The "law of the falling tendency of the rate of profit"

Its place in the Marxian theoretical system and relevance to the U. S. economy

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Submitted in partial fulfillment
of the requirements for the degree of
doctor of philosophy
in the faculty of political science
Columbia University

1963

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First edition: 1 May 2020.

www.ergebnisseundperspektiven.de

Abstract

1 The concept of a falling rate of profit occupies a crucial position in Marx's theory of economic development: it is, he declared, the economic mechanism whereby capitalism ultimately blocks its own growth and thus proves that it must give way to a higher social order.

This "law" has in the past been criticized on two main grounds: It was alleged that Marx's theoretical derivation of a falling tendency of the rate of profit from a rising tendency of the "organic composition of capital" (the capital-labor ratio) fails to show why the rate of profit cannot permanently be maintained through a rising tendency of the "rate of exploitation" (the relative share of the national income going to capital) and why the organic composition of capital should itself tend to increase. It was argued, moreover, that the predictions of a falling rate of profit, and especially of a rising organic composition of capital, as formulated by Marx, have not been borne out by empirical data from the U. S. economy.

The present study tests Marx's "law" both on theoretical and empirical grounds.

2 The theoretical discussion involves stating or restating the basic categories of Marx's system in a way which establishes both their coherence with each other and their identifiability to empirically knowable economic magnitudes. This analysis involves examination of: (a) Marx's implicit and explicit treatment of certain controversial but vital questions, such as the predicted historical tendency of the real wage and the definition and treatment of "unproductive" labor; (b) Similarities and differences between Marxian and non-Marxian treatments of the central topic; (c) The inter-relationships among the various sections of the Marxian system.

It is argued in conclusion that the "law of the falling tendency of the rate of profit" has theoretical validity both as a vital part of Marx's model of economic development under capitalism and as a logically correct and necessary deduction from the basic premises of the Marxian system.

The empirical test of the "law" covered the U. S. non-farm private business economy for the period 1900–1960. All computations were made twice, on the basis of two different systems of measurement: (a) Capital stock and capital consumption expressed for each year in current dollars through deflation of original cost; (b) Capital stock and capital consumption expressed throughout in terms of the basic quantitative unit of the Marxian system, the hour of "socially necessary labor." 3

The data indicate that the Marxian rate of profit for the U. S., whether calculated on a labor-unit or current-dollar basis, has fallen drastically over the past sixty years, and that the organic composition of capital has simultaneously increased, though not in as large a way. At the same time these data indicate another major tendency which Marx did not predict and which contradicts his anticipations: a substantial long-term decline in the rate of exploitation, sufficiently pronounced to account for two-thirds of the observed fall in the Marxian rate of profit.

Nevertheless, despite the invalidation of certain major Marxian predictions, Marx is confirmed on the issues he regarded as decisive: the rising tendency of the organic composition of capital and the falling tendency of the rate of profit.

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Glossary of terms and relationships

v *Value*: The *value* of the product of a capitalistic economy is a term used by Marx in two senses; *net value* and *gross value*.

a.) *Net value* (Y): The *net value* of the annual product is determined by the *input of productive labor* required for its production, defined quantitatively as the number of hours worked by production and production-related workers. The flow of net value is identical to the sum of the following two flows:

- *Variable capital* (v): the wage-cost of production and production-related labor input.
- *Surplus-value* (s): total non-labor factor net income

$Y \equiv v + s$

b.) *Gross value* (P): the *gross value* of the annual product is the sum of its net value plus an additional flow:

- *Constant capital* (c): the sum of overhead costs (exclusive of property compensation) and capital consumption. (N.B. Despite its appellation, this must always be recognized as a *flow*.)

$P \equiv Y + c$

Monetary flows can be converted into value flows through the implicit value-content of the price unit given by the ratio of the net value (Y) to the money net income of productive laborers and proprietors of other factors of production.

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Capital stock (C): *Capital* is the value, net of depreciation, of the stock of privately owned productive resources used by capitalistic enterprises.

Productivity of labor: Like value, labor-productivity has both a *gross* and a *net* sense:

a.) *Gross productivity*: Gross labor-productivity is given by total real output per unit of productive-labor inputs.

b.) *Net productivity of labor* (Π): The net productivity of labor is the ratio of the real income of productive laborers and proprietors of other factors of production to productive-labor input. The net productivity of labor is equal to its gross productivity multiplied by the ratio of net value to gross value.

Organic composition of capital (Q): The organic composition of capital signifies *capital per worker*—i.e., the ratio between the capital stock and productive-labor input, $Q \equiv \frac{C}{Y}$. The numerical value of this quantity depends on the time period over which the flow Y is measured, and can be thought of as the number of production-periods embodied in the capital stock. This ratio, which is expressed in units of labor-value, ultimately, according to Marx, reflects the technologically determined ratio of *real* capital (in "physical" units) to labor input (which latter ratio is termed by Marx the "technical composition of capital.")

vii *Rate of surplus-value* (s'): The rate of surplus-value is the ratio between the flows surplus-value and variable capital, $s' = \frac{s}{v}$. This ratio is determined by the ratio of the net productivity of labor to the real wage, $\frac{s+v}{v} \left(= 1 + \frac{s}{v} = 1 + s'\right)$. Given the total number of hours of productive labor performed, the rate of surplus-value determines the quantity of surplus-value:

$$s = Y - v = Y - \frac{s}{s'} = \frac{Y}{1 + \frac{1}{s'}} = Y\left(\frac{s'}{1 + s'}\right)$$

The rate of profit (p'): The Marxian rate of profit is the average net rate of return on investment in capitalistic enterprises; the ratio of surplus-value to the capital stock, $p' = \frac{s}{C}$. This rate is determined by the relationship between the rate of surplus-value and the organic composition of capital:

$$\frac{s}{C} = \frac{Y\left(\frac{s'}{1+s'}\right)}{YQ} = \frac{s'}{Q(1+s')}$$

Falling tendency of the rate of profit: The incremental rate of profit, $\frac{ds}{dC}$ (equivalent to the marginal efficiency of investment,) is the increase in aggregate property income per additional unit of net investment. Marx contends that all net investment tends to augment capital per man. If the rate of surplus-value is fixed (i.e., if productivity and the real wage change in the same pro-

portion) the accumulation of capital must therefore produce a falling rate of profit, since

$$\frac{dp'}{dQ} = -\frac{s'}{Q^2(1+s')}$$

Introduction

1

> The orthodox economists have been much preoccupied with elegant elaborations of minor problems, which distract the attention of their pupils from the uncongenial realities of the modern world, and the development of abstract argument has run far ahead of any possibility of empirical verification. Marx's intellectual tools are far cruder, but his sense of reality is far stronger and his argument towers above their intricate constructions in rough and gloomy grandeur.
> Joan Robinson, *An Essay on Marxian Economics*[1]

The "law of the falling tendency of the rate of profit" occupies a decisive position in the theoretical structure developed, primarily in the three volumes of *Capital*, by Karl Marx.

For Marx the crucial character of this "law" is a consequence of the central proposition of "historical materialism" that every socio-economic system comes into being in order to further the development of the productive forces and is replaced by a different and higher system only when it ceases to be able to fulfill this task.

2

> No social order ever disappears before all the productive forces, for which there is room in it, have been developed, and new higher relations of production never appear before the material conditions of their existence have matured in the womb of the old society.[2]

Marx and Engels characterized their social program as *scientific* socialism because it was based, not on a moral criticism of capitalism, but on what they claimed to be the actual laws governing capitalist development:

> ... large scale industry, as it develops more fully, comes into conflict with the barriers within which the capitalist mode of production holds it confined... Modern socialism is nothing but the reflex in thought of this actual conflict.[3]

The falling tendency of the profit-rate, according to Marx is the actual economic mechanism whereby a capitalist economy ultimately blocks its own growth and thereby proves that it must give way to a higher order:

> The barrier of the capitalist mode of production becomes apparent:
>
> 1. In the fact that the development of the productive power of labor creates in the falling rate of profit a law which turns into an antagonism of this mode of production at a certain point and requires for its defeat periodic crises.
>
> 2. In the fact that the expansion or contraction of production is determined ... by profit and by the proportion of this profit to the employed capital, thus by a definite rate of profit, rather than the relation of production to social requirements, i.e., to the requirements of socially developed human beings. It is for this reason that the capitalist mode of production meets with barriers at a certain expanded stage of production which, from the other point of view, would be altogether inadequate. It comes to a standstill at a point determined by the production and realization of profit, not by the satisfaction of social needs.

3

> The rate of profit is the motive power of capitalist production, and things are produced only so long as they can be produced with a profit. Hence the concern of the English economists over the decline of the rate of profit. That the bare possibility of such a thing should worry Ricardo, shows his profound understanding of the conditions of capitalist production. The reproach moved against him, that he is unconcerned about "human beings" and has an eye solely for the development of the productive forces, whatever the cost in human beings and capital-*values* — it is precisely that which is the most important thing about him. Development of the productive forces of social labor is the historical task and justification of capital. It is precisely in this way that it unconsciously creates the material requirements of a higher mode of production. 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. And here the quantitative

1. Robinson, *An Essay on Marxian Economics*, p. 2.

2. Marx, *Critique of Political Economy*, p. 12.

3. Engels, *Herr Eugen Dühring's Revolution in Science (Anti-Dühring)*, p. 293.

> proportion means everything. There is, indeed, something deeper behind it, of which he is only vaguely aware. It is here demonstrated in a purely economic way, i.e., from the bourgeois point of view, within the limitations of capitalist understanding, from the standpoint of capitalist production itself, that it has a barrier, that it is relative, that it is not an absolute, but only a historical mode of production corresponding to a definite and limited epoch in the development of the material conditions of production.[4]

4

The validity of the "law of the falling tendency of the rate of profit" is thus a question of the highest interest for modern economists. The problem with which Marx was most concerned, the pattern of economic growth under a capitalist form of social organization, has in the past generation become the foremost concern of Western economic theory and practice, and "The Lagging U. S. Growth Rate" is at this moment not only a subject for discussion among academic economists[5] but even a commonplace of political oratory.

Is Marx's law of the falling rate of profit relevant to our current concerns? An answer to this question must proceed from both the theoretical and the practical side. The second part of this study is devoted to a confrontation of Marx's "law" with the data of 20th-century U. S. economic development. But before Marx's theory can be tested by the facts of economic life it must pass a prior test: it must be shown to be a correct and necessary derivation from the

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basic premises postulated by Marx, *and* it must be shown to refer to economic reality in such a way that its predictions can be refuted by the facts.

The first part of this study, accordingly, is devoted to an analysis of the derivation and meaning of the "law," and an examination of its validity in the light of the major theoretical criticisms that have been brought against it.

In the course of this analysis it has continually been necessary to "interpret" Marx: i.e., to attempt restatement of his theories in a way that is not merely consistent with his fundamental approach but above all makes them meaningful in the context of modern economics and of the contemporary economic system. My criterion in this has not been exegesis but theoretical clarification in the context of an empirical reality, and where Marx is ambiguous or even contradictory I have sought to interpret his meaning in as realistic a way as possible. For this procedure I need offer no apology beyond the words of Marx himself:

> The question whether objective truth is an attribute of human thought—is not a theoretical but a *practical* question. Man must prove the truth, i.e., the reality and power, the "this-sidedness" of his thinking in practice. The dispute over the reality or non-reality of thinking that is isolated from practice is a purely *scholastic* question.[6]

4. Marx, *Capital*, vol. III, pp. 303–305 (Chicago, C. Kerr and Company, 1906–1909). All subsequent citations of the English translation of *Capital* will refer to the Kerr edition. The translations have sometimes been revised in minor respects in light of the original text and the recent English translation of volumes II and III (Moscow, 1957 and 1959).

5. A symposium with this title was held at the 1961 convention of the American Economic Association.

6. Marx, "Theses on Feuerbach", Thesis II, p. 197.

I. The fundamental categories of the Marxian system

6 In the preface to the first edition of *Das Kapital* Marx stated his essential purpose in these words: "It is the ultimate aim of this work to lay bare the economic law of motion of modern society."[1] He sought to formulate a systematic and coherent scientific view of the historical path of development of the capitalist economic system from its origins to its hoped-for replacement by a socialist form of economic organization.

Marx's endeavor to determine "economic law" imposed on him the requirement that he carry out his project in terms of economics. But his economic theory cannot be understood exclusively within the confines of the economics of capitalism. Its basis is a view of human nature and of the historical growth of humanity, a view whose scope far transcends analysis of the specifically capitalist economic system.

