency' and 'countertendencies'. By tendency, we mean a direction to move to some definite point, no matter what the intermediate stages are; ultimately, the point is reached. Under this meaning of the term Marx's law of the falling rate is analyzed.

[10] Baumol W., "Values vs. Prices : What Marx 'Really' Meant", The American Economist, p.63, Fall, 1973.

[11] Capital, Vol. III, p.232

[12] Grundrisse, p. 763, Capital, Vol. III, p.232, Selected Correspondence, p.194.

[13] Marx did state: " this is in every aspect the most important law of political economy", Grundrisse, p. 748.

constant (fixed) capital relative to variable capital (wages). This leads to a fall of the rate of surplus value or the degree of exploitation and in consequence profits earned decline.

Marx in his celebrated theory of capital accumulation stated that monopoly capital becomes a fetter upon the mode of production. Centralization of the means of production and socialization of labour at last reach a point where they become incompatible with their capitalist integument; thus the integument bursts asunder: the knell of capitalist private property sounds "the expropriators are expropriated".[14] However, the crises that result from the decline of the profit rate do not lead to a "*breakdown*" of the capitalist system. In fact, Marx did not have a *breakdown theory*, as several writers have suggested.[15] He had a business cycle theory associated with periodic crises of the system which intensify over time.[16]

These economic crises emanate from the fundamental characteristics of capitalism, *unplanned* production and *anarchistic* movement of prices. Capitalist production being a production for a market of *commodities* rather than for the individual producer of *products* himself, [17] there is no necessary connection between the quantities produced and desired, i.e., capitalist production is oriented not for consumption needs (use-values) but towards production of profits (exchange-values). In other words, capitalism is a system of production not for consciously designed social ends but for profits.[18] It is by virtue of the profit motive that the pursuit of surplus value assumes a dominating significance so that a decline in the rate of profit can exert a great influence on economic events raising serious concern.

Marx's diagnosis was that there is an inherent tendency in the capitalist system the rate of profit to fall under the pressure of accumulation since it changes the composition of capital by *displacing living labour* the essence of surplus value creation. Hence profits are constantly being eliminated by the very workings of the system. And without profits capitalist society cannot exist and its economic system cannot function. This is the reason why incessant effort is expended by the capitalist class, and it becomes its prime motive, to keep the system alive.

Thus it is apparent why the tendency of the profit rate to fall was so crucial to Marx's analysis of the *modus operandi* of the capitalist system. Since the problem is *endogenous*, the system by its own development generated the seeds of its own retardation, decay and final destruction; therefore, testifying to its merely historical transitory character."[19]

The vision of Marx has not materialized yet and the knell of capitalism still sounds, but the echo is feeble. The system was severely tested during the Great Depression in the 1930's, and it survived, but at a great cost of human suffering, corporate failures and massive unemployment. Today, the concentration of capital, the mechanization in the production process and intensification of exploitation are obvious, as well as, the promotion of foreign investment and fostering of speculation. These symptoms of illness in Marxian diagnosis would hasten the transformation to socialism.

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[14] Capital, Vol. I, chap. xxxii, p. 715.

[15] Bronfenbrenner M., "Das Capital for the Modern Man", Science & Society, pp. 419-438, 1965.
Sweezy P., The Theory of Capitalist Development, 1942, op.cit.

[16] Wage Labour and Capital, p.173, op. cit. Communist Manifesto, p. 113, op. cit.

[17] Marx stated that "In conditions in which men produce for themselves there are in fact no crises, but also no capitalist production." (Theories of Surplus Value, Part II, p. 380).

[18] Dobb M., Political Economy and Capitalism, p. 80, 1937.

[19] Capital, Vol. III, p. 242.

The Falling Rate of Profit : The Classical Approach

The assertion or postulate that there is an inherent tendency of the rate of profit to fall with the growth of the capitalist system was not original with Marx: "the economists perceived the phenomenon and cudgeled their brains in tortuous attempts to interpret it. Since this law is of great importance to capitalist production it may be said to be a mystery whose solution has being the goal of all political economy since Adam Smith."[20]

In fact this tendency of falling profits in the capitalistic process which took the form of 'law' in Marx's phraseology, held a great place in classical doctrine. It was a common theme in political economy in the early 19th century and subject of discussion and speculative thinking in an attempt to solve the puzzle, to find an explanation of the economic conditions that cause this phenomenon. The classics did observe that there is a tendency of the profit rate to fall as capital accumulation advances and tried hard to find not only the real root of the problem of capitalist evolution, but also its association with the so called 'stationary state'[21]

Adam Smith attempted to explain the decline of profits as capital accumulates by the competition of capitals: "the increase of stock, which raises wages, leads to lower profit. When the stocks of many rich merchants are turned into the same trade their mutual competition naturally leads to lower its profit; and when there is a like increase of stock in all the different trades carried on in the same society, the same competition must produce the same effect in them all."[22] Although, Smith's account is in line with the traditional classical view of the declining rate of return on capital, his loose propositions - according to professor Hollander - leave open the possibility that increasing wages constitute one of the operating pressures.[23] However, since rising wages do not represent a necessary condition for the decline in profits, he concludes that... [Smith's] most general statement relates the declining profit rate to 'increased competition' between capitalists in commodity markets." [24]

Furthermore, in Smith’s analysis there is no casual relationship between wage-rate changes and the adoption of capital intensive processes, since he states “the final payment of the rise in wages... together with the additional profit of the master manufacturer would fall upon the consumer.” [25] This statement, however, implies any increase in money wages will be passed on higher manufactured goods prices; and with a further sequence on inflationary effects. Hence, the motive for a change in the relationship of the main factors of production, capital and labour, is absent. Simply, wage increases are passed on to the consumer.

It is this argument that attracted the attention of Ricardo and directed his severe criticism on Smith. For Ricardo, high wages and high profits are incompatible. The interests of the labourers and the capitalists are always directly opposed to one another. For this reason Smith’s contention is wrong: wages and profits do not rise together but in inverse relationship. This is the fundamental theorem of Ricardian economics - though it did not

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[20] Capital, Vol. III, p. 213.

[21] Dobb M., Theories of Value and Distribution since Adam Smith, p. 137, Cambridge, 1973.
Schumpeter J. History of Economic Analysis, p.651. Oxford, 1954.

[22] Smith A., The Wealth of Nations, int. by Skinner A., chap. IX, p.190, Pelican Classics, 1970.

[23] Hollander S., The Economics of Adam Smith, Chap. 5, p. 182, University of Toronto, 1973.

[24] Hollander S., ibid., p.182.

[25] Smith A., The Wealth of Nations, pp. 816- 817, Cannan edition.

affect critically the economic thinking of the day - it is the essential theoretical innovation over Smith's thesis that competition between capitals raises the wages of labour and sinks profits.

Ricardo contended that competition between capitals can indeed reduce profits to an average level, or foreign trade can increase profits above the average level in the various branches of business, but it cannot depress or raise respectively the general rate itself. Ricardo's adamant view was that "the ultimate determinant of the general rate of profit was the level of *money wages*, governed in turn by food prices so that the secular behavior of the profit rate could be explained by inverse movements of money wages."[26] In Ricardo's own words : " It has been my endeavour to show throughout this work that the rate of profits can never be increased but by a fall of wages and that can be no permanent fall of wages but in consequence of a fall of the necessaries on which wages are expended." [27]

Consequently, in Ricardian economics a tendency for the rate of profit to fall can only be explained by increases in *money wages*, which in turn are caused by increases in prices of wage goods or by the simple fact that the price of food is rising. The latter implies that land becomes less productive and hence the profit rate falls due to the declining productivity of land: "If there be not plenty of fertile land, if to produce this additional quantity, more than the usual quantity of capital and labour be required, corn will not fall to its former level. Its natural price will be raised, and the former, instead of obtaining permanently larger profits will find himself obliged to be satisfied with the diminished rate which is the inevitable consequence of the rise of wages, produced by the rise of necessaries. The natural tendency of profits is then to fall for in the progress of society and with the additional quantity of food required is obtained by the sacrifice of more and more labour." [28]

A similar view was maintained by J. S. Mill with respect to the decline of profit rate as capital accumulated over time: "The economic progress of a society constituted of landlords, capitalists, and labourers, tends to the progressive enrichment of the landlord class, while the cost of labourers subsistence tends on the whole to increase and profits to fall."[29] J.S. Mill, however, not only held the view that there exists a tendency of the profit rate to fall as society progresses, but he also stated explicitly that this secular profit fall will lead society to a "stationary state."[30] Specifically Mill stated: "When a country by long possessed a large population and a large net income to make savings from, and then, therefore the means have long existed of making a great addition to capital...it is one of the characteristics of such country, that the rate of profit is habitually within as it were a hand's breadth of the minimum and the country therefore on the very verge of the stationary state."[31]

J. S. Mill's vision on the stationary state is amplified by the following theorizing: "If now say that the mere continuance of the present annual increase of capital, if no circumstance occurred to counteract its effect, would suffice in a small number of years to reduce the net profit to the one percent...The richest and most prosperous countries would

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[26] Hollander S., " Ricardo's Analysis of the Profit Rate : 1813-1815", p. 262, Economica, Aug. 1973.
[27] Ricardo D., Principles of Political Economy and Taxation, p. 151, Pelican Books, 1971.
[28] Ibid., p. 139, chap. VI.
[29] Mill J.S., Principles of Political Economy, p. 737, Collected Works, University of Toronto, 1965.
[30] It is my view and in this I would like to be corrected if I am wrong, that Ricardo does not refer explicitly in his Principles to the 'stationary state'; however, he does talk about an end to accumulation when wages will be equal to 'the whole receipts of the farmer', 'for no capital can then yield any profit whatever, and no additional labour can be demanded' (Principles of Political Economy, Chap. VI, p. 140).
[31] Mill J.S, Principles of Political Economy, p. 738, op. cit.

very soon attain the stationary state, if no further improvements were made in the productive arts and if there were a suspension of overflow of capital from those countries into the uncultivated or ill-cultivated regions of the earth."[32]

Mill's visualization that eventually the capitalist system will approach a stationary state did not follow from a probable failure to recognize the existence of counteracting tendencies,[33] but from his personal conviction of the strength with which growing capital and population increase exert upon profits, a strength that could not be counteracted. A force that would bring an impossibility of ultimately avoiding the stationary state: "at the end of what they (Political Economists) term the progressive state lies the stationary state."[34]

Summarizing the *classical* argument of the falling rate of profit as society progresses, the explanations are centered on Smith's *competition of capitals* and Ricardo's *declining productivity in agriculture*. The implications of the declining productivity of labour in the economic process are negative to the extent that it would induce increases in prices of 'wage goods' which in turn would pressure money wages higher and consequently profits will sink. Simply put, over the long run as capitalism evolves, the accumulation of capital proceeds at faster pace while labour productivity gradually diminishes causing the profit rate to fall.