Human progress, according to Marx, consists in the increase of man's power over nature. This power is made effective through the characteristically human process of labor: the social organi-
7 zation of human beings to cooperate in the control and exploitation of the natural environment, *to produce*. Production, from the very dawn of humanity, is carried on by means of tools:

> No sooner does labor undergo the least development than it requires specially prepared instruments... The use and fabrication of instruments of labor, although existing in the germ among certain species of animals, is specifically characteristic of the human labor-process, and Franklin therefore defines man as a tool-making animal.[2]

These tools, and the techniques corresponding to them, constitute, with nature, the productive forces available to mankind at every given moment. They form the basis for the mode of production, the social organization of the labor-process, which in turn determines the total structure of the society:

> In the social production which men carry on they enter into definite relations that are indispensable and independent of their will; these relations of production correspond to a definite stage of development of their material powers of production. The sum total of these relations of production constitutes the economic structure of society—the real foundation, on which rise legal and political superstructures and to which correspond definite forms of social consciousness. The mode of production in material life determines the general character of the social, spiritual, and political processes of life.[3]

Capitalist society is a historically determined form of human society in general, and thus its central feature, in the historical-materialist 8
view, is its social organization of the labor-process. But whereas, in previous forms of society, "the social relations between individuals in the performance of their labor appear at all events as their own mutual personal relations," under capitalism these relationships are "disguised under the shape of social relations between the products of labor."[4] The task of economics, according to Marx, is to penetrate this disguise and show how "the wealth of society [which] under the capitalist system presents itself as an immense accumulation of commodities"[5] in its essential reality expresses and is determined by the actual social relationships among human beings.

Since these basic social relationships appear as exchange relationships, relationships through which every commodity is valued in terms of all others by means of its money price, Marx takes the problem of "*value*" as his point of departure. This problem was defined by Marx as the relationship between the *exchange-process* typical of a capitalist society and the *labor-process* which he regards as the kernel of all human societies:

> Even if there were no chapter on value in my book, the analysis of the real relationships which I give would contain the proof and demonstration of the real value relation ... the mass of products corresponding to the different needs require different 9
> and quantitatively determined masses of the total labor of society. That this necessity of distributing social labor in definite proportions cannot be done away with by

1. Marx, *Capital*, vol. I, p. 14.
2. Ibid., vol. I, p. 200.
3. Marx, *Critique of Political Economy*, p. 11.
4. Marx, *Capital*, vol. I, p. 89.
5. Marx, *Critique of Political Economy*, p. 19.

> the *particular form* of social production, but can only change the *form it assumes* is self-evident. No natural laws can be done away with. What can change, in changing historical circumstances, is the *form* in which these laws operate. And the form in which this proportional division of labor operates, in a state of society where the interconnection of social labor is manifested in the *private exchange* of the individual products of labor, is precisely the *exchange-value* of these products. The science consists precisely in working out *how* the law of value operates.[6]

Marx's response to this problem, the "labor theory of value," starts with the postulate that the value of a commodity *consists of* the portion of social labor allocated by society to its production. As Joan Robinson correctly remarks, this conception of *value* "is purely a matter of definition. The *value* of a commodity consists of the labor-time required to produce it, including the labor-time required by subsidiary commodities which enter into its production."[7]

That "value" in this sense is something quite different from "utility" or "use-value" is obvious. Marx, in declaring that to be a commodity every commodity must both "satisfy human wants" and be a "product of labor," merely repeats the basic distinction established by Smith and Ricardo.

What is new in Marx's use of the term "value" is that he establishes a radical disjuncture between the category of *value* and that of *price*, insofar as these apply to individual commodities or groups of commodities. One of his sharpest criticisms of the Ricardian value theory is that Ricardo seeks to determine "relative value" on the basis of the relative quantity of labor in the commodities to be exchanged.

Ricardo's error, according to Marx, is that since in reality the "natural prices" at which commodities tend in the long run to be exchanged are governed (under competitive conditions) by "prices of production which are not directly determined by the values of the commodities ... he should therefore have said: These average prices of production are different from the values of the commodities. Instead of this he concludes that they are identical. ..."[8] Thus Ricardo finds himself driven toward an admission "that values are themselves determined by influences independent of labor time."[9]

All individual money relationships, in Marx's view, are necessarily characterized by this difference between *price* and *value*:

> Magnitude of value expresses a relation of social production, it expresses the connection that necessarily exists between a certain article and the portion of the total labor-time of society required to produce it. As soon as magnitude of value is converted into price, the above necessary relation takes the shape of a more or less accidental exchange-ratio between a single commodity and another, the money commodity. ... The possibility, therefore, of quantitative incongruity between price and magnitude of value, or the deviation of the former from the latter, is inherent in the price form itself. This is no defect, but, on the contrary, admirably adapts the price form to a mode of production whose inherent laws impose themselves only as the mean of apparently lawless irregularities that compensate one another.[10]

The commodity, then, taken in itself, has two opposite characteristics: *utility* and *price*, *use-value* and *exchange-value*. In Marx's Hegelian terminology the commodity's *value* constitutes the "identity" of these "opposites" because as *value* it no longer appears as a thing in itself but is now apprehended as the product of a definite amount of social labor. (In the Hegelian dialectic *opposites* are not to be thought of as the terms of a logical contradiction or paradox but as poles of a dynamic logical *process*. In the case of the commodity, abstract utility, usefulness *as such*, is the fundamental category, the initial pole. The coat is produced as a coat. But when it enters the market as a commodity offered for sale its seller regards it simply as a sum of money to be realized by the sale—its utility has been negated, its form changed from use-value to exchange-value, though it remains a real coat all the time. When it is bought by the final consumer it becomes an object of utility again and loses its commodity form. Thus, sale to the user is "negation of negation." This process has given the category of use-value a new meaning, raised it to a higher level than the original "utility" that was abstracted from in the offer of the coat for sale. The social process of sale has not merely provided the purchaser with a useful article—it has also influenced the allocation of social resources to the production of coats, and thereby helped to determine the *value* of the subsequent output of coats. Thus the Marxian category of *value*, despite the opin-

6. Karl Marx, Letter of 11/7/1868 to Dr. Kugelmann, in Marx and Engels, *Selected Correspondence*. New York: International Publishers, 1934, p. 246.

7. Robinson, *An Essay on Marxian Economics*, p. 13.

8. Marx, *Theories of Surplus-Value*, p. 213.

9. Ibid., p. 233.

10. Marx, *Capital*, vol. I, p. 114.

ion of a number of commentators,[11] is not derived through *abstraction* from use-value but on the contrary involves use-value at least equally with exchange-value. As Engels wrote (in 1843!) "*Value is the relation of production costs to utility.*"[12]

13 Viewed pragmatically, the establishment of *value* as a "higher" category than *price* reflects a division of the subject matter of economics into different sets of problems, for each of which different analytic tools are required.

Marx, as we have seen, recognizes the *market* as the mechanism whereby society allocates its productive resources among alternative uses. The analysis of *exchange-value* is aimed at comprehending a price system whose function is "to bring that quantity of commodities on the market which social requirements demand; in other words, that quantity of commodities whose market-value society can pay."[13]

These problems of short-run resource allocation, however, are not Marx's main concern. True, chapter X of the third volume of *Das Kapital*, "Market Prices and Market Values," with its declaration that "the market-value is always regulated by the commodity produced under the least favorable circumstances, if the supply is too small, and by the commodity produced under the most favorable conditions, if the supply is too large,"[14] leaves the door wide open for development of a marginal-cost price theory. But Marx himself did not formulate any such theory.

14 For Marx's central purpose, elucidation of "the economic law of motion of modern society," he needed instruments of analysis appropriate to the study of longterm economic growth and of the division of the social product among the basic social classes. In order to measure and compare economic magnitudes over time he needed to reduce relative prices, expressed in money, to a dimension which could make them measurable in terms of a *unit of measure which would not itself vary over time.*

As the unit of measure in which "social labor" is to be quantified Marx postulates the unit of duration: "The quantity of labor is measured by its duration, and labor-time finds its standard in weeks, days, and hours."[15] Marx thus defines *value* as a *quantity of labor-time.*

This definition of *value* does not start from the "surface phenomena" of commodity-exchange: its starting point is the labor-process in society as a whole. The Marxian concept of *value*, accordingly, has meaning and can be understood only in social terms. The primary category from which all other economic quanta are derived by Marx is the aggregate labor at the disposal of society. Viewed from the angle of the individual producer, "the labor-time of a single individual is directly expressed in exchange-value as universal labor-time, and this universal character of individual labor is the manifestation of its social character."[16] Similarly starting from the 15 relative exchange-value of commodities in terms of each other, "their relativity by no means consists only in the ratio in which they exchange for each other, but in the ratio of all of them to this social labor which is their substance."[17]

"Social labor" consists in reality of the labor of a vast number of different individuals, producing different things with different uses. In this sense, as being always at bottom the unique labor of a definite individual under definite social conditions producing an object with a definite utility, Marx calls it "concrete labor."

The formulation of an abstract unit of measure in terms of labor-time requires abstraction from these differences. In Hegelian terms, the category forming the *ground* of the unit of measure consists of the "identity" of the "opposites" *abstract* labor and *concrete* labor. What this means is that the working-time of every individual is viewed as a *fraction* of the *total working time* of society.

Proceeding from this aggregate, Marx defines the way in which labor-time can be made into an objective unit of measure: the work of different individuals is to be expressed as "socially necessary labor-time." As Marx states it:

> The total labor-power of society, which is 16 embodied in the sum total of the values of all commodities produced by that society, counts here as one homogeneous mass of human labor-power, composed though it be of innumerable individual units. Each of these units is the same as any other, so far as it has the character of the average labor-power of society, and takes effect as such; that is, so far as it requires for producing a commodity no more time than

11. Thus Hilferding wrote: "the natural (!) aspect of the commodity, its use-value, lies outside the domain of political economy." (Hilferding, *Böhm-Bawerk's Criticism of Marx*, p. 130). And Sweezy repeats: "Marx excluded use-value (or, as it would now be called, 'utility') from the field of investigation of political economy." (Sweezy, *The Theory of Capitalist Development*, p. 26). The incompatibility of these interpretations with Marx's actual doctrine is thoroughly demonstrated in the essay by Rosdolsky, "Der Gebrauchswert bei Karl Marx, eine Kritik der bisherigen Marx-Interpretation".

12. Engels, "Outlines of a Critique of Political Economy", p. 186.

13. Marx, *Capital*, vol. III, p. 213.

14. Ibid., vol. III, p. 218.

15. Ibid., vol. I, p. 45.

16. Marx, *Critique of Political Economy*, p. 26.

17. Marx, *Theories of Surplus-Value*, p. 210.

> is needed on an average, no more than is socially necessary. The labor-time socially necessary is that required to produce an article under the normal conditions of production and with the average degree of skill and intensity prevalent at the time.[18]

If qualitatively unlike, *unique* units of labor are to be quantified this must be done in a dimension objectively common to all of them, and all, necessarily, possess *duration*, take place in a temporal universe. This essential nature of Marx's category of "socially necessary labor-time" as a term of measurement, is well stated by Naville:

> It is *time* that remains the foundation of this conception. In other words, society has at its disposal a given mass of labor-power and of labor-time concretized in quanta having among themselves a certain relationship of proportionality. As a mass in activity, "abstract" labor can be conceived as an energetic substance common to all labors. As a potential mass it is to be conceived as a disposable time, measurable in homogeneous units. But in one as in the other case it can be considered in its abstract, social form only in function of its concrete forms.[19]

17 The determination of "socially necessary labor-time" thus involves the transformation of a qualitatively heterogeneous mass of different concrete labor-powers into a homogeneous magnitude. The *quanta* of this magnitude are units of the "average labor-power of society." Consequently individual labor-powers of differing skill stand in a quantitative as well as a qualitative relationship one to another: all can be expressed in terms of this fundamental unit as it is manifested in the value of the commodities produced; i.e., in time-units of "simple, average, labor."

This *quantitative* relationship, by which the labor of every worker differs, even if infinitesimally, from the labor of every other, is thus defined by Marx as relative deviation from a "mean," "dem gesellschaftlichen *Durchschnittsgrad* von Geschick und Intensität der Arbeit."[20]

"Simple, average, labor," in consequence, like all Marx's categories, is properly viewed only as a socially determined magnitude. It is the labor, not of some standard, "unskilled," worker, but of the *average* worker, the laborer working with "*the average degree of skill and intensity.*" An hour of the labor of this "average" worker is the 18 measure of "abstract labor," and thus *the basic quantitative unit of the entire Marxian system.*

All the aspects of concrete labor must vary continually, but this unit of abstract labor is invariant to time, no matter how vastly the productivity of concrete labor may increase: "However then productive power may vary, the same labor, exercised during equal periods of time, always yields equal amounts of value."[21] Historic changes in "the average degree of skill and intensity" itself are to be taken into account as a factor *increasing the productivity of labor* and consequently do not touch the unit of measure:

> The value of a commodity would remain constant if the labor-time required for its production remained constant. But the latter changes with every variation in the productiveness of labor. This productiveness is determined by various circumstances, amongst others, by the average amount of skill of the workmen, the state of science and the degree of its practical application, the social organization of production, the extent and capabilities of the means of production, and by physical conditions.[22]

By defining the unit of *value* as the hour of socially necessary labor-time Marx establishes an empirically utilisable standard of measurement, based on a knowable quantity: the number of hours of labor performed by productive workers in the course of the year. The way in which it 19 is to be used depends on a further definition: the relationship of *value* to the units of *money* in which a market-economy society conducts its economic activities.

This relationship is formulated by Marx by means of an identity: money is "the phenomenal form that must of necessity be assumed by that measure of value which is immanent in commodities, labor-time."[23] Conversely, *price* is "value in the form of money."[24] By definition, therefore, the monetary unit of a given society at a given time, whether it nominally consists of gold or of inconvertible paper, represents a definite quantity of *value. It has a definite labor-content.*

This fundamental term, the *labor-content of the price unit*, is identically the ratio between two empirically determinable magnitudes, the *sum of prices* and the *sum of values* of the commodities produced in the year. Equivalently it is the ratio between the *money net income of the laborers and capitalists* and the *number of hours of productive labor performed* in the year.

18. Marx, *Capital*, vol. I, p. 46.

19. Naville, *De L'Alienation à la Jouissance: La Genèse de la Sociologie du Travail chez Marx et Engels*, p. 414.

20. Marx, *Kapital*, vol. I, p. 5, cited in translation, *supra*, p. 5.

21. Marx, *Capital*, vol. I, p. 53.

22. Ibid., vol. I, p. 47.

23. Ibid., vol. I, p. 101.

24. Ibid., vol. III, p. 227.

Through this identity any economic quantity expressed in prices of a particular year is theoretically convertible into *value-units*. Accordingly, the Marxian theories concerning the division of the *value* of the social product among the 20 classes and the proportions between the *value* newly created and the *value* accumulated in the past in the form of the material preconditions of production are subject to testing on the basis of knowable facts. The Marxian system is thus capable of generating empirically refutable predictions.

The "labor theory of value," as the basis of a definitional structure, cannot be considered as "true" or "false" in itself—its validity depends on its indispensability to the formulation of empirically valid theories.

Recognizing its definitional nature, Joan Robinson directs two highly germane criticisms to the "labor theory of value":

In the first place, she argues, "The problem of finding a measure of real output—a measure which, in the nature of the case, must contain a certain arbitrary element—is not solved by reckoning in terms of *value*, for the rate of exchange between *value* and output is constantly altering."[25]

This is true and vitally important, but as an *objection* to Marx's use of labor-time as a unit of measurement it misses the mark.

The essential point is that the *output* of a given period consists of commodities which 21 inherently are *both* exchange-values and use-values. To measure output *only* in *value* terms is to make *labor-productivity* a meaningless notion, since the *value* of the commodities is identical to the quantity of labor required for their production. But Marx is continually concerned with the *productivity* of labor—it is, in fact, his dominant concern, and explicitly one of the basic categories of his system. Since *production* means determinate change of form, and consequently requires measurement of output in different units from those in which input is measured, it is evident that Marx either was talking nonsense or that he possessed, at least implicitly, a conceptual basis for measurement of real output.

The latter is clearly the case. Marx explicitly maintains that commodities can be aggregated *in their character as use-values*.[26] Thus, virtually at the beginning of volume I, he writes:

> The same change in productive power which increases the fruitfulness of labor and, in consequence, the quantity of use-values produced by that labor, will diminish the total value of this increased quantity of use-values, provided such change shortens the total labor-time necessary for their production.[27]

Marx is therefore subject to justified criticism, 22 not for the absence from his system of a conceptual basis for the measurement of real output but for his taking such measurement for granted, his failure to derive an *explicit* unit of measure of real output.

This gap in the Marxian definitional structure can easily be filled in practice by means of measurement of output in constant prices through whatever price-index is judged appropriate. The theoretical problem is to demonstrate the coherence of this system of measurement with the rest of Marx's basic categories. What must be formulated is the meaning, in Marxian terms, of a "*real*" quantity: in other words, when we measure use-value in "constant prices" just what is it that we are using as our unit of measure?

When the product of 1955 is expressed as a quantity of "1954 dollars" what this means is that every unique commodity has been assigned a second price, *differing from its actual price*. But for Marx "price is value in the form of money." Abstraction from *current price* means abstraction from *current value*, which latter term of course is grounded on the abstract category of "socially necessary labor-time." The transformation of current to constant prices thus represents abstraction from abstraction, the restoration of concreteness on a new level.

In plain English: the products of one year are 23 represented as the products of the labor of a different year, in proportions determined by the relative prices of that base year. By their expression in 1954 dollars the commodities of 1955 are expressed as quantities of *1954* labor-time. But when labor-time is specified as being that of a definite year we have ceased to abstract from the social demand which determined the allocation of resources, hence the relative price structure, prevailing in that year. To measure in terms of *dated* labor is to view this labor as *concrete* labor. This, indeed, is precisely what is required, since Marx defines the "concreteness" of labor as its productivity of use-value.

The *quantum* of use-value thus is to be defined as the *hour of dated social labor-time*. Its

25. Robinson, *An Essay on Marxian Economics*, p. 20.

26. Cf. *supra*, pp. 4–5. Utility is unmeasurable only in its "abstract" form of "mere subjective utility" (Engels). The market transformation is an objective, social process. Through the very negation of "utility" it becomes social and therefore quantifiable, so that Marx continually speaks of the "quantity of use-values."

27. Marx, *Capital*, vol. I, p. 54.

practical determination is inherently a problem of relative, not absolute, measurement, since the entire system of measurement depends on the base-year chosen.

One can only speculate on the reasons for Marx's failure to specify how productivity is to be measured. Perhaps, in an epoch before the technique of index-number construction was developed in practice, he was satisfied with generalized, qualitative discussions of productivity which do in fact provide a tolerable treatment of the main problems.

In my opinion Marx avoided the problem 24 mainly because of what Joan Robinson calls the "arbitrary element" in the system of measurement. This does not only involve "the index-number problem," the arbitrary selection of a base year. It is equally important that to Marx the *pattern* of needs, of effective use-values, in a capitalist society is itself "arbitrary," determined by a distribution of wealth, income, and power that he indicts as distorting real social needs, real utility, and which he seeks to abolish.

In any event, measurement of real output in *constant-price units*, *use-value units*, is perfectly consistent with measurement of factor input, capital and income, in *value units*, *labor-time units*. The productivity of labor, as real product per unit of labor input, is determinable only through the use of *both* systems of measurement simultaneously, within the Marxian framework.

Joan Robinson's second criticism of the "labor theory of value" is even more crucial. Calculation in terms of *value*, she declares, is *useless* for Marx: "none of the important ideas which he expresses in terms of the concept of *value* cannot be better expressed without it."[28] The *value* unit is "otiose": "It has no operational content. It is just a word."[29]

25 But is it true that use of some other unit of measure would more effectively produce the same testable theories that Marx derived through analysis in terms of *value*? Mrs. Robinson asserts this, but she does not demonstrate it. On the contrary—her own theoretical work (strongly influenced by Marx) points to the area where calculation in terms of *value* is indispensable to Marx's structure.

This is the category of *capital*. Marx makes capital unambiguously measurable by defining it as the *accumulated value* invested in privately-owned means of production. What is the alternative? J. B. Clark defines capital as "a permanent fund of productive wealth ... describable in terms of 'money'."[30] He does not, however, specify the *quanta* of this "permanent fund" which is "invested in material things which are perpetually shifting—which come and go continually—although the fund abides."[31] And when Joan Robinson herself, in her book *The Accumulation of Capital*, comes face to face with this problem, she has to declare *non possumus*: "The evaluation of a stock of capital goods is the most perplexing point in the whole of the analysis which we have undertaken. Indeed in reality it is insoluble in principle."[32]

The essential relevance of the "labor theory of 26 value," its operational content, is precisely that it makes the problem of "evaluation of a stock of capital goods" *soluble in principle*.

I.1. Surplus-value

The essential thing that must be understood in discussing Marx's analysis of the category "capital" is that, in his view, capital is *not* a "factor of production":

> Capital is not a thing. It is a definite interrelation in social production belonging to a definite historical formation of society. This interrelation expresses itself through a certain thing and gives to this thing a specific social character. Capital is not the sum of the material and produced means of production. Capital means rather the means of production converted into capital, and means of production by themselves are no more capital than gold or silver are money in themselves. Capital signifies the means of production monopolized by a certain part of society, the products and material requirements of labor made independent of labor-power in living human beings and antagonistic to them, and personified in capital by this antagonism.[33]

There is thus a clear distinction between Capital, on the one hand, and the real "factors," Land and Labor, on the other:

> Capital is a definite form of an element of production belonging to a definite mode of production having a definite cast. It is an element of production combined with and represented by a definite social form. The other two, Land on the one hand and Labor on the other, are two elements of 27 the real labor process. In their material form they are common to all modes of production, they are the material elements of

28. Robinson, *An Essay on Marxian Economics*, p. 20.
29. Robinson, *Economic Philosophy*, p. 46.
30. Clark, *The Distribution of Wealth*.
31. Ibid., p. 122.
32. Robinson, *The Accumulation of Capital*, p. 117.
33. Marx, *Capital*, vol. III, p. 947.

> all processes of production, and they have nothing to do with the social form of productive processes.[34]

In sum, for Marx the concept of capital as "factor of production" is an instance of "commodity-fetishism," of visualizing the economic process as a system of relations among *things*, not of relations among *people*. Things are capital if and only if they express the specifically capitalist social relationship; i.e., if they serve the production, not of utilities or even of value in general, but of a specific type of value, *surplus-value*.

Surplus-value is the capitalist form of a phenomenon common to all post-primitive forms of human society: the formation of a social surplus above and beyond the needs of the direct producers as a material expression of surplus-labor, and the appropriation of this surplus by the ruling class:

> Capital did not invent surplus-labor. Wherever a part of society possesses a monopoly of the means of production the laborer, free or not free, must add to the working time necessary for his own maintenance an extra working time in order to produce the means of subsistence for the owner of the means of production, whether this proprietor be an Athenian aristocrat, Etruscan theocrat, Roman citizen, Norman baron, American slave-holder, Wallacian boyar, modern landlord—or capitalist.[35]

28

This surplus-labor, under capitalism, takes the form of *value*, because that is the form which *all* labor must take under this mode of production:

> It is every bit as important for an understanding of surplus-value, to conceive it as a mere congelation of surplus-labor-time, as nothing but objectified surplus-labor, as it is for an understanding of value *in general* to conceive it as a mere congelation of labor-time, as nothing but objectified labor. Only the *mode* in which this surplus-labor is extracted from the direct producer, the laborer, differentiates the various economic forms of society.[36]

Thus for Marx the decisive point in the entire fabric of capitalist social relationships, the point at which the objective preconditions of production manifest their character as *capital*, is the institution of *wage-labor*, the legal freedom and economic necessity for the individual worker to alienate to another person, during a defined period and for a money-price, the utilization of his ability to work. "The form of labor, as wage-labor, determines the shape of the entire process and the specific mode of production itself."[37]

In *form*, wage-labor is an equalitarian relationship, the exchange of equivalents. For a price agreed to by both, the capitalist purchases from 29
the worker the right to use his labor-power for a given period. In *content*, according to Marx, the relationship is one of exploitation. The *value* of the worker's labor-power is determined by the number of hours of social labor-time in the form of money needed to purchase the goods required to develop the worker's skills and maintain him and his family at the standard of living regarded as "normal" in the given society. This number of hours, as we have seen, *must be less than the working-day*. The difference accrues to the capitalist who owns the entire product of the worker's labor (i.e., the effects of the consumption of the labor-power which has been bought at its value); but for this reason it accrues not as a deduction, but as a *new product*.

The capitalist does not steal from the worker: he *exploits* him. Consequently the relationships between the classes take on a specifically capitalistic, quantitatively-determined, form. That form is *the ratio between the surplus-value produced by the worker and the value paid to him for the right to utilize his labor-power*: the "rate of surplus-value." It expresses the internal division of the working-day into a time during which the worker produces for himself his necessary means of subsistence and a time during which he produces for his employer the social surplus.

Marx devotes chapter XVIII of volume I to a discussion of the correct expression for the rate 30
of surplus-value. He states categorically that this relationship must be expressed only as the ratio between "surplus labor" and "necessary labor" (in symbols, s', the rate of exploitation, $= \frac{s}{v}$, s representing surplus-value and v representing value of labor-power), and *not* the ratio between surplus-labor-time and the total working-day ($\frac{s}{s+v}$), even though this second formula is directly derived from the first ($\frac{s}{s+v} = \frac{s'}{1+s'}$).