It should be recognized that the falling rate of profit and the stationary state were not identified by classical political economists as signaling the end of a particular mode of production that is superseded by a higher social system as Marx visualized. For Adam Smith the tendency could be mitigated by extending both domestic and foreign trade to allow expanding capital to find new outlets. Ricardo examined the issue more deeply than Smith did and realized that the tendency of the rate of profit to fall was not a mere accidental phenomenon due to such pressures as the competition of capitals. The falling tendency, according to Ricardo, could be mitigated by the free importation of corn [35] which would cheapen domestic prices of wage goods, hold down wages and thus increase profit margins.

With respect to J. S. Mill it will be remembered that he not only accepted the common view of the falling profit rate, but he went a step further in developing the notion of the *stationary state*. A state which would create "a society greatly preferable to the present" that would exhibit "stationary condition of capital and population but not stationary state of human improvement." A society whose leading features would be "a well paid and affluent body of labourers, a larger body of persons than at present, not only exempt from the coarser toil but with sufficient leisure, both physical and mental to cultivate the graces of life."[36]

In concluding the classical approach to the falling profit rate, it should be emphasized that the predecessors of Marx conceiving capitalism as an a absolute, eternal system of social production functioning as the heavenly bodies following Newton's laws could not perceive of the tendency of the profit to fall as an irremediable weakness as Marx envisaged.

[32] Ibid., pp. 739, and 752.
[33] Ibid., pp. 733-746, 747-749, and 751-757.
[34] Ibid., Chap. VI, p. 752.
[35] In a letter to Trower Ricardo says "I contend that for free trade in corn on the ground that while trade is free and corn cheap, profits will not fall however great the accumulation of capital"(M. Dobb, Theories of Value and Distribution, p. 90). On the subject of 'corn' model Prof. Hollander argues that Ricardo did not maintain as a matter of principle that the money wage rate and thus the profit rate varies just only with corn, but with 'wage goods' in general (S. Hollander, Ricardo and the Corn Profit Model, Economica, May, 1975).
[36] Mill J.S., Principles of Political Economy, p. 755.

Marx's Critique of the Classical Approach

For Marx the analysis which the classical political economists had conducted on the tendency of the profit rate to fall as society progresses, was based on 'false presuppositions' and therefore not only it did not disclose the true origins of the problem by providing sound explanations, but it failed miserably to solve the problem of falling profitability itself.

It has been already discussed that Adam Smith's explanation with respect to the declining profit rate was ambiguous and inadequate. David Ricardo challenged it and finally refuted Smith's position. Marx, in addition to accepting Ricardo's refutation further rejected it by contending that Smith's argument was erroneous on the grounds that competition can permanently depress the rate of profit [37] in all branches of industry in so far as a general and permanent decline of the profit rate is conceivable prior to competition and regardless of competition. And he added: "competition executes the inner laws of capital; makes them into compulsory laws towards the individual capital but does not invent them. It realizes them."[38]

With respect to Ricardo's explanation Marx was very critical, arguing that his theory rests on two false presumptions:[39] a) that the rate of profit is equal to the rate of surplus value,[40] and only rises or falls in inverse proportion to a fall or rise in wages, and b) that the existence and growth of rent is determined by the diminishing productivity of agriculture.

Accepting Ricardo's view that the profit rate falls because of declining productivity in agriculture, Marx found himself in a great dilemma. First, it would mean that the rate of profit falls because the productive force of labour declines in agriculture, which in turn implies a decrease in the rate of exploitation as capitalist production advances. The latter is totally contrary to Marx's main proposition that "the rate of profit falls not because labour becomes less productive, but because it becomes more productive."[41] Besides, the declining productivity does not constitute a real barrier. It is simply a natural barrier which could be surpassed by increasing productivity in agriculture though the use of science (chemical

[37] Incidentally, when Marx speaks of the 'rate of profit' in relation to the falling rate of profit in the course of the development of capitalist production, he means 'the total sum of surplus value which is seized in the first place by the industrial capitalist (irrespective of) how he may have to share this later with the money-lending capitalist (in the form of interest) and the landlord (in the form of rent). Thus the rate of profit is equal to surplus value divided by the capital outlay (Theories of Surplus Value, Part II, p. 453.)
[38] Grundrisse, p. 752.
[39] Theories of Surplus Value, Part II, p. 439.

[40] Since the concepts of *surplus value* and *rate of surplus value* are central to Marx's critique of capitalism that professed to explain the inherent instability of the system it is appropriate to provide the following definitions: a) surplus value= s, is unpaid labour representing excess value of product over and above paid labour (profit), b) rate of surplus value=s/v, is the ratio of the surplus value to variable capital (v) (paid labour or wages). The ratio: s/v or the degree of exploitation of labour power by capital is also defined as unpaid labour/paid labour.

[41] Theories of Surplus Value, Part II, p. 439

sciences to work together with capital). [42] And with a dose of irony and accusation he stated that "Ricardo flees from economics to seek refuge in organic chemistry."[43]

Nevertheless, Marx's main criticism of Ricardo's argument [44] in his theory of rent [45] was that he confounded cost - price with value and the rate of surplus value with that of the rate of profit. His conclusion rested on the following argument: "Although a greater value is produced, a greater proportion of what remains of that value, after paying rent, is consumed by producers, and it is this, and this alone, which regulates profits."[46]

It is revealing in the present context to consider Marx's critique on Ricardo's usage of the profit rate, or as he colorfully calls it "blunder", with the following lengthy passage:

> Ricardo says in plain terms that by rate of profit he understands the rate of surplus value. In other words, apart from rent, the rate of profit is equal to the excess of the value of the commodity over the value of the labour which is paid during its production or that part of its value which is consumed by the producers.[Hence] Ricardo calls only the workers producers. He thus defines surplus value here as that part of the value created by workers which the capitalist retains. But if Ricardo identifies rate of surplus value with rate of profit -and at the same time assumes as he does, that the working day is of given length- then the tendency of the rate of profit to fall can only be explained by the same factors which make the rate of surplus value to fall. But, with a given working day, the rate of surplus value can only fall if the rate of wages is rising permanently. This is only possible if the value of necessaries is rising permanently. And this only [occurs] if agriculture is constantly deteriorating, in other words, if Ricardo's theory of rent is accepted. Since Ricardo identifies the rate of surplus value with the rate of profit, and since the rate of surplus value can only be reckoned in relation to variable capital-capital laid out in wages- Ricardo, like Adam Smith, assumes that the value of the whole product, after deduction of rent, is divided between workmen and capitalists into wages and profit. This means that he makes the false presupposition that the whole of the capital advanced consists of variable capital.[47]

[42] Ibid., p. 110.

[43] Grundrisse, p. 754.

[44] Marx despite his criticism of David Ricardo, which seems sometimes to be unjustified, he profoundly studied his works and highly respected him as a political economist. Especially, once he named Ricardo "as one who must be regarded as its (classical political economy) complete and final expression" (Grundrisse, p.884).

[45] According to Ricardo, "rent is that portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible power of the soil. It invariably proceeds from the employment of an additional quantity of labor with a proportionately less returns" (*Principles of Political Economy, and Taxation*). Ricardo believed that rent arose because of the differences in the fertility of land since not all lands are equally fertile. Hence lands of superior fertility command an advantage over the less fertile. Consequently, rent is a differential surplus that arises from the differences in the fertility and location of different plots of the land. His theory assumes increase in population and fixed superior lands. Thus, the law of diminishing returns is in operation with the inevitable result the cost of production per labour-unit over time to continuously increase since less fertile land is pressed into cultivation. As a result, the cost of raising food progressively increases and with it the subsistence level of labour; thus causing rent to rise and productivity in agriculture to decline.

[46] Theories of Surplus Value, Part II, Chap. XI, p. 463.

[47] Ibid., p. 464. It should be noted that according to Marxian interpretation, the surplus-value generated in the process of production by C, the capital advanced, is made up of two components, one, the sum of money c laid out upon the means of production, and the other, the sum of money v expended upon the labour-power; c represents the portion that has become constant capital, and v the portion that has become variable capital; thus $C= c + v$. When the process of production is finished, we get a commodity whose value = $(c + v) + s$, where s is the surplus-value. However, the constant part (fixed capital), c, of the value of the product is set to zero, because it plays no part in the creation of value. Hence, the rate of profit = $s / c + v$ (Capital, Vol. I, Ch. IX and Vol.III, Ch. XIII) is a measure of the surplus labour time against the capitalist's total investment.