What Marx is actually concerned with here is to emphasize that the basic relationship is not the division of a given product but the *production* of a new substance: surplus-value. The "rate of exploitation" is the "direct expression of the degree of self-expansion of capital."[38]

The category v in the formula $\frac{s}{v}$ has in fact a *dual* significance, corresponding to the already analyzed dual character of s. As the share of the workers in the social product it expresses a

34. Marx, *Capital*, vol. III, p. 949.
35. Ibid., vol. I, p. 259.
36. Ibid., vol. I, p. 241.
37. Ibid., vol. III, p. 1028.
38. Ibid., vol. I, p. 583.

category common to all forms of society. But it is also the quantitative expression for a section of the social *capital*, that section which, according to Marx, is alone responsible for the "self-expansion of capital," because, by setting labor-power into motion and transforming it into *value*, it leads to the production of surplus-value. The rate of exploitation thus expresses "the very transaction that characterizes capital, namely the exchange of variable capital for living labor-power and the consequent exclusion of the laborer from the product."[39]

Marx consequently regards the social capital as made up of two components, *constant capital* and *variable capital*, whose qualitative difference, it should be noted clearly, is not based on any distinction in regard to their concrete physical attributes but is entirely an expression of the difference in their *social function*, manifested in the way in which they transfer value to the commodity produced. Only capital expended on living (productive) labor leads to the formation of surplus-value and so adds to the commodity a value greater than itself. Its value *varies* in the course of the reproduction process. Machines mightily enhance the productive power of labor, but they are not directly productive of *value* in the Marxian view. Since by definition *value* consists of human labor-time, a *thing* cannot impart more value to its product than the *value* which it already contains as a product of past human labor.

> That part of capital then, which is represented by the means of production, by the raw material, auxiliary material, and the instruments of labor does not, in the process of production, undergo any quantitative alteration of value. I therefore call it the constant part of capital, or, more shortly, *constant capital*.
>
> On the other hand that part of capital represented by labor power does, in the process of production, undergo an alteration of value. It both reproduces the equivalent of its own value and also produces an excess, a surplus-value, which may itself vary, may be more or less according to circumstances. This part of capital is continually being transformed from a constant into a variable magnitude. I therefore call it the variable part of capital or, shortly, *variable capital*.[40]

Variable capital, then, is the sum of wages expended on the purchase of labor-power to be consumed in productive labor: *constant* capital is the remainder of the total capital:

> The same elements of capital which, from the point of view of the labor process, present themselves respectively as the objective and subjective factors, as means of production and labor-power, present themselves, from the point of view of the process of creating surplus-value, as constant and variable capital.[41]

I.2. Summary of chapter I

The basic economic category in the Marxian system is that of *value*. Marx establishes a fundamental distinction between *value* and *price*. The former is defined as *the quantity of socially necessary labor-time* expended in the production of a commodity, the latter as the *exchange-ratio of a commodity to other commodities* expressed in money and established at a particular time by the market mechanism. This distinction reflects the difference between aggregative long-run and partial short-run economic analysis. Marx's main concern is with long-run analysis in aggregative terms.

Marx defines *money* as the "phenomenal form" of *value*: the monetary unit of a given society at a given time is held to represent a determinate amount of labor-time. This *labor-content of the price unit* is empirically determinable through the ratio between the *aggregate value* of the commodities produced by a society in a time period and the *sum of the prices of those commodities*. It is also identical to the *number of hours of productive labor performed* in the time period divided by the *money net income of the laborers and capitalists* during that period.

Measurement of the *productivity of labor* requires calculation of *real output* in another unit than that used to measure factor input. Marx treats *use-value* (utility) as a quantifiable magnitude, but fails to provide an explicit unit of measure for real output. Measurement of output in *constant prices* is fully in accordance with the implicit Marxian treatment of the category of use-value.

Capital is made subject to an objective standard of measurement by Marx's definition of it as *accumulated past labor*. Its essential nature, in Marx's view, is to serve as the means whereby the class of capitalists appropriates the social surplus-product.

Under capitalism this surplus-product has to be sold on the market, and therefore takes the form of *surplus-value*. Surplus-value is defined as the difference between the total number of hours worked by productive laborers in the course of

39. Marx, *Capital*, vol. I, p. 584.

40. Ibid., vol. I, p. 232.

41. Ibid., vol. I, p. 233.

the year and the *value* (the *labor-content* of the money) paid to them as *wages*.

The *value* of the money wage is called *variable capital* by Marx because in return for this money the worker must perform more hours of work than his wage represents, and thereby add *surplus-value* to it. The ratio between surplus-value and variable capital is identical to this ratio of the "unpaid" to the "paid" portion of the working day. Marx calls this ratio the *rate of surplus-value* or *rate of exploitation*.

In addition to variable capital and surplus-value the *value* of a commodity also contains *value* transferred to it through the consumption of raw materials and through the wear and tear
35 (depreciation and obsolescence) undergone by the machinery used in production. Capital consumed in this way merely transfers its own value to the product, without creating any *new* value. Its value, thus, can be said to remain constant, changing only in concrete outer form. Those expenses of production which merely transfer preexisting *value* to the product are termed by Marx *constant capital*.

II. Basic quantitative relationships

36 The value of the *gross product*, during a given period, of the total social capital, resolves itself into these three constituent parts: *variable capital*, *constant capital*, and *surplus-value*. (In symbols, $P \equiv c + v + s$.) To each of these categories corresponds a section of the mass of commodities produced having a specific social destination. The variable capital is objectified in those use-values consumed by the class of productive wage-laborers; the constant capital in those use-values required to maintain intact the conditions of production and reproduction in the broadest sense; the surplus-value in those use-values consumed or invested by the class of capitalists.

The value of the social *net product*, on the other hand, consists solely of the new *value* produced; namely, the sum of variable capital and surplus-value. The net product in *real* (constant-price) terms is therefore identical to *the real net income* of the classes of laborers and capitalists, i.e., the *purchasing power* of aggregate wages and surplus-value. Consequently the productivity of labor (computed, of course, as
37 the index of real production per man-hour) has two distinct senses: a *gross productivity* and a *net productivity*. The two will be in a stable proportion only if the share of the value of the gross product consisting of constant capital remains stable. If the percentage of constant capital increases, then gross productivity will grow faster than net productivity, and inversely.

"c" and "v" in the foregoing identity are *flow variables*, whose value depends on the period over which they are computed. But, as their names indicate, each corresponds to a section of the total *capital stock*, which is determinable at any instant. This capital stock, therefore, can be defined by the identity $K \equiv C + V$, with each (upper case) stock variable related to its (lower case) flow counterpart by a specific rate of turnover.

The difference between these rates of turnover, however, is so great that such a procedure would unnecessarily complicate the whole analysis. A better procedure is to assume that the stock of variable capital is virtually zero, so that *the capital stock is assumed to consist entirely of constant capital, i.e.,* $K = C$.

This assumption may appear drastic, but in fact it is extremely realistic. Most large businesses in practice segregate the "variable" portion of their circulating capital in a special payroll account, whose maximum size is slightly 38
above the average payroll. But since production workers are generally paid several days to a week *after* the close of the payroll period, the "stock of variable capital" is always equaled or even exceeded by the liability "wages payable," so that its *net* value is actually zero or even negative! Marx was quite well aware of this , when in volume 1 (p. 621) he wrote "the laborer is not paid until after he has expended his labor-power ... he has produced, before it flows back to him in the shape of wages, the fund out of which he himself is paid, the variable capital." Gillman,[1] in his statistical study though not in his theoretical exposition, correctly sets the stock of variable capital at zero. We will do likewise throughout this study.

These three variables (C, v, s) form the terms in which Marx expresses the three fundamental quantitative relationships of his system: the *rate of exploitation* (s'), the *organic composition of capital* (Q), and the *rate of profit* (p').

II.1. The rate of surplus-value

The numerical value of the rate of surplus-value, and therewith the quantity of surplus-value produced, is determined by two factors: the *length of the working day* and the *value of labor-power* 39
(i.e., the length of the "necessary" portion of the working-day). These magnitudes are conceived as the average representative of the corresponding social aggregate.

> The labor which is set in motion by the total capital of a society, day in, day out, may be regarded as a single collective working-day. If, e.g., the number of laborers is a million, and the average working-day of a laborer is 10 hours, the social working-day consists of ten million hours.[2]

Similarly,

> The variable capital of a capitalist is the expression in money of the total value of all the labor powers that he employs simultaneously. Its value is, therefore, equal to the average value of one labor-power,

1. Gillman, *The Falling Rate of Profit*, pp. 44–45.
2. Marx, *Capital*, vol. I, p. 336.

> multiplied by the number of labor-powers employed.[3]

Any change in the rate of surplus-value must be the consequence of a change in one or both of these quantities, and therefore Marx draws a distinction between two different methods of augmenting that rate:

> The surplus-value produced by prolongation of the working-day, I call *absolute surplus-value*. On the other hand, the surplus-value arising from the curtailment of the necessary labor-time, and from the corresponding alteration in the respective lengths of the two components of the working-day, I call relative surplus-value.[4]

40 It should be made clear that Marx uses the terms "absolute" and "relative" surplus-value only to refer to *incremental* quantities and never to subdivide aggregate surplus-value. "Absolute surplus-value" is to be defined as *that change in surplus-value caused by a change in the duration of the working-period*, and "relative surplus-value" is to be defined as *that change in surplus-value caused by a change in the duration of the necessary labor-time (i.e., of the "paid" portion of the working period.)* In all subsequent use of the terms "absolute" and "relative" surplus-value these definitions are what is meant.

The relation between absolute and relative surplus-value may be illustrated simply as follows:

An average laborer working a 40 hour week at a rate of surplus-value of 100 % will produce surplus-value to the amount of 20 labor-units. If his hours of work per week are increased to 48 while the labor-content of his wage drops to 16 units due to an increase in productivity he will then produce 32 units of surplus-value per week. The increase of 12 units is composed of 8 units of *absolute surplus-value* and 4 units of *relative surplus-value*. The rate of surplus-value will of course have been doubled.

Put algebraically, this relationship can be
41 analyzed in this way:
If the working-day changes from Y hours to X hours, the productivity of labor per-hour increases by a %, the real wage per-hour increases by b %, and the original rate of exploitation is σ:

Absolute surplus-value is equal to

$$X - Y.$$

Relative surplus-value is equal to

$$\frac{Y}{1+\sigma}\left(\frac{a-b}{1+a}\right).$$

The new rate of surplus-value is

$$\frac{X(1+\sigma)(1+a)}{Y(1+b)} - 1.$$

These categories are important for the analysis of variations in real wages and in the length and intensity of the working day, variations which have a radically different significance according to whether they are simultaneous in a given society or represent the result of changes over time.

In the production of absolute surplus-value Marx regards a *simultaneous* difference in the intensity of work as equivalent to a difference in the duration of work. "The value created varies with the extent to which the intensity of labor deviates from its normal intensity in the society. A given working-day, therefore, creates no longer a *constant* but a *variable value*."[5]

But just as we saw to be the case with "skilled labor," this equivalence does not apply to *changes over time* in the average intensity 42
of labor itself. "If the intensity of labor were to increase simultaneously and equally in every branch of industry, then the new and higher degree of intensity would become the usual and normal degree for the society, and would cease to be taken into account as an extensive magnitude."[6]

If the duration of the working-day is unchanged, absolute surplus-value, an "*extensive magnitude*," cannot arise. The opposite is the case with relative surplus-value, which arises from an "*intensive magnitude*,"[7] the *productivity of labor*. Every change in this productivity must ultimately affect the relative share of the working-day devoted, at a given real wage, to "necessary labor."

Absolute surplus-value thus cannot result from historic changes in the average degree of intensity or skill. The converse of this is that *relative surplus-value* cannot result from *simultaneous* differences in the value of labor-power: in other terms, assuming that all workers receive a wage proportional to the value of their labor-power (defined by Marx as "the value of the necessaries of life habitually required" plus 43
"the expenses of developing that labor-power"), it would follow that all produce surplus-value

3. Marx, *Capital*, vol. I, p. 331.

4. Ibid., vol. I, p. 345.

5. Ibid., vol. I, p. 575.

6. Ibid., vol. I, p. 575.

7. On the distinction between "extensive" and "intensive" magnitudes, derived by Marx from Hegel's *Logic*, see Naville, *De L'Alienation à la Jouissance: La Genèse de la Sociologie du Travail chez Marx et Engels*, pp. 377–378.

at the same rate of exploitation. Or, to put the same idea in rigidly "orthodox" terms: in equilibrium the ratio between the wages of any two workers is equal to the ratio between their marginal products.

No less a Marxist than Hilferding, however, has disputed the above proposition:

> To deduce the value of the product of labor from the wage of labor conflicts grossly with the Marxist theory. ... Even if the rate of exploitation of unskilled labor were known to me, I should have no right to assume that the identical rate of exploitation prevailed for skilled labor. For the latter the rate of exploitation might be much lower.[8]

If this be true, then the amount of surplus-value depends, not on the quantity of concrete labor performed at a given rate of exploitation, but on the *shapes* of the dispersion of skills and of rates of exploitation, a concept impossible to work with empirically.