Accordingly, Marx refuted Ricardo's theory that the rate of profit falls because of the growing deterioration in agriculture on the basis that it would only be correct, if the rate of profit and rate of surplus value were identical. Since they are not- because *capital advanced* includes the factor of *constant* or '*dead'* labour- the rate of profit falls not because of the declining productivity, but because labour becomes more productive. Provided the working day remains unchanged, labour productivity increases, because in the capitalist mode of production constant capital (machinery, tools, and auxiliary materials) increases as time progresses relative to variable capital (wages). It follows that Marx's critique of the classical doctrine thus far reduces to an 'error' attributed to its major proponents Adam Smith and David Ricardo: the failure to take into consideration the factor of constant capital. [48]

Going a step further, Marx, considers the 'literature of the epigones'[49] of the classical school by examining briefly the views of Henry Carey [50]and Frederic Bastiat on the falling profit rate. He criticized Carey's position on the basis that he accepted the false view that falling profits are associated with increases in the relative share of labour.[51] Similarly he dismissed Bastiat's [52] proposition (he named it 'law') that the rate of profit declines secularly over time in such a way that never reaches zero (it approaches asymptotically zero).

Marx emphasizing the irrelevance of the 'law', he called it a joke [53] and refuted it on the grounds that, firstly, drawing on harmonic economic relationships it painted a picture based on *illusionary imagination* rather than on actual economic functioning; and secondly, if such a view of secular decline of the profit rate over the long run was accepted, it would in effect imply rejection of the fundamental working hypothesis- an undeniable fact for Ricardo and Marx- that "economics moves within unpleasant contradictions and antagonisms." The latter viewpoint underlies the implication that the operation of these contradictions would prevent the profit rate to decline continuously without interruption and therefore the decline could only be realized for a certain time period. And once more Marx draws his attention to Ricardo: "Ricardo has anticipated his Bastiat. Emphasizing that the sum of profit grows as capital grows despite the decline of the profit rate- thus anticipating Bastiat's whole profundity - he does not fail to note that this progression is true only for a certain time." *(Grundrisse, p. 756)*

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[48] Theories of Surplus Value, Part II, pp. 470-473.

[49] Grundrisse, p. 883.

[50] Henry Charles Carey (1793-1879), an influential American economist best known for his treatise Principles of Political Economy (1840) and Harmony of Interests: Agricultural, Manufacturing, and Commercial (1851). He was an advocate of debt- free, government issued money, tariff protection and government intervention to encourage production and self-sufficiency. He was chief economic adviser of U.S President Abraham Lincoln.

[51] Grundrisse, p. 558, and p. 754.

[52] Frederic Bastiat (1801-1850) was a French liberal political economist, member of the French assembly, and writer who advocated unrestricted free markets, private property and limited government. He was a champion of free trade and the main underlying theme of Bastiat's writings was that the operation of free market was inherently a source of "economic harmony" among individuals, as long as government was restricted to the function of protecting the lives, liberties, and property of citizens from theft or aggression. Marx characterized Bastiat as 'the shallowest and thus the most successful representative of the apologists of vulgar economics' and criticized him severely for his works: Harmonies Economiques(1851) and Gratuite du Credit (Bastiat et Proudman). In fact, it may be amusing to the reader to site some of Marx's labels directed to Bastiat in Grundrisse. The 'harmonic Bastiat in whose harmonic brain all cows are grey' (p. 758); ' we can finish up here with the witlessness of Bastiat, who expresses commonplaces in a paradoxical way, grinds and polishes them into facets, and hides an utter poverty of ideas under the cover of formal logic' (p. 755). And in indignation Marx at the close of his analysis he dropped him "it is impossible to pursue this nonsense any further."(p. 893).

[53] Grundrisse, p. 755.

Hence, we have reached the stage that we must now deal with the crucial question regarding the reasons of Marx's fascination with the classical theories related to the *tendency of the profit rate to fall* and his paramount concern in attempting to solve the 'riddle' as he called it, of all previous political economy since Adam Smith. It would not be difficult to see the profound importance of this phenomenon to Marx, if we remind ourselves of his key premise that: *the motive power and impelling force of capitalist production is the creation of profit in the form of private capital*. Should the rate of profit, therefore, have a tendency to fall as capital grows over the long term, it would lead to an arrest of all accumulation which could bring an end to self-expanding capital, an end to the historic mission of capital.

A full acceptance, of course, of this development would require the dismissal of the approach to *stationary state*, which in effect Marx did by considering the possible existence of such a state a mere illusion. This fallacious idea emanated from the misconception of the classical economic school that the relations of the capitalist mode of production are *eternal* and not *historical* relations corresponding to a specific stage of social development.[54] With only one exemption, that of David Ricardo, the political economists according to Marx were so much attracted by strange ideas such as those related to the imaginary *economic harmonies and stationary states*. Their preoccupation was so intense that they could not perceive anything catastrophic being associated with the decline of the rate of profit. Ricardo however who was not an optimist [55] was described by Marx as considerably worried: "What worries Ricardo is the fact that the rate of profit, the stimulating principle of capitalist production, the fundamental premise and driving force of accumulation should be endangered by the development of production itself."[56] This decline of the rate of profit is, as Ricardo sees it, "the bourgeois Twilight of Gods- the Day of Judgement."[57]

Therefore, the great emphasis that Marx put on the tendency of the profit rate to fall is intrinsically linked with the ultimate destiny of the capitalist system toward self-destruction. And if the plausibility of this phenomenon could be shown through a systematic analysis, then as society progresses the fatal consequences of the declining profit would manifest themselves and the capitalist mode of production would reach its limit. Hence, capital *negates* capital: "the real barrier of the capitalist process of production is capital itself." [58]

Indeed, it should not be surprising that Marx's attitude was to take the currently accepted view of the falling profit rate and attempt to provide an alternative explanation to that offered by the classical laissez-faire economists. His intention was to enunciate and demonstrate a novel interpretation of the functioning of the economic system of capitalism consistent with his profound vision of its historic destiny as a social institution. He offered an alternative rational for the tendency of falling profitability different from that held by the classical doctrine. And more importantly, Marx expressly repudiated the prevailing view regarding the stationary state and in its place as a 'final act' he put the *class struggle*.

[54] Grundrisse, pp. 85-88, pp. 758-9.
[55] Professor Hollander in a recent article explicitly disagrees with the commonly held view that characterizes Ricardo as being a 'pessimist' .On the contrary, he argues in favor of being an 'optimist': " Ricardo did not draw pessimistic conclusions from his theoretical growth model."(Ricardo and the Corn Laws, H.O.P.E, Spring, 1977)
[56] Capital, Vol. III, p. 259.
[57] Theories of Surplus Value, Part II, p. 544.
[58] Capital, Vol. III, p. 250.

As Marx's correspondence with Engels indicates, [59] the final act of the analysis of the 'whole business resolves itself into the class struggle.' Hence, instead of the creation of the imaginary stationary state, the fundamental basis is established for the transformation of the capitalist mode of production into a higher social structure, that of socialism:

"The rate of profit is the motive of capitalist production. Things are produced only so long as they can be produced with a profit…Development of the productive forces of social labour is the historical task and justification of capital. This is just the way in which unconsciously creates the material requirements of a higher mode of production. There is, indeed, something deeper behind it (the decline of profit rate) of which he (Ricardo) is vaguely aware. It comes to the surface here in a purely economic way, i.e. from the bourgeois point of view, within the limitations of capitalist understanding, from the standpoint of the capitalist production itself, that it has its barrier, that it is relative, that it is not an absolute, but only a historical mode of production corresponding to a definite limited époque in the development of the material requirements of production." *Capital Vol. III, p.259*

The Tendency of the Rate of Profit to Fall: Marx's Approach[60]

By the way, I am discovering some nice arguments.
For instance, I have overthrown the whole doctrine
of profit as it has existed up to now.[61]

Marx recognized at an early stage that "failing to find the laws which govern the rate of profit is failing to find the laws of formation of capital." [62] This awareness let him to place the tendency of the falling rate of profit at the centre of his analysis of the 'laws' of motion of capitalism in his attempt to formulate the logic of the modus operandi of the system.

The Law of the Tendency of the Rate of Profit to Fall - the Law as Such- which is presented in *Capital Vol. III, Part III* is considered as the foundation of Marx's theory of crises. Crises, which in the early 19th century it became clear that they occur periodically and are an inevitable component of the capitalist mode of production, were regarded by Marx as a threat to economic existence of *bourgeois society* and they were connected with the expected 'deluge', the ultimate breakdown of the system. Since in Marxian theory, before the ultimate breakdown occurred, capitalism will display disruptions and symptoms of fatal illness.

The famous "Law" which has been the source of intense academic controversy could be formulated as follows. In the course of capitalist development there exists an inherent tendency to continually extend and substitute objectified labour (dead labour) for living labour, i.e. the owners of the means of production replace workers by using more machinery. Together with this change an increase in productivity and intensity of labour takes place as capitalists try to obtain more value per worker at a given time. Both increased productivity and greater intensity of labour lead to an increased amount of output produced in any given time, which in turn shortens the part of the working day necessary to produce the wage bill. As a result, the amount of dead labour (constant capital) incorporated in the means of

[59] Marx & Engels, Selected Correspondence, p. 175 (Letter ref., 30- 4- 1868) 3rd ed., Progress Publishers, 1975.
[60] The main exposition of the 'law' is in Capital I Vol., Ch. XXV; Vol. III Chaps. XIII and XV; Grundrisse, pp. 745-64.
[61] Thus Marx informed Engels in a letter dated on January 14, 1858, when he was working on his 1857-1858 notebooks that have become known as the Grundrisse (Marx & Engels, Selected Correspondence, p. 93).
[62] Grundrisse, p. 748.

production (machinery, raw materials, and auxiliary inputs) increases over time relative to the amount of living labour (variable capital) directly employed in the production process.

In this evolution of the production process, according to Marx's theory, the *organic composition*[63] of capital will rise, although not as fast as the *technical composition*, due to the increasing productivity of labour. [64] In other words, as the organic composition tends to rise over time, the ratio of dead to living labour increases due to technological innovations which Marx asserted would take a predominantly labour - saving form.[65] This rise in the organic composition is associated with an increase in productivity (in wage goods industries) which in turn induces a tendency for the rate of surplus value to rise: "the tendency of the rate of profit to fall is bound up with a tendency of the rate of surplus value to rise."[66]

Put it differently, Marx argues, that in spite of the rise of both ratios which is caused by the mutual interaction of technological change and labour relations in production, the rate of profit will tend to fall over the long run because the compensation of the reduction in the number of workers by means of an increase of exploitation has certain 'insurmountable limits.' For this reason it may well check the fall in the rate of profit but cannot prevented it altogether.[67] This fall of the profit rate does not manifest in an absolute form, but as a tendency toward a progressive fall. The progressive tendency is a development *peculiar to* the capitalist mode of production due to the gradual growth of the productivity of labour, which emanates from the nature of capitalist production writes Marx: that it progressively produces a relative decrease of variable capital in relation to constant capital and consequently a continuously rising of the organic composition of capital that leads to a decline in the profit rate.

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[63] The concept of the Organic Composition of Capital (OCC) is dealt in Capital Vol. I, Chap. 25, "The General Law of Capital Accumulation". Due to the importance and complexity of the subject we let Marx speak himself: "The most important factor in this inquiry is the composition of capital and the changes it undergoes in the course of the process of accumulation. The composition of capital is to be understood in a two-fold sense. On the side of value, it is determined by the proportion in which it is divided into constant capital or value of the means of production, and variable capital or value of labour-power, the sum total of wages. On the side of material, as it functions in the process of production, all capital is divided into means of production and living labour-power. This latter composition is determined by the relation between the mass of the means of production employed, on the one hand, and the mass of labour necessary for their employment on the other. I call the former the value-composition, the latter the technical composition of capital. Between the two there is a strict correlation. To express this, I call the value-composition of capital, in so far as it is determined by its technical composition and mirrors the changes of the latter, the organic composition of capital." Simply put, OCC can be defined as the ratio of constant (fixed) capital to variable capital (wages), or OCC = c / v.

[64] With the growth in the proportion of constant to variable capital, the productivity of labour also grows i.e. the productive forces brought into being with which social labour operates. As a result of the increasing productivity of labour a part of the existing constant capital continuously depreciates in value, for its value depends not on the labour time that it cost originally, but on the labour time with which it can be reproduced. And this declines continuously as the productivity of labour grows (Theories of Surplus Value, Part II, p. 415).

[65] There is an incessant debate since Marx's works were published on the issue of the rising OCC, the type of technology involved, and whether or not it was a mere 'assertion' or followed logically from Marx's analysis. This theme will be discussed below; in recent literature see: Christiansen J."Marx and the Falling Rate of Profit", A.E.R., pp. 20-26, May 1976; Meek R.," The Falling Rate of Profit", Economics and Ideology, pp. 129- 42, 1967; also in Science and Society, Winder 1960; Meek R., " Karl Marx's Economic Method" Economics and Ideology, pp.93-112, 1967; Yaffe D., " The Marxian theory at crisis capital and the state" Economy and Society, pp. 186-232, Nov., 1973.

[66] Capital, Vol. III, p. 240.

[67] Capital, Vol. III, p. 242.

Marx's contention rests heavily on the proposition that increases in the composition of capital, as time progresses, would be greater than those due to the rise of the rate of surplus value, so that the rate of profit would tend to fall despite a number of counteracting forces.[68] Furthermore, his argument relies on the dialectic interpretation of the nature of capitalist mode of production that it is a logical necessity in the development of capitalism the rate of surplus-value must express itself in a falling rate of profit. An *inherent barrier* that eventually will prevent the capitalist process from going beyond a certain limit. This limit is posed by the working day [69] and the inability of the rate of surplus value to increase except by reducing the living labour employed, i.e. the number of workers: "beyond a certain point, the development of productive powers of production becomes a barrier for capital.[70]

The falling rate of profit is an 'absolute' barrier in the capitalist mode of production which cannot be surpassed, according to Marx, by increases in productivity or extensions in the working day. It is, therefore, the limit of production for surplus value that "portion of living labour, unpaid and concealed" which is continually on the decrease compared to the amount of value represented by the invested total capital whose profit rate must constantly fall; bringing the limit to capitalist production since profit is another name for surplus-value itself.[71]

<u>The Formal Treatment of the Falling Rate of Profit</u>

The 'law' of the progressively falling profit rate, which under Marx alive never took a final form, [72] it initially presupposes a constant rate of surplus-value and considers in the hypothetical example cited in footnote 72, under a given working day and wage rate a rising value of composition of capital, which then necessarily leads to a fall in the rate of profit.

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[68] <u>Capital</u>, Vol. III, Chap. XIV, p. 232. The most general counteracting forces listed by Marx are: 1) Increasing intensity of exploitation, 2) Depression of wages below the value of the labour power, 3) Reduction in the costs of the elements of constant capital, 4) Relative overpopulation, 5) Foreign trade, 6) Increase in the stock of Capital. In <u>Grundrisse</u>, however, Marx says that the most important counteracting force is *crises!* (pp. 750-51). Since they delay the downward movement of the profit rate; also, are listed, i) constant devaluation of a part of existing capital (that part of capital that does not serve in direct production), ii) lowering taxes on profits, iii) reducing ground rent, iv) creation of new branches of production in which more direct labour in relation to capital is needed, and v) Monopolies. It should be noted that J. Schumpeter (<u>History of Economic Analysis,</u> p. 652.) with respect to counteracting tendencies insinuates that these 'could be copied' from J. S. Mill's 'counteracting circumstances', Book IV. His argument might be accepted in the light of evidence in Vol. III. However, when we consider the evidence in Grundrisse, it seems Schumpeter's suspicion is not justifiable.

[69] <u>Capital</u>, Vol. I, pp. 444-45; Vol. III, p. 247.

[70] <u>Grundrisse</u>, p. 749.

[71] <u>Capital</u>, Vol. III, Chap. XIII, "The Law as Such".

[72] The presentation of the 'Law as Such' in Capital Vol. III, chap. 13, is done by Engels, where it is absent any specific formulation of the 'Law'. In fact, the exposition of the 'Law' under the heading "The Tendency of the Rate of Profit to Fall" starts with a hypothetical example using the following assumptions: 1) the wage rate is given, 2) the working - day is given, 3) the number of employed people (workers) is given= 100, 4) the wage bill is given= £ 100 per week; thus the wage rate is: £100/100= 1 £ per week, 4) the workers perform equal amounts of necessary and surplus value, 5) The total product produced has a value = £200 , hence, the surplus value, s = £200 – £100 = £100, and the rate of surplus value, s/v = 100/100 = 100%; 6) the rate of surplus value, s, is constant at 100% and hence the rate of labour exploitation also remains the same. Under those conditions the rate of profit (p) will fall because of an assumed gradual increase of constant capital (c), since, the rate of profit p = s/C, where C is the total capital C = c + v, and substituting, p = s/ c + v. "The hypothetical example at the beginning of the chapter expresses the actual tendency of capitalist production", writes Engels.

In principle, there is no proper structure in Marx's argument of the falling tendency of the profit rate in the presentation furnished by Engels from the original manuscript. In the exposition there is no seamless continuity of the 'law', and hence a coherent explanation is absent. Despite the difficulties that led to intense debates and controversies regarding the theoretical consistency of the argument a formal treatment could be given in the following way.

In Marx's system, the total value of a commodity or of the output of the economy as a whole over a given period is expressed as gross output or value product (VP):

[73] C + V + S, the rate of profit as P = S/ C + V,[74] and his key concept, the rate of surplus value or rate of exploitation as S/V, [75] the ratio of surplus value to variable capital. Taking the flow of output per year in terms of value as C + V + S, then the rate of profit is P = S/ C + V and not as Marx writes, (c + v) for the stock of capital and S / c + v for the rate of profit. Adding both C and V we obtain the *flow* of total outlays; and dividing total outlays by the appropriate turnover periods we obtain the stock of capital invested (C+V). It is precisely this argument that obliged Joan Robinson to criticize Marx as being ambiguous. [76]

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[73] Capital, Vol. III, p. 36. In order to avoid terminological confusion, we shall denote *stocks* with capital letters and *flows* with small letters (Joan Robinson in a series of articles and a book, "Marx on Unemployment", E. J., 1941, An Essay on Marxian Economics, 1942, "Some Problems on the Definition of Capital", Oxf. Econ. Papers, 1959, and "The Labour Theory of Value", Monthly Review, 1977), criticized Marx for not distinguishing clearly when he was talking about stocks and when about flows, despite the fact that he was aware of the differences involved as it can be seen in his discussion of turnover periods in Capital, Vol. II). Following Marx's terminology,

VP = total value of a commodity or of the output of the economy as a whole.

c = (a flow) is defined as constant capital representing depreciation charges on fixed capital (value of used up machinery) and inputs of raw and auxiliary materials.

C = investment in fixed capital equipment.

v = (a flow) is defined as variable capital representing the payments to workers necessary for their maintenance and their reproduction (paid labour or wages).

V = wage bill (i.e. v is the flow of the expenditure on the Wage Bill) in a given period (a year).

s = (a flow) defined as surplus value (unpaid labour) representing the excess value produced over and above the paid labour.

S = surplus value (profit) in a given period (a year) which consists of the sum of industrial profit + interest + rent. * All of the above components are measured in labour time.

[74] Capital, Vol. III, p. 42. Marx to avoid the complications arising from the consideration of *stocks* and *flows,* he explicitly assumed that the rate of profit is calculated on total capital invested during a year and that capital is turned over exactly in a period of a year (Capital, Vol. III, p. 227).

[75] Although we dealt before with the concept, it is worth mentioning that Marx, while devoted a whole chapter on the rate of surplus value (Capital, Vol. I, chap. 9) no mathematical symbol can be found expressing this key concept. Moreover, he uses three formulas in defining it (Capital, Vol. I, Chap. 18). The formulas representing S/V are: surplus value/variable capital, surplus labour/necessary labour, and unpaid labour/paid labour.