Fortunately Hilferding's argument can be shown to be based on a misinterpretation of a single sentence from Marx: "Ist der Wert dieser Kraft höher, so äussert sie sich daher auch in höherer Arbeit und vergegenständlicht sich daher, in denselben Zeiträumen, in
44 verhältnissmassig höheren Werten."[9] Hilferding argued that, because in the second German edition of *Das Kapital* the word "aber" (however) stood in place of the first "daher" (consequently), the *sense* of the passage "is somewhat as follows: 'Even though the value of this power be higher, it can none the less produce more surplus-value, because it manifests itself in higher work' — and so on."[10]

With his confusion between the "aber" of the *second* edition and the "daher" of the third, and his little phrase "and so on," Hilferding has quite simply blotted out the key concept of this passage: that labor-powers of higher value "objectify themselves ... in a *proportionately* (*verhältnissmässig*) higher mass of value." Marx thus is saying quite bluntly that the value created is *proportional* to the value of the labor power, that *the rates of exploitation are equal.*

In a later part of volume I Marx is, if possible, even more explicit. This is the discussion of *piece wages*, which Marx considers "*the form of wages most in harmony with the capitalist mode*
45 *of production*,"[11] and which of course consist of paying a relative wage corresponding directly to relative productivity, and thus directly carrying out the process of expressing qualitatively different concrete labor-powers as expressions of homogeneous, abstract, social labor, differing only quantitatively:

> With regard to actual receipts there is, therefore, great variety according to the different skill, strength, energy, staying-power, etc., of the individual laborers. Of course this does not alter the general relations between capital and wage-labor. First, *the individual differences balance one another* in the workshop as a whole, which thus supplies in a given working-time the average product, and the total wages paid will be the average wages of that particular branch of industry. Second, *the proportion between wages and surplus-value remains unaltered, since the mass of surplus-labor supplied by each particular laborer corresponds with the wage received by him.*[12]

Piece-wages are the form of wages "most in harmony with the capitalist mode of production" because, despite transitory divergences between the relative value and relative price of specific labor-powers, in the long run labor-power, unlike other commodities, tends to sell at its value and, in a competitive factor-market, tends to be allocated in such a way that the product, and hence the surplus product, of each laborer "corresponds with the wage received by him."

Consequently, relative surplus-value can only 46
result from *changes in the value of labor-power over time*, and absolute surplus-value, over time, only from *changes in the duration of the working-day.* The factors determining these magnitudes and their changes are identically those determining the rate of exploitation.

The rate of exploitation is the immediate representation of the prevailing social relationship between the two fundamental classes, and as such its quantitative determination cannot be the result of "pure" economic causes. This is most immediately apparent in the length of the working-day, whose basic duration is presently fixed by legislation, itself the outcome of long political and social struggles. Accordingly Marx declares:

> We see then that, apart from extremely elastic bounds, the nature of the exchange of commodities itself imposes no limit to the working-day, no limit to surplus-labor.

8. Hilferding, *Böhm-Bawerk's Criticism of Marx*, p. 142.

9. Marx, *Kapital*, vol. I, p. 206, in translation, "This power being of higher value, it consequently also manifests itself in superior labor and therefore is objectified, in equal spaces of time, in a proportionately higher mass of value."

10. Hilferding, *Böhm-Bawerk's Criticism of Marx*, p. 142.

11. Marx, *Capital*, vol. I, p. 608.

12. Ibid., vol. I, p. 607 (italics mine).

> ... There is here, therefore, an antinomy, right against right, both equally bearing the seal of the law of exchanges. *Between equal rights force decides.* Hence is it that in the history of capitalist production, the determination of what is a working-day presents itself as the result of a struggle, a struggle between collective capital, i.e., the class of capitalists, and collective labor, i.e., the working class.[13]

Thus absolute surplus-value is determined by "force," and we know that the past four generations have seen a prevailing tendency toward reduction of the working-day. With relative surplus-value, on the other hand, we seem at first glance to be dealing with an economically determined cause, the value of labor-power, which, Marx states, "is determined by the value of the necessaries of life habitually required by the average laborer,"[14] that is, the value of the "*real wage.*"

What however, determines the quantity of "necessaries of life" whose value determines that of labor-power? It is certainly not a physiological minimum determined with the force of an "iron law"; on the contrary it is a socially and historically determined magnitude subject to evolution:

> The number and extent of so-called necessary wants, as also the modes of satisfying them, are themselves the product of historical development, and depend therefore to a great extent on the degree of civilization of a country,[15] and in particular on the conditions under which, and consequently on the habits and degree of comfort in which, the class of free laborers has been formed. In contradistinction therefore to the case of other commodities, there enters into the determination of the value of labor-power a historical and moral element.[16]

For particular short-run partial analyses the real wage can be held constant, since "in a given country at a given period the average quantity of the means of subsistance necessary for the laborer is practically known."[17] Nevertheless in the long run the real wage is most definitely a variable quantity. The question is how far, and in what direction, can it be expected to vary?

Perhaps the most widespread single misconception about Marx's view of capitalism, a misconception shared by anti-Marxists like John Strachey[18] with the High Priests of Stalinist "Marxism" (of whom the foremost surviving specimen is Maurice Thorez), is the belief that Marx enunciated a "Law" of "Increasing Misery" or "Absolute Immiseration" or "Pauperization." According to this "Law," the net effect of capitalist development would be to drive real wages, despite temporary fluctuations, down toward the absolute physiological minimum.[19]

Two citations are usually presented as evidence for this view. In the "Communist Manifesto" of 1847 Marx and Engels wrote:

> The modern laborer, on the contrary, instead of rising with the progress of industry, sinks deeper and deeper below the conditions of existence of his own class. He becomes a pauper, and pauperism develops more rapidly than population and wealth. And here it becomes evident that the bourgeoisie is unfit any longer to be the ruling class in society ... because it is incompetent to assure an existence to its slave within his slavery, because it cannot help letting him sink into such a state that it has to feed him, instead of being fed by him.[20]

Twenty years later, in volume I of *Capital*, Marx stated:

> The greater the social wealth, the functioning capital, the extent and energy of its growth, and, therefore, also the absolute mass of the proletariat and the productiveness of its labor, the greater is the industrial reserve-army. The same causes which develop the expansive power of capital, develop also the labor-army at its disposal. The relative mass of the industrial reserve-army increases therefore exponentially with wealth. But the greater this reserve-army in proportion to the active labor-army, the greater is the mass of a consolidated surplus-population, whose misery is in inverse ratio to its torment of labor. The more extensive, finally, the lazarus-layers of the working-class and the industrial reserve-army, the greater is official pauperism. *This is the absolute general law of capitalist accumulation.* Like

13. Marx, *Capital*, vol. I, p. 259 (italics mine).

14. Ibid., vol. I, p. 568.

15. Compare Ricardo: "It is not to be understood that the natural price of labor, estimated even in food and necessaries, is absolutely fixed and constant. It varies at different times in the same country and very materially differs in different countries. It essentially depends on the habits and customs of the people." Ricardo, *Principles of Political Economy*, p. 96.

16. Marx, *Capital*, vol. I, p. 190.

17. Ibid., vol. I, p. 190.

18. The failure of capitalism to comply with this alleged "Law" is the main thesis of his *Contemporary Capitalism.*

19. A very valuable discussion of this matter is to be found in the article by Sowell, "Marx's 'Increasing Misery' Doctrine", 111 ff.

20. Marx and Engels, "Manifesto of the Communist Party", p. 333.

> all other laws it is modified in its working by many circumstances, the analysis of which does not concern us here.[21]

50 The first of these passages, which speaks of "the modern laborer," can legitimately, though not conclusively, be interpreted as a prediction of the impoverishment of the working class. The second, however, which states Marx's thought in a much more developed way, gives no support for the "Immiseration" doctrine. What Marx is here concerned with is that portion of the labor-force more-or-less permanently *unemployed* as a result of capital-intensive technological progress. These are workers who have sunk "*below the conditions of existence*" of their class; who produce no more surplus-value, but must be fed at the expense of the ruling class. This is a stratum, Marx declares with mathematical precision, "whose misery is *in inverse ratio* to its torment of labor (deren Elend im umgekehrten Verhältnis zu ihrer Arbeitsqual steht)."[22] In sum, Marx is talking about the West Virginia ex-coal-miner, not (or not yet) the Akron rubber-worker.

What then is Marx's actual analysis of the historical tendency of the real wage? As in the determination of the working day, so in that of the real wage Marx places primary emphasis on bargaining power:

> The fixation of [the rate of surplus-value's] actual degree is only settled by the continuous struggle between capital and labor, the capitalist constantly tending to reduce wages to their physical minimum, and to extend the working day to its physical maximum, while the working man constantly presses in the opposite direction.
>
> The matter resolves itself into a question of the relative powers of the combatants.[23]

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This bargaining process, however, always takes place in a context set by general economic conditions:

> a struggle for a rise of wages follows only in the track of *previous* changes, and is the necessary offspring of previous changes in the amount of production, the productive powers of labor, the value of labor, the value of money, the extent or the intensity of labor extracted, the fluctuations of market prices, dependent upon the fluctuations of demand and supply, and consistent with the different phases of the industrial cycle.[24]

In this discussion of wages Marx maintains that "in its merely economical action capital is the stronger side," and thus that under capitalism "it is the nature of *things*" that "the general tendency of capitalist production is not to raise but to sink the average standard of wages, or to push the *value of labor* more or less to its *minimum limit*."[25]

All of this, however, still does not add up to a discussion of real wages: Marx is referring to the "value of labor" and considering struggles over wages as "efforts at maintaining the given value of labor."[26] 52

In fact Marx never declares explicitly that real wages *must* tend to rise in the course of capitalist development. This position, however, has a very strong implicit basis in Marx's general approach to the question.

The theory that *the level of real wages must tend to increase* can be derived from several points in Marx's discussion of wages:

(a) As we have seen, the "necessary wants" are dependent on the "degree of civilization." As capitalism develops, therefore, these "necessary wants" increase, so that the socially determined minimum grows relatively to a physiologically-determined subsistence level. A possible mechanism to bring this about is that increases in working-class living standards, when they partially correspond to the already-realized progress of other classes, would be regarded by the workers as permanent and psychologically incorporated into the "necessary wage."[27]

(b) Marx regards the expenses of education and training as factors determining the value of labor-power, and states that these expenses "vary with the mode of production."[28] To the extent that increasing productivity requires increased specialization, training, and literacy on the part of the average worker the necessary minimum real wage is thereby increased. 53

(c) Marx regarded the increasing *intensity* of work as a central aspect of economic development under capitalism. This increased intensity of labor, if not compensated by at least a proportional increase in real wages, would be physically ruinous to the worker. "By increasing the *intensity* of labor, a man may be made to expend as much vital force

21. Marx, *Capital*, vol. I, p. 707.
22. Marx, *Kapital*, vol. I, p. 679.
23. Marx, *Value, Price, and Profit*, p. 88.
24. Ibid., p. 84.
25. Ibid., p. 92.
26. Ibid., p. 92.
27. This point is made quite strongly in the essay by Sowell previously cited.
28. Marx, *Capital*, vol. I, p. 569.

in one hour as he formerly did in two. In checking this tendency of capital, by struggling for a rise of wages corresponding to the rising intensity of labor, the working man only resists the depreciation of his labor and the deterioration of his race."[29] Thus increased real wages are *necessary* to the very self-preservation of the worker.

(d) Finally, the growth of productivity allows for increases in real wages without any decrease in the amount of surplus-value produced and even with an increase in surplus-value. When the value of consumption goods is falling, "it is possible with an increasing productiveness of labor for the price of labor-power to keep on falling and yet this fall to be accompanied by a constant growth in the mass of the laborer's means of subsistence."[30]

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This third means of raising the necessary real wage is available only to the extent that workers are organized and can compel capital to share with them the gains from increasing productivity. It "*depends on the relative weight which the pressure of capital, on the one side, and the resistance of the laborer, on the other, throws into the scale.*"[31] And of course, in the most celebrated passage of *Capital* Marx speaks of the increasing "revolt of the working-class, a class always increasing in numbers, and disciplined, united, organized by the very mechanism of the process of capitalist production itself."[32]

The conclusion must be that if there is a "law" of real wages in the Marxian system it should be entitled, not the "Law of Increasing Misery" but the "*Law of Increasing Requirements.*" And this indeed is how Lenin, in 1893, put the matter:

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> We must not lose sight of the indubitable fact that the development of capitalism inevitably entails a rising level of requirements for the entire population, including the industrial proletariat. This rise is ... brought about by the crowding together, the concentration of the industrial proletariat which enhances their class consciousness and sense of human dignity and enables them to wage a successful struggle against the predatory tendencies of the capitalist system. This law of increasing requirements has manifested itself with full force in the history of Europe—compare, for example, the French proletariat of the end of the eighteenth and of the end of the nineteenth centuries, or the British worker of the 1840's and of today.[33]

What Marx clearly does expect is a decline, not of the real wage, but of the *value* of the real wage. He maintains that the continual increase in the potential labor-force due to the proletarianization of former peasants, artisans, and shopkeepers, in addition to the natural growth of population, will tend to exceed the increase in employment due to capital accumulation, particularly since he expects technological progress to be highly capital-intensive.