[76] Joan Robinson correctly pointed out (p. 55, 1977; and pp.104-6, 1959) this leads to a confusion between the organic composition of capital (ratio of dead to living labour) and the capital- labour ratio, since the whole part of capital, C, is necessary to the process of production and no part alone can be credited with extracting the surplus. The confusion, of course, arises from the fact that Marx in making the assumption that the turnover period of working capital (c + v) is a year, so that c= C, and v= V, subsequently he did not make the distinction in his analysis, talking as if they were the same thing. But more importantly, he created a further confusion by calling as Organic Composition of Capital the ratio of 'objectified labour to living labour' and then specifying it mathematically as C/V, the ratio of constant to variable capital. The C/V ratio, is not the ratio of objectified labour to living labour, since living labour includes both parts of labour, paid labour and unpaid labour, while V is only the paid part (wages). As it will be shown in the progress of the analysis of this essay, for the 'law' of the falling profit rate to be logically consistent, the Organic Composition of Capital expressed as the ratio of objectified (dead) labour to living labour must be adopted. Therefore, what Marx repeatedly called Organic Composition is not C/V, but C/L, the value ratio of the stock of the means of production to labour employed.

Before we proceed, we need to clarify the issue with respect to 'correct' expression of the profit rate, as it should be stated as the rate of profit (return) on capital invested for a year. That is, it is only equal to the rate of profit on capital invested if the capital stock turns over once a year. This event from the society's point of view implies that its stock is entirely consumed and reproduced each year. Hence, the correct formula of the rate of profit is:

$$\rho = S/\frac{C}{h^c} + \frac{V}{h^v} = S/\frac{C+V}{h^w} \quad \text{or} \quad \rho = \frac{S/V}{\frac{C}{V+1}} \cdot h^w$$ [77]

Thus, if $h^c = h^v = 1$, *or* generally $h^w = 1$, *then* (1) $\rho = \frac{S}{C+V} = P$ and Marx's formulation of the rate of profit is correct. Therefore, any increase in the turnover rate of invested capital (C + V) in the production process will increase the rate of profit.

Now to arrive at the Organic Composition of Capital (OCC) which as we have seen is the crucial factor in Marx's 'law' of the falling rate of profit, [78] an approach is to divide both the numerator and denominator of the rate of profit by V, obtaining the following formula:

$$(2) \qquad P = \frac{S/V}{\left(\frac{C}{V}\right)+1}$$

Thus, it becomes clear why the contention that the rate of profit tends to fall is chiefly grounded on the rising OCC. It should be remembered that in the numerical example of the 'Law as Such', Marx initially assumes the numerator S/V which stands for the rate of surplus value remains constant while the denominator which stands for the OCC [(C/V) +1] grows gradually over time. Hence, necessarily the rate of profit falls as time progresses.

However, the rate of surplus value does not remain constant. It is an initial assumption to expose clearly to the reader that under the same degree of labour exploitation the growth of constant capital expresses itself in a falling profit rate. The ratio S/V changes, since a rise in the OOC is associated with an increase in labour productivity which in turn induces a tendency for the rate of surplus value to rise. Marx is aware of this fact, and it seems contradictory when he states that "the tendency of the rate of profit to fall is bound up with a tendency of the rate of surplus value to rise. Yet, when we look carefully at the text "The Law as Such" it states, because of "a continuously rising of the organic composition of capital the immediate result of this is the rate of surplus-value, at the same, or even a rising degree of labour exploitation, is represented by a continually falling general rate of profit."

It must be obvious to both defenders and critics alike of Marx's contention, that the derivation of the 'law' is not based on the assumption of the *constancy* of the rate of surplus value. Therefore, it is worth to continue our effort to solve the riddle of what causes the OCC to *continuously rise* in the capitalist process of production that brings along a continuous decline of employed living labour as compared to the materialized labour of constant capital.

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[77] Where, ρ is the rate of profit, P is the rate according to Marx, h^c is the turnover rate of constant capital, h^v is the turnover rate of variable capital, and h^w is the weighted average of the turnover rates h^c *and* h^v.

[78] Marx in presenting his arguments with respect to the 'law' of the tendency of the rate of profit to fall over the long term, he emphasized that his intent was not the analysis of a single country or a particular epoch of capitalist development, but rather the analysis of the "laws themselves" that form the basis of the capitalist mode of production. Accordingly, Marx does not assume any particular form of market structure or conditions of competition, nor the stage of development of a country, i.e. an underdeveloped vis a vis advanced country. But, he attempts to explain the general form of development of production process typical under capitalism, 'the distinctive methods of production in the capitalist system', as he states, which manifest in a continuous substitution of variable by constant capital that leads in an increasing deployment of machinery, i.e. the same numbers of workers operate in the same time span an ever-increasing quantity of machinery and fixed capital. This is the reason that Marx speaks of the *general rate of profit* that applies to all capitalist economies.

As we have seen, Marx's fundamental proposition is that capitalist production has as its aim and driving force the production of surplus value or profit: "the product of capital is profit."[79] In addition, he dealt extensively with the problem of the rising organic composition in Grundrisse [80] explaining the reasons why the OCC should rise over time at a higher rate relative to the rise of the rate of surplus value. Furthermore, he emphasized that capitalist production attends itself to a relative increase of constant capital to variable capital. This is another way of saying that the same number of workers operates an ever-increasing quantity of the means of production, with the immediate result being an increase in productivity as capital invested in wages constitutes a far smaller expense compared to mechanized production.

It should be noted, an increase in labour productivity in the capitalist mode of production has no meaning, unless it increases surplus value, i.e. it reduces the cost of labour per unit of product. To the extent that increases in productivity are brought about by the introduction of machinery, they involve changes in the technical composition[81] of capital which in turn change the value composition and thus the organic composition. In the words of Marx: "Machinery produces relative surplus value by directly depreciating the value of labour power and by indirectly the same through cheapening the commodities that enter into its production." [82] Thus, a technological change will be introduced in the production process, if it is profitable. To meet this criterion the managerial decision to employ more machinery relative to labour in order to increase productivity must meet another criterion, the cost: that for a given output, an increase in constant capital C, must be accompanied by a decrease in the sum of (C+V), the cost of production,[83] i.e. for a technological change to be introduced with a given output, the inequality: $Ct+1-Ct<Vt-Vt+1$ must hold to assure profitability.

Accordingly, given the working population, then surplus value can only be increased by the productivity of labour (reduction of working population). On the other hand, given the productivity of labour (certain stage of development of productive forces) then surplus value can only be increased by increasing the working population. Between the mythical sea-monsters noted by Homer, Scylla and Charybdis, a choice necessarily must be made. How did Marx get out of this dilemma? Did he stay in the middle and as a skilful sailor in the stormy waves of his turbulent life tried to pass his intellectual 'ship' through the strait? The answer is No! He opted to pass by Scylla, the rock shoal on the side of the strait following the route of Odysseus losing only a few sailors, rather than risk the entire ship in the whirlpool.

Marx facing the danger of shipwreck he developed his argument as follows:

Surplus value arises from variable capital alone[84] and it depends on two factors, i) the rate of surplus value, and ii) the number of workmen simultaneously employed. Thus, for surplus value to expand, either the rate of surplus value has to increase, or the number of workmen employed has to increase. Increasing the latter, given the length of the working day, demands: a) an increase in constant capital C (capital invested in buildings, machinery, raw materials, and other auxiliary inputs), and b) a greater dependence on labour force – instead of capital becoming more independent in its self-expansion – capital depends on working population. Indeed, "the threat of withdrawal of labour services through strikes has been a power force in directing energies in search of labour-saving machines." [85]

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[79] Capital, Vol. III, p. 41 I, pp. 380

[80] Grundrisse, pp. 690-695 and pp. 758-778; Capital, Vol. I, pp. 380 -386.

[81] Though belatedly, just for clarification: The physical amount of constant capital used per unit of labour, i.e. the degree of mechanization of the production process; an empirical measure for the technical composition of capital is the average amount of fixed equipment and materials used per worker.

[82] Capital, Vol. I, p. 382.

[83] Konus A. A, " On the Tendency for the Rate of Profit to Fall", Socialism, Capitalism and Growth, Essays presented to Maurice Dobb, Ed by C.H. Feinstein, p. 83, Cambridge, 1967.

[84] Capital, Vol. I, p. 383.

[85] Rosenberg N., "The Direction of Technological Change", Econ. Dev. & Cultural Change, p. 13, October, 1969.

The lengthening of the working day, on the other hand, allows of a production on an extended scale without any alteration in the amount of capital invested in buildings and machinery. [86] Consequently, an undisturbed expansion of surplus value can be achieved only through the lengthening of the working day. But since the working day has its physical and social limits,[87] the only way left to get out of this impasse is the lengthening of the working day through increases in productivity. In other words, increases in the rate of surplus value S/V for realization of greater amount of surplus-value or profit through reductions in variable capital V, i.e. reductions in wage expenses. Mainly on this argument is based Marx's contention that capital in its drive for self-expansion first of all must introduce machinery in the production process: "Machinery is the surest means of lengthening the working day; it sweeps away every moral and natural restriction on the length of the working day."[88]

Consequently, capital in its drive to achieve its self-realization through expansion, it employs machinery: the most powerful means of increasing the productiveness of labour. In Marx's terminology, machinery is "the most adequate form of capital in general"[89] since it has a *labour-saving bias*; it increases the productivity of labour by shortening the *working time* required in the production of a commodity. Thus, machinery by replacing living labour with objectified labour, when is first introduced it directly depreciates the value of labour-power by converting labour employed into labour of greater efficiency and profitability. This is the reason during the transition period, when the use of machinery is a sort of monopoly, says Marx, "the profits are exceptional and the capitalist endeavours to exploit thoroughly "the sunny time of this his first love", by prolonging the working-day as much as possible." [90]

But, the utilization of machinery, continues Marx, converts what was formerly variable capital invested in labour-power into machinery which being constant capital, it does not produce surplus-value. Hence, the application of machinery to the production of surplus value implies a *contradiction* which is *immanent* in it, since of the two factors of surplus value created (number of workers, and rate of surplus value), one, the rate of surplus value, cannot be increased except by diminishing the other, the number of workers.[91] The ever-increasing utilization of machinery -being part of constant capital- implies that the non-producing capital, the objectified capital, over the long run progressively grows by replacing labour, the living part of capital, the very essence of surplus value creation and thus profits. Consequently, the rate of profit would progressive fall as capitalist production approaches the stage of "automata", where according to ancient Greek tradition the work was performed automatically by *creatures* moving like real humans after an *executive order* by the Gods.

In fact, Aristotle in Politics[92] envisaged a world in which "if" inanimate instruments (robots) could perform the work of humans, then there would be no need for the division

[86] Capital, Vol. I, p. 383.
[87] With respect to the paramount importance of the working day in expansion of profits and its social limits, Marx (Capital, Vol. I. chap. 9, sec. 3) refers to the episode of Senior's "Last Hour", where he rebuts professor Nassau Senior (he held the first chair of Political Economy at Oxford University) in his (1836) argument in defense of British manufacturers and against the Factory Acts that proposed the reduction of the working day to 10 hours. His conclusion was that if the working day is reduced by one hour, from 11.5 to 10.5, then such an Act would wipe out all manufacturing profits. Further, Senior's analysis indicated that the workman in the last hour but one produces his wages, and in the last hour the surplus-value or net profit. That's the source of 'Senior's Last Hour' and the rest is a story of humiliation of Senior's argument based on false logic. And with Marx commending: Senior invented the battle cry of the 'last hour'; this dreadful 'last hour'… is "all bosh."
[88] Capital, Vol. I, pp. 384-385.
[89] Grundrisse, p. 695.
[90] Capital, Vol. I. Chap. 15, sec. 2, "Prolongation of the Working Day."
[91] Ibid. "Prolongation of the Working Day, p. 384.
[92] Aristotle, Politics, Book I, 1253b 27, 1254a1.

between rulers and ruled. Marx does quote from Aristotle to support his argument of the "economic paradox" that machinery a most powerful instrument in augmenting profits by shortening labour-time, finally by displacing continually labour it would bring the inevitable automation of production and thereby collapse of profitability threatening the very existence of capitalism. That's why Marx's curtain falls with Aristotle's 'automata' of Daedalus and the tripods of Hephaestus [which the poet(*Homer*) says "of their own accord came to the gods' gathering"] so the shuttles would weave themselves and picks play the lyre, master craftsmen would no longer have a need for subordinates, or masters for slaves. [1253b27-1254a1]

Criticism and Restatement of the Falling Rate of Profit

In this section we shall deal initially with the chronic criticism of Marx's "law" of the falling tendency of profit rate and subsequently we will attempt to provide a reformulation of the "law" which generated so many heated debates that continue till the present day.

Let us begin with the general criticism that Marx's *proof* of the falling tendency of the profit rate is based upon the much discussed assumption of the *constancy* of the rate of surplus value. [93] The criticism of "constancy" that finally turns to verbosity, as we argued previously, is grounded on misconception. Nevertheless, at the risk of being repetitious, but in an effort to clarify a subject in which a host of renown economists got involved with, we will present a synopsis of the argument characterizing the assumption unjustifiable and thus the "law" is not a law at all, it explains nothing, it is just a mere definitional tautology.

The basic argument of the criticism is that the rate of profit being a function of two ratios, the organic composition and the rate of surplus value, both theoretically can rise without limits. Specifically, the rise in OCC will bring about a rise in productivity which will affect the industries producing wage goods, since the value of variable capital will decline and wages, the payments to labour, will be reduced. Thus, unless wages rise in proportion to the rise in productivity- contrary to what Marx maintained- the rate of surplus value is going to rise when the OCC rises. Which one increases faster depends on technological factors. Hence there is no reason to assume that this tendency cannot be counteracted or over-counteracted by a rise in the rate of surplus value. Accordingly, the movement of the rate of profit over time is *indeterminate*. In a dynamic system such as capitalism which continuously evolves, the rate of profit will only fall when OCC rises, if the rate of surplus value remains *constant*.

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[93] A sample of authorities would include: 1) Blaug M. "Technical Change and Marxian Economics", in Marx and Modern Economics Ed. By Horowitz, pp. 227-243, 1968, 2) Bortkiewicz Ladislaus, "Value and Price in the Marxian System", International Economic Papers, No. 2, pp. 1-52, 1952, 3) Robinson J., An Essay on Marxian Economics, chap. V, 1942.[It is worth mentioning that J. Robinson in her December 1977 paper has dropped the criticism on Marx, since in the relevant part dealing with the falling rate of profit nowhere appear her expressions such as: ' it rests on the assumption of a constant rate of exploitation' or ' the explanation of the falling tendency of profits explains nothing at all'. Instead she writes: "he argued: C/V will rise indefinitely, and S/V cannot rise indefinitely; therefore sooner or later, S/C + V will tend to fall, p. 55]. 4) Sweezy P., The Theory of Capitalist Development, Chaps. IV, VI. 5) Schumpeter J., History of Economic Analysis, p. 652, 1954. 6) Samuelson P., "The economics of Marx: An Ecumenical Reply", p. 51-57, J.E.L., 1973, where he states "… how natural it was to postulate steady growth in ΣC/ΣV". Couple this with the conviction that exploitation of labour continued unabated and identify this insight with the postulate *constancy of S/V,* the rate of surplus value, the rest becomes arithmetic"., p. 55. And in his 1971 article "Understanding the Marxian notion of Exploitation", b Samuelson writes:"Marx had to be refuted by orthodox economists- if only he was there", p. 423, J.E.L. It is interesting to see Samuelson's evolution of ideas about Marx:"A minor post- Ricardian, Marx was an autodidact cut off in his lifetime from competent criticism and stimulus (Wages and Interest: a modern discussion of Marxian economic models, pp. 399-431, A.E.R., 1957). And in 1973 (J.E.L) he acknowledges: "In conclusion let me applaud the movement toward secularizing Marx, the economist". As Joan Robinson said, he deserves the compliment of being taken seriously as a scholar". "Reply on Marxian Matters", p. 68, J.E.L, June 1973.

As we have indicated before, it is true that Marx in Vol. III - compiled and published posthumously by Engels- in chapter 13 “The Law as Such” explicitly assumes that the rate of surplus value is constant. But then he goes on and states “the law of the falling rate of profit which expresses the same or even higher rate of surplus value”, and once again more clearly “the tendency of the rate of profit to fall is bound up with the tendency of the rate of surplus value to rise”. And we can go on tiring the reader on citing passages not only from Vol. III, but from all his works to show that Marx was well aware of the fact that a rise in OCC will be accompanied by a rise in S/V. Of course, increases in OCC will bring about increases in S/V. This is one of the focal points in his analysis: the increasing productiveness of labour. He fully recognized that both interact with one another and increases in the organic composition are accompanied by increases in surplus value. As it will be shown in the rest of the analysis, Marx did not base the *proof* of the “law” on a *constancy* to show the dynamic effects of the falling tendency on the system. How this could be? Laws of motion based on constancies?

It is our opinion, however, that there is a plausible explanation of the usage of this restrictive assumption, if Marx is linked to classical doctrine. It will be remembered the classical theory generally maintained that the falling rate of profit was a result of a decline in the ratio of profits to wages (rate of surplus value) due to a decline in labour productivity. In other words, the rate of profit falls because the rate of exploitation falls, i.e. because labour becomes less productive. This inference of the classics was anathema to Marx and therefore it is not surprising that he chose to demonstrate the “law” by initially assuming that even though the rate of exploitation or rate of surplus value (S/V) remains constant the rate of profit still falls as long as constant capital increases. This implies that the increase in OCC alone is responsible for the falling profit rate and hence the decline is brought not because labour becomes less productive, but it becomes more productive, i.e. it is more exploited.

Marx’s understanding of the classics was, it will be recalled, that for the rate of profit they attributed the ratio of profits to wages, S/V, and not, S/C +V, i.e. constant capital was not included in the profit rate determination. Hence, for him it was a matter of tactic to put at the very beginning of the formulation of the “law” the assumption of *constancy*, so that to show explicitly the incorrectness of the classical doctrine of profit and then proceed with the exposition of his own law. The assumption of *constancy* had a purpose: to indicate in a simple, clear way the non-validity of the doctrine in order to falsify or in Marx’s own words “to overthrow the whole doctrine of profit as it existed up to now”. And he definitely did show the falsity of the doctrine and after, the assumption *disappeared* from the picture of his analysis.

While the criticism regarding the accusation that Marx assumed or even postulated a constant rate of surplus value to prove his case is unjustifiable and obviously incorrect, the argument that the evolution of the profit rate over time is *indeterminate* has merit. The view is well grounded and undoubtedly is correct insofar as the interpretation of the organic composition as C/V is adopted- this is indeed how most of the critics interpreted it: value of constant capital to variable capital. However, it may be strange but this interpretation is incorrect, since the OCC being determined by the technical composition and expressed in value terms is not the ratio, C/V; but, as we have already argued, the ratio C/L: the ratio of objectified labour (dead) to living labour, i.e. the value of machinery, raw materials and auxiliary inputs, to the total value that labour created, both being measured in labour time.

In other words, only if C/V is replaced with C/L, then there will be logical consistency in the definition of the organic composition as the ratio of objectified to living labour. It is obvious that C/V does not express the ratio of objectified to living labour, since living labour creates value that consists of not only the paid part V (wages), but also of the unpaid part S (profits). Thus, living labour corresponds to the sum of (V+S) and not only V. Apparently, what Marx had in mind expressed in written form was formalized wrongly in an arithmetic ratio. Consequently, if we accept the interpretation that the organic composition of capital is the ratio of dead to living labour, C/L, then we could show that Marx’s “law” is correct.