If we assume, with Marx, that the structure of the labor market is or can be made essentially monopolistic, the existence of a growing "industrial reserve army" is perfectly consistent with a rising real-wage level. But since this "monopoly power" of unions is at best far from complete, and is confronted with at least as well organized a "monopsony power," there are substantial economic forces working against a more than gradual tendency toward increasing real wages. Thus despite the increase in the real wage, "the abyss between the laborer's position and that of the capitalist would keep widening"[34] if the working-day remains constant.

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What then can be predicted on the basis of the Marxian system as to the long-run tendency of the rate of surplus-value? As we have seen, this change is made up of both absolute and relative surplus-value, but absolute surplus-value tends to be a *negative*, and relative surplus-value a *positive*, magnitude. In other words, both the total working day and the duration of its "paid" portion tend to decrease in the long-run. There can therefore be no general economic law governing the movement of the rate of exploitation: it appears almost entirely as a function of the balance of social forces. Accordingly, despite violent short-term fluctuations, any long-run increase or decrease in the rate of exploitation would be expected by Marx to show itself only as an exceedingly slow and gradual trend. Marx himself expected the rate of surplus-value to increase in the long-run. Nevertheless, in terms of the Marxian system, the actual prevailing historical tendency of this rate cannot be predicted on theoretical grounds—it must be determined empirically.

57

In analyzing the rate of surplus-value it remains to ascertain the concrete manifestations of the categories v and s in the capitalist economic system.

v cannot be identified with the total wage-bill of the enterprise or of society. Marx defines it as representing exclusively the outlay on labor-

29. Marx, *Value, Price, and Profit*, p. 82.
30. Marx, *Capital*, vol. I, p. 573.
31. Ibid., vol. I, p. 573.
32. Ibid., vol. I, p. 783.
33. Lenin, "On the So-called Market Question", p. 106.
34. Marx, *Capital*, vol. I, p. 573.

power to be consumed as *productive labor*, the sole source of surplus-value:

> Capitalist production is not *merely* the production of commodities, it is essentially the production of surplus-value. ... *That laborer alone is productive who produces surplus-value* for the capitalist, and thus works for the self-expansion of capital. If we may take an example *from outside the sphere of production of material objects*, a schoolmaster is a productive laborer when, in addition to belaboring the heads of his scholars, he works like a horse to enrich the school proprietor. That the latter has laid out his capital in a teaching factory, instead of in a sausage factory, *does not alter the relation*. Hence the notion of a productive laborer implies not merely a relation between work and useful effect, between laborer and product of labor, but also a specific, social, relation of production, a relation that has sprung up historically and stamps the laborer as the direct means of creating surplus-value.[35]

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Marx thus states *two* necessary conditions for labor to be productive:

(a) The productive laborer must "work for the self-expansion of capital"—his labor-power must exchange with *capital* and not with revenue, he must work for a capitalist, not for the direct consumer of his product. "A singer who sells her song on her own is an unproductive worker. But the same singer commissioned by an entrepreneur to sing in order to make money for him is a productive worker. For she produces capital."[36]

(b) The productive laborer must *produce commodities* since surplus-value, like value in general, can only come into existence if it is embodied in a commodity. However the commodity is not, as Adam Smith thought, defined as necessarily a durable material substance. Marx makes it unequivocally clear that the services performed by schoolmaster and singer are *commodities* defined as such by their abstract characteristics as *product of social labor* and *object of alienation*.

59

What, then, is *unproductive* labor? It is not useless, aimless activity (which would be a type of *leisure*, not labor). Unproductive labor is defined by Marx in its contrast to productive labor: *it is that portion of the total social labor which produces no surplus-value* because it is not engaged in commodity production or because it is not employed by a capitalist. There are thus vast domains of social activity, notably the spheres of *circulation* and of *government*, in which the wage-laborers are *unproductive* despite the formal identity of their social position to that of wage-laborers in the productive spheres.

Nevertheless, since it ranks as social *labor*, unproductive labor must still be *socially necessary*. This follows from the fact that the *work* performed by these laborers is necessary to *capital*. "The capitalist mode of production begets ... the creation of a vast number of employments, at present indispensable but in themselves superfluous."[37] Certainly a genuinely socialist community would require a vastly altered governmental and distributional system. But today the only relevant criterion is necessity for the functioning of *capitalist* society.

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Within the private capitalist sector, the Marxian division between productive and unproductive labor corresponds quite closely to the usual business bookkeeping and cost-accounting practice. The wages of productive employees are *costs*, and go above the "gross-profit line"; the payments to non-productive workers are *expenses*, and go below it. The *Census of Manufactures* classification of "Production and related workers" likewise corresponds to these categories:

> Workers (up through the working foreman level) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial, watchman services, product development, auxiliary production for plant's own use (e.g. power plant), record keeping, and other services closely associated with these productive operations.

Among non-"production-related workers" the census definition includes:

> Factory supervision above the working foreman level, sales, sales delivery, advertising, credit, collection, installation and servicing of own products, clerical and routine office functions, executive, purchasing, finance, legal, personnel, etc.[38]

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With one minor exception (installation and

35. Marx, *Capital*, vol. I, p. 558 (italics mine).

36. Marx, *Theories of Surplus-Value*, p. 186.

37. Marx, *Capital*, vol. I, p. 581. Cf. also Robinson, *An Essay on Marxian Economics*, p. 20 n. "The distinction [between productive and unproductive labor] is clearly important. Industry and transport are necessary to society in a sense in which the activity of searching for buyers is not, and in the present age of advertising the distinction between production costs and selling costs is even more significant than it was in Marx's own day."

38. U.S. Bureau of the Census, *Census of Manufactures, 1954*, vol. I, p. xvii.

servicing of own products) this enumeration quite conforms to the Marxian definitions.

For the same reason that v does not include the entire wage bill, s does not stand for the total of "unpaid labor" performed by the class of wage-workers. A great deal of social labor is "unproductive"; nevertheless the unproductive laborer, exactly like the productive worker, sells his labor-power at a price approximating its cost of production, and consequently also "performs partly *unpaid labor*."[39]

Surplus-value thus is that portion of the social surplus-labor which assumes the form of value and in that form is appropriated by the property-owning classes. It is divided into three categories: "profit of enterprise," "interest," and "rent."

It is here that *profit* is defined by Marx. Since commodities are sold at a price systematically diverging from their value, the surplus-value *embodied* in a commodity always differs from the surplus-value *realized* by the capitalist producer. It is this latter quantity alone that constitutes *profit* from the viewpoint of the individual capitalist. But on the scale of the whole society, 62 if total interest and rent are added to the total profit, this aggregate must be equal to the aggregate surplus-value:

> In a capitalist society, this surplus-value ... is divided among the capitalists as a dividend in proportion to the percentage of the total social capital held by each. In this shape the surplus-value appears as the average profit which, in its turn, is separated into profit of enterprise and interest, and which in this way may fall into the hands of different kinds of capitalists ... the landlord, in his turn, pumps a portion of this surplus-value, or surplus-product, out of the capitalist in the shape of rent.
>
> Hence, when speaking of profit as that portion of surplus-value which falls to the share of capital, we mean average profit (profit of enterprise plus interest) which has already been limited by deducting the rent from the aggregate profits (identical in mass with the aggregate surplus-value.) Profits of capital (profit of enterprise plus interest) and ground-rent are merely particular constituents of surplus-value, categories by which surplus-value is distinguished according to whether it falls into the hands of capital or of private land. This classification does not alter its nature in any way. If added together, these parts form the sum of the social surplus-value.[40]

If v, then, comprises only the wages of productive laborers, and s is "*identical in mass*" with the sum of profit-of-enterprise, interest, and rent, how are the wages of unproductive labor to be treated? Although Marx, as we will see, provides in essence a clear explanation, he does not do so explicitly, and even seems to contradict himself in certain regards. This has led to gross misinterpretations, some commentators seeking 63 to subsume these wages under "v,"[41] others, with only slightly less violence to Marx's meaning, under "s."[42]

Concretizing Sweezy's view, Gillman writes:

> In Marx's schema, 'profit' includes all income accruing to the capitalist above his prime and factory overhead costs, and is equivalent to the 'gross profit' in capitalist accounting practice. The whole congeries of administrative expense and selling costs, as well as rent, interest, and business taxes, are all part of surplus-value.[43]

Having thus totally misconstrued the content which Marx ascribed to the category *surplus-value*, Gillman quite naturally got weird-looking results from his attempt at an empirical test of Marx's predictions concerning the rate of profit. In order to obtain a closer correspondence with the facts, he therefore inserted into what he took to be the Marxian theory two new categories: "unproductive expenses" and "diminished s" (net profit), the latter being equal to $s - u$.

This is theoretically an indefensible procedure[44] both because it retains the erroneous definition of s and because in u and "diminished s" it introduces categories which are not constituent parts of the value of the commodity and consequently cannot be integrated in the general Marxian model of capitalist production. 64

A seeming justification for this approach, nevertheless, can be found in a passage from volume II which presents the expenses of circulation as "a deduction from the surplus-value or surplus-product."[45] However, in its proper context, even this passage points toward conclusions very different from those Gillman has drawn. In his original text Marx wrote:

> Das allgemeine Gesetz ist, daß alle Zirkulationskosten, die nur aus der Formverwandlung der Ware entspringen, dieser

39. Marx, *Capital*, vol. III, p. 354.

40. Ibid., vol. III, p. 955.

41. Cf. Robinson, *An Essay on Marxian Economics*, p. 20, fn.

42. Cf. Sweezy, *The Theory of Capitalist Development*, p. 279: "The employees in the commercial sphere are paid out of surplus-value."

43. Gillman, *The Falling Rate of Profit*, p. 17.

44. In practice "$s - u$" can be made equivalent to the Marxian s.

45. Marx, *Capital*, vol. II, p. 169.

> letztren keinen Wert hinzusetzen. Es sind bloss Kosten zur Realisierung des Werts oder zu seiner Übersetzung aus einer Form in die andre. Das in diesen Kosten ausgelegte Kapital (eingeschlossen die von ihm kommandierte Arbeit) gehört zu den *faux frais* [unproduktiven, aber notwendigen Kosten] der kapitalistischen Produktion. Der Ersatz derselben muss aus dem Mehrprodukt geschehn, und bildet, die ganze Kapitalistenklasse betrachtet, einen Abzug vom Mehrwert oder Mehrprodukt, ganz wie für einen Arbeiter die Zeit, die er zum Einkauf seiner Lebensmittel braucht, verlorne Zeit ist.[46]

65 To understand this it is essential to realize that Marx refers to the expenses of circulation as "a deduction from the surplus-value or surplus-product" *only* "from the point of view of the entire capitalist class" and *not* from the standpoint of the process of capitalist production as a whole. For this process they are "necessary expenses" and no more a "deduction from surplus-value" than are the totality of hours of working time "lost time" to society, even though they appear as this to the working-class. In reality what takes place in the unproductive spheres is simply *the outlay of a determined and necessary constituent part of the total social capital*:

> *These costs form additional capital*, but they produce no surplus-value. They must be made good out of the value of the commodities. For a portion of the value of the commodities must once more be converted into these circulation costs; and no additional surplus-value is created thereby. So far as this concerns the total capital of society it means that a portion of it must be
66 set aside for secondary operations which are no part of the process of creating value, and that this portion of the social capital must be continually reproduced for this purpose.[47]

Since these commercial and political overhead expenses, though unproductive of new value, signify the consumption of a portion of the social capital, the *value* consumed in this way, in order to assure its continual reproduction, must enter into the *total value* of the mass of commodities produced. "The additional value, which the merchant adds to the commodities by his expenses, resolves itself into an addition of previously existing values."[48]

As we saw earlier, the difference between variable and constant capital is founded on their differing modes of transferring value to the commodity-product; and in the case of constant capital this characteristic mode is precisely *the addition of previously existing values.* Consequently the appropriate treatment for the outlay on unproductive expenses in general, provided only that they are "socially necessary" under the existing form of social organization, is to regard them as part of the *constant capital* advanced and expended.