Before we begin the restatement of the "law" of the falling rate of profit, [94] it is worth mentioning again that when Marx talks about the *composition of capital* as presented in Capital I, under the heading "The General Law of Capital Accumulation", he refers to it in three ways, all of which are actually related. First, as the Value Composition of Capital (VCC) which is the ratio of the value of constant capital used in the production process to the value of labour employed in relation to it. Second, as the Technical Composition of Capital (TCC) which is the ratio of constant capital in relation to actual exerted worker's labour in production, i.e. the physical amount of constant capital used per unit of labour or the capital-labour ratio. And third, the complexity now starts; since Marx noted that there is a strict correlation between VCC and TCC in the capitalist mode of production and he called that relationship, without explicitly defining it, as the *Organic Composition of Capital* (OCC). In his own words:

> The composition of capital is to be understood in a two-fold sense…I call the former the *value-composition*, the latter the *technical composition* of capital. Between the two there is a strict correlation. To express this I call the value composition of capital, in so far as it is determined by its technical composition and mirrors the changes of the latter, the *organic composition* of capital. Wherever I refer to the composition of capital, without further qualification, its organic composition is always understood.
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> *Capital Vol. I, chap. 25*

In addition, the problem of what Marx *actually* had in the back of his mind further is compounded by his concept of the rate of surplus value, where he uses various formulas of defining it, such as, (i) S/V = surplus value/variable capital = (ii) surplus labour/necessary labour. But, formula (i) represents a ratio of values while formula (ii) represents a ratio of labour time and aside from the difficulties involved in measuring *socially necessary labour* in working hours, we have a problem of compatibility in estimating the rate of surplus value. The formulas actually do not provide the same results. For instance, the ratio S/V is equal to the ratio of unpaid labour to paid labour, but it differs from the ratio of surplus labour to necessary labour. Actually, Marx says "it is not longer possible to be misled by the formula unpaid labour/paid labour into concluding, that the capitalist pays for labour and not for labour power. This formula is only a popular expression for surplus labour/necessary labour".[95]

Marx generally called the organic composition of capital (OCC) as the ratio of objectified labour to living labour, C/L (that's indeed organic: the relationship between dead and living elements in capital investment) and then surprisingly he referred to it as the ratio C/V of constant capital to variable capital. However, the ratio C/V is not the ratio of objectified to living labour since V represents wage payments or paid labour, while living labour includes both, paid labour and unpaid labour V+S. In other words, L = living labour = V + S. Hence, the formula of the rate of surplus value consistent with the OCC as objectified to living labour is surplus labour/necessary labour. Since it compares surplus labor time with necessary labor time and measures the surplus in terms of the workers' labour as a whole; it gives an estimate about what proportion of the workers' day is given up to the capitalist versus the amount spent on self-reproduction, i.e. reproducing the value of labour power.

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[94] See Steindl J. "Karl Marx and Accumulation of Capital" in Horowitz, Marx and Modern Economics, pp. 244-259, 1968. Steindl argues on the basis of the organic composition being the ratio of capital invested to net product, the one that 'Marx had in the back of his mind and explains the tenacity of his conviction'; Nobuo Okisio, "Technical Changes and the Rate of Profit", Kobe, University Economic Review, pp. 89-92, 1961. Okisio maintains that Marx's procedure in calculating the general profit rate as aggregate surplus value divided by aggregate capital in terms of value, that is as S/C +V is incorrect. We agree completely with that statement since the profit being the *appearance* is only realized in actuality through the price system and not through the value system; Morris J. "Spurious Capital and the Rate of Profit", Science and Society, pp. 302-22, Vol. 31, 1967; Yaffe D.S., " The Marxian Theory of Crisis Capital and the State", 1973, op. cit.; and Christiansen J., " Marx and the Falling Rate of Profit", 1976, op. cit.

[95] Capital, Vol. I, Chap. 18.

With these remarks in mind, we start from Marx's definition of the rate of profit as P = S/ C + V, where S/ C + V < S/V. [96] To demonstrate the profit rate falls when the organic composition now defined as C/L is rising, all we have to do is to show that C/L is the inverse of the *maximum* profit rate. The maximum profit rate is obtained when wage payments V to living labour are zero: [97] V = 0. This implies that the rate of surplus value S/V tends to infinity: S/V → ∞. In this hypothetical case, the rate of profit P = S/C or is equal to the ratio of surplus value to constant capital and the organic composition C/L is transformed to C/L = C/S. Dividing the profit rate P = S/C by S then S÷S/C÷S = 1/C/S is the inverse of the organic composition. The result indicates that if payments to labour go to zero the rate of profit falls when the organic composition rises no matter how high the surplus value increases.

We stressed the point of a hypothetical case, but mathematically it invalidates the main argument of the critics that the rate of profit being a function of two ratios, the organic composition and the rate of surplus value both theoretically can rise without limits over time. The reason is OCC defined as C/V increases but also the rate of surplus-value increases, since both the numerator and denominator increase in formula (2) in page 15. Hence, for the rate of profit to be falling they said, Marx must demonstrate that in the long run the denominator C/V grows faster than the numerator S/V. Accordingly, we showed with the substitution of OOC by C/L in the extreme case of V=O, the rate of profit falls when the OOC rises no matter how fast S/V increases. In fact, in this case in Marx's theory S/V collapses to zero and so do profits, since surplus value is a fraction that arises from labour power alone. Hence, a *full automation* is attained and we return to the Greek mythology of the "automata" of Daedalus, the great inventor and architect of Labyrinth in Crete who designed the dancing ground of Ariadne and then tying wings in his body, he flew escaping from frightful Labyrinth.

In a similar manner, Marx by developing his profit theory he tried to escape from the classical doctrine that erroneously preached "zero wages would mean infinite rate of profit". It just appears that the critics were motivated by their orthodox prejudices than by essential argument to invalidate Marx's thesis just as Samuelson said "if only he was there". Hence, we proceed with the analysis of our theme by considering whether there is also a limit to the increases in the rate of surplus value that prevents it to increase as fast the OOC. If it does, then it follows logically that over the long term the rate of profit must fall. This conclusion is reached if Marx's rate of profit is stated having as organic composition the ratio C/L. Thus, we divide all terms of the profit rate by living labour L, and we obtain the following formula:

$$(3) \qquad P = \frac{S/L}{\frac{C}{L}+\frac{V}{L}} = \frac{\frac{S}{S+V}}{\frac{C}{S+V}+\frac{V}{S+V}}$$

As we can see in (3), in the numerator of the rate of profit P, theoretically there is an upper limit which is 1 *when* V→0, and as a result there is a limit to the mass of surplus value.

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[96] Grundrisse, p. 763. It should be noted (translator's note) the manuscript had C+V/S $< V/S; S/C + V < S/V$ is the corrected expression, In terms of profit determination Marx stated" The rate of profit is determined not only by the relation of surplus labour to necessary labour, or by the relation in which objectified labour is exchanged for living labour, but by the overall relation of objectified to living labour employed, Ibid. p. 764.

[97] Setting wages to zero, then V = 0; this condition assures maximum profit rate according to classical doctrine, but not for the Marxian theory. For the classics, the rate of profit is P = S/V (profits/ wages). Thus if V = 0 then C/V → ∞. Marx's profit rate being P = S/C +V, if V = O, then P = S/C = profit/constant capital i.e. all the production is automated. In that case according to Marx, the profit rate instead of going to maximum it goes to zero, since constant capital being dead capital; it does not create surplus value. Surplus value is part of the value created by labour or surplus labour constitutes a part of the working day. Hence, if surplus value absorbs the whole working day, the necessary labour must sink to zero. But if the necessary labour vanishes, so does the surplus value, because it is only a fraction created by labour power. Thus said Marx, and in this respect his claim that "I have overthrown the whole doctrine of profit as it existed up to now", seems justified.

However, C/L in the denominator has theoretically no upper limit and thus could increase infinitely. That Marx conceived of limitations set to the increases in surplus value through a rising labour productivity could best be seen in the statement: “the compensation of the reduced number of labourers by intensifying the degree of exploitation has certain insurmountable limits”.[98] These limits are, 1) the *working day* in the creation of surplus value and 2) the *reduction of labour employed* in the increase of the rate of surplus value.

Marx in Grundrisse [99]sets a number of arithmetic examples in an attempt to illustrate that due to the limitation of the working day, increases in the rate of productivity bring forth smaller increases in the rate of surplus value. Therefore, since a rising organic composition which is a necessary effect of capital *accumulation* and *competition* in the sphere of production can increase infinitely over time and the rate of surplus value cannot, sooner or later the rate of profit will fall. We may find here a logical link between the conclusion just reached and Marx’s reference to the “law” as “tendency of the rate of profit to fall as society progresses”. Accordingly, the whole argument rests on the inability of the rate of surplus value to rise as rapidly as the organic composition to prevent the fall in the rate of profit.[100]

As capitalism develops it becomes increasingly more difficult to shorten the necessary labour time by increases in productivity, since surplus value increases but in ever *diminishing proportion* to productivity. To the extent that capital is incessantly growing, productivity has to expand in very large proportions to induce increases in surplus value. The reason is that the gain in surplus value is always a fraction of reduced necessary labour time which in turn is a fraction of the entire working day. Therefore, the smaller the part of the working day corresponding to wages the smaller is the effect of productivity in raising surplus value.

To be more explicit, the mechanization of production process that replaces labour power with machinery in order to expand productivity simultaneously reduces the necessary labour time and brings about a smaller effect on productivity in augmenting surplus value. Let us crystallize this important dynamic effect of capitalism in pursue for ever increasing profits with the following example. Let L= living labour, be the labour time available to society, where L= S + V is the sum of society’s surplus value (profits) S, and V the payments to labour (wages). The rate of surplus value is E = S/V, and thus V = S/E. Then, it can be shown mathematically that a % increase in S will require a larger % increase in E, [101] and this implies that percentage increases in labour productivity through continuous mechanization in production cannot bring about equal percentage increases in surplus value.

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[98] The complete relevant passage -which is badly worded- is as follows:”In as much as the development of the productive forces reduces the paid portion of employed labour, it raises the surplus value because it raises its rate; but inasmuch as it reduces the total mass of labour employed by a given capital, it reduces the factor of the number by which the rate of surplus-value is multiplied to obtain its mass. Two labourers, each working 12 hours daily, cannot produce the same mass of surplus- value as 24 who work only 2 hours, even if the control live on air and hence did not have to work for themselves at all. In this respect, then the compensation of the reduced number of labourers by intensifying the degree of exploitation has certain insurmountable limits. It may for this reason well check the fall in the rate of profit, but cannot prevent it all together”. Capital III, p. 247.

[99] Grundrisse, pp. 333-431.

[100] The rate of profit being a function of two ratios, $i)$ S/V = $\varepsilon,\ and\ ii)\ C/L = \mu$, it can be expressed as $p = f(\varepsilon, \mu)\ where, \frac{\vartheta p}{\vartheta \varepsilon} > 0\ and \frac{\vartheta p}{\vartheta \mu} < 0$. For changes in the organic composition μ, to be greater than changes in the rate of surplus value, i.e. the negative effect of $\frac{\vartheta p}{\vartheta \mu}$ cannot be offset by the positive effect of $\frac{\vartheta p}{\vartheta \varepsilon}$, the following condition must hold: $\vartheta^2 p/\vartheta \mu^2 > \vartheta p/\vartheta \varepsilon^2$ for the profit rate to fall. In other words, the profit rate falls, when the rate of surplus value cannot increase as fast as the organic composition of capital.

[101] Substituting, V, $\frac{S}{E} + S = L\ \ or\ \ S\left(\frac{1}{E} + 1\right) = L$. Differentiating with respect to time, t : $\frac{ds}{dt\left(\frac{1}{E}+1\right)} - \frac{S}{E^2} . \frac{dE}{dt} = 0$, $thus \frac{ds}{dt}\left(\frac{1}{E} + 1\right) = \frac{S}{E^2} . \frac{dE}{dt}\ \ multiplying\ by \frac{E}{S} and\ rearranging, \frac{1}{S} . \frac{ds}{dt} = \frac{1}{1+E} + \frac{1}{E} . \frac{dE}{dt}$ This expression shows that a % increase in S will require a larger increase in % E, i.e. $\frac{1}{S} . \frac{ds}{dt} < \frac{1}{E} . \frac{dE}{dt}\ or\ \ S^\circ/S < E^\circ/E$.

Put it differently, the rate of growth in labour productivity over time has to be greater than the growth rate of surplus value so that to increase surplus value to a level that it would prevent the fall in the rate of profit. Accordingly, as long as society progresses the rate of surplus value E, also grows and with it the allocation of worker's time given up to the owner of the means of production; but surplus value S requires larger increases in productivity in order to augment. Finally, this dynamic outcome of the system's functioning suggests that the higher the rate of surplus value S/V is, the greater must be the increase in S/V in order to lift surplus value sufficiently high so that to compensate for the falling rate of profit.

The conclusion reached was based on the assumption that living labour L is given, i.e. the labour force of working population in society is constant. Now we drop this assumption and let L change over time at a uniform rate, i.e. we assume that working population increases every year at a constant rate $\delta = dL/dt$. The result that we obtain in the dynamic development of the system is that as population increases through immigration or a higher birth rate, the increases in surplus value and hence profits can be achieved with lower increases in productivity compared with those under constant working population.[102] It should be noted as surplus value increases over time the effect of population growth on increasing S/V is gradually reduced since $(\delta \cdot E)/(1+E)S \to 0$. In fact, the decline in S/V accelerates if the rate of increase of the working population declines over the long term.

In summarizing, the rate of profit falls as society progresses because, a) the length of the working day limits the creation of surplus value that can be produced by living labour, b) relative increases in surplus value through the mechanization of production process are continuously smaller than relative increases in productivity, c) as the fraction of surplus labour increases generating larger profits, productivity has to increase enormously to realize a given amount of profit or surplus value: " the smaller the fractional part of the working day, the smaller is the increase in surplus value which capital obtains from the increase of productive force. Its surplus value rises, but in an ever smaller relation to the development of the productive force".[103] It follows, as productivity increases by displacing living labour by machinery a smaller quantity of labour sets in motion a larger quantity of capital.

Therefore, the rate of profit must fall since increases in the organic composition of capital cannot be compensated by increases in the rate of surplus value. It is apparent, the falling rate of profit as developed by Marx based on the inability of the rate of surplus value to rise as fast as the organic composition, posits-as capital accumulation grows over time- a limit to the production of surplus value and thus to the capitalist production itself.[104] Insofar as the capitalist development is ruled by the quest of extra surplus value or ever increasing profits the economic fate of the existing system is doomed. The final result of rising organic composition would be full automation and the arrival of an époque where as Aristotle writes: "master craftsmen would no longer have a need for subordinates, or masters for slaves".

[102] If population increases at constant rate, $\delta = \frac{dL}{dt}$ $then\ \frac{1}{S} \cdot \frac{ds}{dt} = \frac{1}{1+E} \cdot \frac{dE}{dt} + \frac{\delta \cdot E}{(1+E)S}, where\ \frac{\delta \cdot E}{(1+E)S} > 0$. This implies that as population grows steadily over time increases in profits are achieved with lower increases in labour productivity compared with the state of stationary population and constant labour force.

[103] Grundrisse, p. 340.

[104] We shall not deal with Marx's 'counteracting tendencies' considered in Capital III, chap. 14, and Grundrisse p. 750. The purpose of the present study was specific: to demonstrate analytically the validity or falsity of the "law" which methodologically must first be established in the context of pure or competitive capitalism. Marx's counteracting tendencies have nothing to do with the logical correctness of the "law" since counteracting tendencies are merely factors that prevent the *actual* manifestation of the law. According to Professor Tom Sekine's view (The Dialectic of Capital, chap. 7, The Theory of Profit, p. 203, unpublished manuscript, York University, Toronto, 1978.) Marx's countertendencies are theoretically irrelevant."They are factors that must be considered in the study of actual manifestations of the law in a concrete historical environment; those factors cannot be discussed at the level of abstraction at which the general law itself is stated."

Conclusion

A serious attempt was made to analyze Marx's controversial theory of the tendency of the profit rate to fall as capitalism develops over the long term. We have shown that Marx's own formulation of the "law" never took a final form when he was alive. Post humanly, due to its great importance in the modus operandi of the economic system heated debates and controversies often erupted that continue to the present day. We put aside risky questions such as what Marx actually had in the back of his mind, and relied on the voluminous work of the learned author, particularly Grundrisse, and on the extensive literature of the subject that Marx himself considered "as the most important law of political economy".

Our analysis indicated that the "law" of the falling rate of profit is logically correct and mathematically consistent if we accept as organic composition of capital, the ratio of objectified capital to living labour. We have seen that the chronic criticism of Marx's "law" that is based on the *constancy* of the rate of surplus value is misplaced and grounded on misconception. After all how is logically possible in a dynamic system such as capitalism that continuously evolves, Marx to lay the foundation of the *proof* of the "law" on a *constancy* to show the dynamic effects of his law of motion. The criticism is incorrect and unjustifiable; it just appears the critics were motivated by orthodox prejudices than by essential argument.

However, we dealt only with the long run development of the rate of profit without examining the specific effects of capital accumulation on crises which induce the long-run falling tendency of the profit rate to behave in a cyclical rather than a secular pattern. The short run falling tendency linked with economic crises emanating from the interruption in the accumulation process and tied to the money and credit system was not treated, since such an analysis would have taken us far away from the scope of the present paper.

One of the issues that constitute the "Achilles heel" of Marx's formulation of the law is the level of abstraction at which the law was conceptualized, on values and not on prices. Hence, the problem of *measurement* arises since it is on prices of production that the average rate of profit for the economy as a whole is established. Profits do not exist in production. Profits only emerge in exchange (circulation) through the sale in the market place. To the extent that the circulation process is taken into consideration the rate of profit does not fall only because the organic composition rises, but also via an increase in circulation time. The rate of profit, therefore, can only emerge in the interaction of supply and demand and not only on the technical conditions and labour relations in the production process. Nevertheless, Marx's "law" being conceptually correct has profound implications for capitalism as social institution that develops under the propulsion of *inner contradictions*. As the organic composition rises through automation, the non- creating value constant capital increases displacing the value creating living labour. Hence, surplus value declines despite the lower labour costs and at the limit, *full automation* will negate the concept of *exploitation*, and thus bring the end of capitalism as a profit maximizing system. Alternatively, constant capital i.e. plant, machinery and auxiliary materials, must be destroyed for the system to rejuvenate the economy.

Finally, Marx's most celebrated concept, the organic composition of capital, on the one side so important to his analysis, on the other so confusing to his readers, expressed as constant to variable capital, created such a *cataclysmic* misinterpretation of his theory that still-after more than a century- enough debris remains to obscure the issue once again. Who is to be blamed? The academics, foes and friends alike, that dealt with the subject? Marx himself because he died and left to us his voluminous works unfinished, unpolished, sometimes sketchy and fragmentary in some respects and ambiguous in many? Perhaps us, that we cannot understand him? Or our ideological biases that as Professor Samuelson expresses it: "can contaminate the search for truth in this imperfect world".[105] *Spiros Lavdiotis, July 2014*

[105] Samuelson P., Rejoinder: "Merlin Unclothed, A Final Word", Journal of Economic Literature, p. 76, 1974.