Marx never explicitly defines the "unproductive but necessary expenses" of capitalist production as part of the *constant* capital, since in his reproduction schemata he abstracts entirely from the unproductive spheres (which would complicate the analysis in several ways, including the seeming paradox that the fraction of the consumer-goods output consumed by unproductive laborers would have to be considered "capital goods" in a peculiar sense) and assumes, as in most places throughout *Capital*, a society composed exclusively of capitalists and productive laborers. Nevertheless in the problem with which the present study is concerned, that of the rate of profit, Marx is categorically clear that the necessary unproductive expenses are to be *treated* in that way: 67

"*Every expense of this kind ... reduces the rate of profit* because the advanced capital increases but not the surplus-value. If the surplus-value s remains constant, while the advanced capital C increases to $C+\Delta C$, then the place of the rate of profit $\frac{s}{C}$ is taken by the smaller rate of profit $\frac{s}{C+\Delta C}$."[49]

In practice unproductive expense and surplus-value can sometimes masquerade in each others form. Thus a large portion of top administrative salaries and perquisites is merely a disguised form of profit[50] while, in the opposite case, for "the actual retailers" a major part of 68

46. Marx, *Kapital*, vol. II, p. 143, in translation, "The general law is, that all those expenses of circulation which only arise from changes of form of commodities, add no value to the latter. They are merely expenses required for the realization of value or for its conversion from one form into another. The capital laid out for these expenses (including the labor employed by it) belongs to the *faux frais* [unproductive but necessary expenses] of capitalist production. Its replenishment must be carried out from the surplus-product and forms, from the point of view of the entire capitalist class, a deduction from the surplus-value or surplus-product, just as, for a laborer, the time required for the purchase of his means of subsistence is lost time."

47. Marx, *Capital*, vol. III, p. 343 (italics mine).

48. Ibid., vol. III, p. 345.

49. Ibid., vol. III, p. 353 (italics mine).

50. "On the basis of capitalist production a new swindle develops in stock enterprises with the wages of management. It consists of placing above the actual director a board of managers or directors, for whom superintendence and management serve in reality only as a pretext for plundering stockholders and amassing wealth." (ibid., vol. III, p. 458)

their nominal profit is really only "wages for labor—wretched unproductive labor though it is."[51]

II.2. The organic composition of capital

The difference between constant and variable capital, as we have seen, reflects the fundamental distinction between the "objective and subjective factors" of the labor process, between the means and conditions of production and living productive labor. The relationship between these two sides of the labor-process can be expressed quantitatively through a number of different ratios of which one, the "organic composition of capital," is placed by Marx in a pivotal position in his general theory. Marx defines this ratio in these terms:

> A definite number of laborers corresponds to a definite quantity of means of production, so that a definite quantity of living labor corresponds to *a definite quantity of labor already objectified in means of production.*[52]

69 As Joan Robinson puts it, what Marx means by "organic composition" is simply "*capital per man employed*"[53] (assuming a working day of given length). It is to be expressed quantitatively as the ratio between two quantities of labor-time: the *value* invested in means of production and the *value* newly created during the production period.

In algebraic form, therefore, the organic composition of capital is defined by the formula $Q = \frac{C}{v(1+s')}$ or, equivalently, $Q = \frac{C}{v+s}$.[54]

Marx, however, is far from always expressing himself this clearly on the precise definition of what he means by "organic composition," and this has misled many commentators. Thus Gillman:

> From the formula $c + v + s = c'$ Marx derived three ratios which served him as foundation stones for his theory of capitalist development. One of these is the ratio between c and v—between constant capital consumed and variable capital consumed. This ratio, commonly expressed as $\frac{c}{v}$, Marx called the *organic composition* of capital. He called it 'organic' because it expresses the relations of the 'dead' to the 'living' labor—of the constant to the creative qualities of the variable capital.[55]

70 Gillman starts from the formula $c+v+s = c'$. But this is not the formula for *capital*, it is the formula for the *commodity-product*. The constant and variable capital *consumed* are not at all the necessary representation of the constant and variable capital involved in the production process. The former are *flows*, the latter *stocks*. Only if there exists no fixed capital, and if all portions of the circulating capital have equal periods of turnover, can these two ratios coincide.

It is true that in many places Marx proceeds on just this assumption, and thus generally operates with the $\frac{c}{v}$ ratio, assumed equivalent to the organic composition as defined above. But for him it had exclusively the character of a drastic and unrealistic simplification, adopted solely for convenience in arithmetic illustrations. At all points Marx makes it very clear that, so far as constant capital is concerned, it is the *invested* capital ("The mass of means of production employed")[56] that is the basis for all ratios involving the composition of capital, and *not* the constant capital consumed in the total process of social production. By identifying the two, Gillman was led to a misleading and laborious computation of organic compositions and rates of profit on a "flow basis," alongside his at least more relevant computations on a "stock basis."

However, recognizing that constant capital is 71
to be computed exclusively on a "stock basis," as the average invested capital during a given period, clears up only the least of the difficulties. In the ratio $\frac{C}{v}$ the symbols do not stand for the means of production and living labor employed, but for the *values* invested in given quantities of labor-power and means of production, which is not at all the same thing:

> The composition of capital is to be understood in a twofold 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 labor-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 labor-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 labor necessary for their employment, on the other.* I call the former the *value-composition*, the latter the

51. Marx, Letter to Engels of April 30, 1868, in Marx and Engels, *Selected Correspondence*, pp. 244–245.

52. Marx, *Capital*, vol. III, p. 171 (italics mine).

53. Robinson, *An Essay on Marxian Economics*, p. 8.

54. Cf. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson".

55. Gillman, *The Falling Rate of Profit*, p. 16.

56. Marx, *Capital*, vol. I, p. 671.

> *technical composition* of capital. Between the two there is a strict correlation. To express this, I call the value-composition, 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.[57]

From this passage Gillman comes to the conclusion that:

> Marx was very clear on the point that, whenever he dealt with the relation between the organic composition of capital and the rate of profit, it was to 'value-composition' and not 'technical composition' that he referred. It is in the value relations between the constant and the variable capitals that Marx located this aspect of his theory of economic development.[58]

72

But if there is one thing clear here it is that Marx is saying nothing of the sort. The *value-composition* can be assimilated to the *organic composition* only "in so far as it is determined by its technical composition and mirrors the changes of the latter" due to the existence of "a strict correlation" between the two. This is by no means always the case: "Capitals of the same organic composition may have a different value-composition."[59]

By "technical composition" Marx essentially signifies what modern economists call "capital intensity," the quantity of capital goods in "real" terms cooperating with each worker at some "normal" level of full employment, the ratio $\frac{\text{Means of Production}}{\text{number of workers}}$.

In what sense, then, can it be said that changes in *this* ratio have a "strict correlation" with changes in the value-composition?

Value-composition (to which we arbitrarily attach the symbol R) is given by the formula $R = \frac{C}{v}$. Technical composition (symbol T) is then given by $T = \frac{C}{v} \cdot \frac{I_v}{I_C}$ (I_v and I_C being the values of the price indexes for labor-power and means of production, respectively.)

73

A strict correlation will exist only if every relative change in T will produce an identical relative change in R—i.e., if the elasticity of R with respect to T is unitary. Unitary elasticity means that $\frac{dR}{dT} \cdot \frac{T}{R} = 1$. Since $R = T\frac{I_C}{I_v}$, $\frac{dR}{dT} = \frac{I_C}{I_v}$ and $\frac{T}{R} = \frac{I_C}{I_v}$, thus $\left(\frac{I_C}{I_v}\right)^2 = 1$, and $I_C = I_v$.

This "strict correlation," therefore, can exist only if the price indexes themselves are always equal, a virtual impossibility. There is, moreover, an additional difficulty. Variable capital is "the index of ... a definite quantity of living labor set in motion" *if and only if* "the rate of surplus-value and the working day have been assumed to be constant and the wages for a definite working day are given."[60] Marx throughout makes this assumption, but he makes it purely in order to simplify his exposition. In any attempt at analysis it must at a certain point be dropped, and Marx's failure to do so explicitly has resulted, not in simplification, but in enormous confusion.

The relationship between R and Q depends entirely on s', the rate of surplus-value, since $\frac{R}{Q} = 1 + s'$. Thus where s' is constant by definition, as we have seen to be the case in cross-section equilibrium, R and Q are really equivalent to each other, and it is in *this* sense that Marx sometimes treats them as identical. If over time s' is considered variable, changes in R will overstate or understate changes in Q according to whether s' increases or decreases.

74

On the long run tendency of the "organic composition of capital" Marx is categorical: Human progress, identical to the development of the productive forces, necessarily involves a steady increase in the technical composition of capital, and this must be reflected in an increasing organic composition:

> The progressively higher organic composition of the social capital is, in another way, but an expression of the progressive development of the social productive power of labor.[61]

II.3. The rate of profit

In the actual workings of a capitalist economy surplus-value, as such, is never directly perceptible. It attains reality only in its derivative form of *profit* (including, for purposes of this analysis, *rent* and *interest.*) Accordingly, it is only in this form that surplus-value can play its role as the goal and regulator of capitalist production. It operates directly as a constituent of the *price* of commodities, and only ultimately as a constituent of their *value.*

75

As we saw at the outset, Marx insists upon the necessary divergence between the "value" of a commodity and its "exchange value" or "natural price." This divergence is a reflection of the fact that it is *profit* and not surplus-value that

57. Marx, *Capital*, vol. I, p. 671 (italics mine).
58. Gillman, *The Falling Rate of Profit*, p. 30.
59. Marx, *Capital*, vol. III, p. 890.
60. Ibid., vol. III, pp. 172–173.
61. Ibid., vol. III, p. 248.

enters into price; and whereas surplus-value is entirely a function (given the rate of exploitation) of the variable capital consumed, *profit* is always calculated on the total capital advanced.

Since the organic composition of capital (which in cross-section equilibrium analysis is also equivalent both to capital-intensity and to "value-composition") differs from industry to industry (each having its own unique technology as well as specific material circumstances) the quantitative equivalence of profit to surplus-value would impose a different rate of profit in every particular industry. But just as it is a formal condition of equilibrium for the marginal return to a "factor" to be the same in all its alternative uses, so is it a real tendency of a capitalist economy for capital to "flow" to areas where the highest profits are expected and out of the least profitable fields of investment, thus modifying existing supply-demand relationships in such
76 a way as to reduce the previous profitability-differential. Worked out to its end, this tendency would result in the formation of a single rate of profit prevailing throughout the economy.

Accordingly, the tendency toward uniform profitability must result in relative commodity prices different from relative values. Marx calls these equilibrium prices the *prices of production*: "The price of production of a commodity is equal to its cost-price [i.e., $c+v$] plus a percentage of profit apportioned according to the average rate of profit, or, in other words, equal to its cost-price plus the average profit."[62]

This price of production is, of course, "the same thing as what Adam Smith calls *natural price*, Ricardo *price of production* or *cost of production*, and the physiocrats *prix necessaire*"[63] ... and the same as Marshallian "long run average cost." It acquires its specifically Marxian form on only one basis: *that of the determination of the average rate of profit itself.* This rate of profit is essentially the ratio $\frac{s}{C}$ for the total economy, the ratio of aggregate surplus-value to aggregate capital. "The general rate of profit arises through the total surplus-value produced
77 being calculated on the total capital of the community (the class of capitalists)."[64]

The aggregate surplus-value, then, enters into the product of every capitalist in proportion to his *invested* capital:

> The various capitalists, so far as profits are concerned, are just so many stockholders in a stock company in which the shares of profit are uniformly divided per 100, so that profits differ in the case of the individual capitalists only in accordance with the amount of capital invested by each in the aggregate enterprise, i.e., according to his investment in social production as a whole, according to the number of his shares.[65]

The identity of aggregate surplus-value to aggregate profit is thus held by Marx to reconcile, on the level of the whole economic system, the microeconomic disparity between the value and the price of production of individual commodities:

> The sum of all the prices of production of all commodities in society, comprising the totality of all lines of production, is equal to the sum of all their values.[66]

The relation between the value and the price of production of a given line of industry, as conceived by Marx, can be presented in a precise algebraic form, though Marx himself failed to 78 do so.

As we have seen, the organic composition of a given capital or of the social capital as a whole is given by $Q = \frac{C}{v(1+s')}$, the rate of profit by $\frac{s'v}{C}$, and, by substitution, $p' = \frac{s'}{Q(1+s')}$. C, the stock of invested constant capital, is related to c, the constant capital consumed, by a rate of turnover t (here assumed to be given and uniform throughout the economy) so that $c = Ct$. In addition we represent the ratio of Q_i, the organic composition of capital in industry i, to the organic composition of the social capital by $\lambda_i = \frac{Q_i}{Q}$.

The value (Z_i) of the product of industry i, then, is equal to

$$c_i + v_i + v_i s' = Q_i v_i (1+s')t + v_i(1+s')$$
$$Z_i = v_i(1+s')(Q_i t + 1)$$

Its price of production (P_i), correspondingly, is given by

$$c_i + v_i + p'C = Q_i v_i (1+s')t + v_i + \frac{Q_i s' v_i}{Q}$$
$$P_i = v_i\left[Q_i(1+s')t + (1+s'\lambda_i)\right]$$

The "transformation coefficient" between price of production and value for industry i, ϕ_i, is thus determined by the ratio

$$\frac{P_i}{Z_i} = \frac{v_i[Q_i(1+s')t + (1+s'\lambda_i)]}{v_i(1+s')(Q_i t+1)}$$
$$\phi_i = \frac{Q_i t + \frac{1+s'\lambda_i}{1+s'}}{Q_i t + 1}$$

while for the entire economy $\vec{Z}\vec{\phi} = \sum P$.

62. Marx, *Capital*, vol. III, p. 186.
63. Ibid., vol. III, p. 233.
64. Marx, *Theories of Surplus-Value*, p. 337.
65. Marx, *Capital*, vol. III, p. 187.
66. Ibid., vol. III, p. 188.

79 For a further discussion of this question, see appendix A.

II.4. Summary

The *net product* during a given period has a value equal to the number of hours of productive labor expended by the members of society, productive labor being defined as the work done by laborers employed by capital and directly or indirectly necessary for the *production* of commodities. The gross product has a value identical to the sum of the prices of the final products in the system.

The difference in value between the gross and net products is defined as the *constant capital* consumed. The value of the net product consists of *variable capital*, the total wage received by the productive laborers, and *surplus-value*, the total of property incomes in the forms of profit, interest and rent. The capital consumed in unproductive but necessary areas of the economy counts as part of the constant capital, and enters into the value of the gross, but not the net, product.

The value of the total invested capital can be regarded as representing entirely a stock of constant capital, and under this assumption the basic categories of the Marxian system are expressed by the four symbols C, c, v, and s—
80 representing respectively the average stock of capital, the constant capital consumed, the variable capital consumed, and the surplus-value produced during the year.

These economic aggregates are linked by three fundamental quantitative relationships: the rate of surplus-value or rate of exploitation, s'; the organic composition of capital, Q; and the rate of profit, p'. These ratios are determined by:

$$s' = \frac{s}{v}$$
$$Q = \frac{C}{v+s}$$
$$p' = \frac{s}{C}$$

The general inter-relationship of the system is expressed by the equation:

$$p' = \frac{s'}{Q(1+s')}$$

III. The law of the falling tendency of the rate of profit as presented by Marx

III.1. Marx's formulation of the "law"

81 The idea that economic development is inescapably accompanied by a secular decline in the rate of profit was by no means original with Marx. On the contrary, when Marx wrote this proposition had been for nearly two centuries generally accepted as a social law as well as a fact of experience.[1] Its status as a dogma is indicated by the admission of Prof. Shadwell, who in 1877 denied the existence of such a tendency, that "this theory, however, is in opposition to the unanimous opinion of all other Political Economists, who maintain that there is a constant fall of profit as society advances."[2]

As to the cause of this tendency, however, there was no such unanimity. "The economists saw the problem," wrote Marx, "and cudgeled their brains in tortuous attempts to interpret it.
82 Since this law is of great importance for capitalist production, it may be said to be that mystery whose solution has been the goal of the entire political economy since Adam Smith."[3]

Marx claimed that the "riddle" was solved through his analysis of capital into constant and variable components and the relationship between them expressed in the "organic composition of capital."

The basis of Marx's thesis is the assertion of a secularly rising tendency of the organic composition of capital, reflected in a similar tendency of the "value composition":

> We have seen that it is one of the laws of capitalist production that its development carries with it a relative decrease of variable as compared with constant capital, and consequently as compared to the total capital which it sets in motion.[4]

If the rate of exploitation is assumed to remain constant or virtually so, the amount of profit is essentially proportional to the number of workers employed. Since, however, the value invested as capital for *each* worker is steadily increasing, the *ratio* of the mass of profit to the mass of capital must decline:

> This progressive tendency of the average rate of profit to fall is, therefore, but a peculiar expression of capitalist production for the fact that the social productivity of labor is progressively increasing. This is not saying that the rate of profit may not fall temporarily for other reasons. But it demonstrates at least that it is the nature of the capitalist mode of production, and a logical necessity of its development, to give expression to the average rate of surplus-value by a falling rate of average profit. Since the mass of the employed living labor is continually on the decline compared to the mass of objectified labor incorporated in productively consumed means of production, it follows that that portion of living labor, which is unpaid and represents surplus-value, must also be continually on the decrease compared to the volume and value of the invested total capital. Seeing that the proportion of the mass of surplus-value to the value of the invested total capital forms the rate of profit, this rate must fall continuously.[5]

83

Putting this in terms of the equation $p' = \frac{s'}{Q(1+s')}$ it is clear that if s' is constant the rate of profit is a decreasing function of Q, so that if Q increases over time p' must tend to decrease over time.

The mechanism by which the fall in the rate of profit is brought about, according to Marx, is the same as that by which the mass of profit is increased: *the accumulation of capital*. For this reason Marx calls it "the two-faced law."

Every competitive entrepreneur, in order to maintain his profits both in mass and rate, seeks 84 simultaneously to increase the volume of his production and to lower its average cost. His gross investment, expended on the most advanced (and hence, on Marx's assumption, the most

1. Cf. Tucker, *Progress and Profits in British Economic Thought, 1650–1850*.

2. "A System of Political Economy," p. 165, cited in ibid., p. 3.

3. Marx, *Capital*, vol. III, p. 250.

4. Ibid., vol. III, p. 248.

5. Ibid., vol. III, p. 249.

capital-intensive) means of production, is simultaneously capital-broadening as well as capital-deepening, since it will provide facilities for the employment of a larger quantity of labor-power. In the short run the innovator, on the basis of his temporary "monopoly" of the new technique, is able to sell his goods at close to their former price of production, thus attracting to himself a higher-than-proportional share of the total surplus-value and raising his own rate of profit above the social average.

When the innovation is fully diffused, however, it no longer provides a higher rate of profit since the "monopolistic" situation has disappeared. The new average rate of profit will be lower than previously because of the general increase in the organic composition of the total capital even though, given a constant rate of exploitation, the total profit will have increased due to the employment of a greater number of workers.

This, then, is the "Law of the Falling Tendency of the Rate of Profit" as Marx presents it in chapter XIII of volume III, "Das Gesetz als solches." It has exclusively the character of a long run
85 tendency of capitalist evolution; but one which is always in operation inasmuch as "The capitalist process of production is essentially at the same time a process of accumulation."[6]

In this chapter, however, Marx remains on an extremely high level of abstraction in which, in general, 1) the rate of exploitation is assumed to be constant, 2) the increase in the organic composition of capital is treated as a simple reflection of the increasing productivity of labor, and 3) the long-run rate of profit and the influences upon it are isolated from the factors governing the short and intermediate range behavior of overall economic activity. The next two chapters, "Entgegenwirkende Ursachen" ("Counteracting Causes") and "Entfaltung der Innern Widersprüche des Gesetzes" ("Unraveling of the Internal Contradictions of the Law"), make the analysis considerably more realistic and concrete.

III.2. The countervailing factors

In the Marxian formula $p' = \frac{s'}{Q(1+s')}$, p' will be increased either by an increase in s' or a decrease in Q. Thus forces offsetting a tendency of p' to fall must work either through increasing the rate of exploitation or decreasing the organic composition of capital.

86 Such forces, furthermore, may have effects of two different sorts: the first express long-term, fundamental immanent tendencies of capitalist evolution which must be regarded as an integral part of Marx's theory of the falling tendency of the rate of profit itself; the others are of an exclusively short-run variety, events either of a unique or self-reversing nature.

Only effects of the latter type can really be regarded as produced by "*counter*acting causes." Marx, however, though he is explicit that "the same causes which bring about a tendency of the rate of profit to fall, also check the realization of this tendency,"[7] treats causes of this sort together with those of a genuinely "counteracting" nature, without clearly distinguishing between them.

Marx enumerates five different main counteracting causes; "Raising the Intensity of Exploitation," "Cheapening of the Elements of Constant Capital," "Depression of Wages below their Value," "Relative Overpopulation," and "Foreign Trade." Of these the first two have (in part only, as we will see) the nature of permanent and fundamental tendencies; the others are short-term possibilities available to concrete capitalist economies.

The long-term tendency of the rate of exploitation was discussed in chapter I. At that time we saw that, secularly, absolute surplus-value is a negative, and relative surplus-value a positive, magnitude. Accordingly their resultant is an expression of the balance of social forces, of the "class struggle," and is not mechanically determined by economic or technological variables. A secular rise in the rate of exploitation cannot therefore be deduced from the Marxian system. Marx himself seems to have expected such a rise to take place, and in the discussion on "counteracting causes" he operates under the specific assumption that this will be the case: "The falling tendency of the rate of profit is accompanied by a rising tendency of the rate of surplus-value, that is, the rate of exploitation."[8] 87

The question whether this hypothetical "rising tendency of the rate of exploitation" can be so strong as to negate completely the effects of a rising organic composition of capital will be examined later. In terms of "counteracting causes" we are here concerned with short-term effects.

Marx presents three main ways in which the rate of exploitation may be raised in the short run: intensification of work, prolongation of the 88 working day, and "the temporary but always recurring, elevations in surplus-value above the

6. Marx, *Capital*, vol. III, p. 255.

7. Ibid., vol. III, p. 277.

8. Ibid., vol. III, p. 281.

general level which keep occurring now in this and now in that line of production redounding to the benefit of those individual capitalists who make use of inventions etc. before these are introduced elsewhere."[9]

The first two of these are at best temporary and self-reversing. As was shown previously,[10] more intense work represents a greater drain on the "vital forces" of the workers and therefore increases the *subsistence* level of the real wage. Under Marx's assumption that labor power in the long run is sold at its *value*, this implies an ultimate increase in real wages "corresponding to the rising intensity of labor." Similarly, every extension of the working-day must be followed fairly soon by at least an equal contraction, in view of the empirical fact of a prevailing secular decline in hours worked per man per year.

Finally, it is hard to see why Marx included the effect of innovations for particular capitalists as a counteracting cause (he himself gives no explanation). It would seem that such innovations
89 produce relative surplus-value only as a function of their higher productivity, and hence their higher organic composition. And if the overall rate of surplus-value remains constant the exceptional profits of particular capitalists must be balanced by below-average profits for others.

"Raising the Intensity of Exploitation," accordingly, has two contrasting aspects: an assumed secular increase in the rate of exploitation as a consequence of the increasing productivity of labor; and a number of possible short-run methods of increasing relative or absolute surplus-value, gains which, however, must speedily prove ephemeral.

"Cheapening of the Elements of Constant Capital," likewise, is primarily an immanent tendency of capitalist development, and Marx explicitly describes it as such:

> the same development, which increases the mass of the constant capital relatively over that of the variable, reduces the value of its elements as a result of the increasing productivity of labor. In this way the value of the constant capital, though steadily increasing, is prevented from increasing at the same rate as its real volume, that is, the real volume of the means of production set in motion by the same amount of labor-power.[11]

But in what sense is this a "counteracting cause" to the increasing organic composition of
90 capital? Rather is it merely a statement that the organic composition itself must grow more slowly than the *technical composition* of capital, maintaining in full force the "law" that the organic composition of capital must steadily increase (a proposition whose theoretical validity will be examined later).

Marx continues:

> In exceptional cases the mass of the elements of constant capital may even increase, while its value remains the same or even falls.[12]

These "exceptional cases," then, provide the true short-run "counteracting cause." Marx is here referring particularly to increasing efficiency in the utilization of raw materials, reduction of waste, development of by-products, etc. A temporary spurt of strongly "capital-saving" innovations of this sort could conceivably block the rise of the organic composition of capital or even cause it to fall, preventing the rate of profit from falling for this reason. But given the existence of a rising secular tendency of the organic composition of capital, such "exceptional cases" must be followed by a sharp though temporary rise in Q, as it returns to its trend value.

We can now discuss the remaining "counter- 91
acting causes" which do not have this immanent aspect.

On "Depression of Wages below their Value" Marx merely states that this "has nothing to do with the general analysis of capital but belongs in a presentation of competition, which is not given in this work. However it is one of the most important causes checking the tendency of the rate of profit to fall."[13]

"The Depression of Wages below their Value" clearly means the reduction of the real wage below the previous quantity of "necessaries of life habitually consumed by the average laborer." Since, as we have seen, this quantity tends to *rise* with the development of capitalism, any fall in it can only be temporary, to be followed by a strong over-compensation. However, under the impact of the cyclic movement of the capitalist economic system, significant periodic decreases in the real wage may conceivably take place, and the consequence of each could only be a marked, though transient, increase in the rate of profit.

The fourth counteracting cause, "Relative Overpopulation," cannot act as such in a purely capitalist economy—its effects are based on the fact that "the imperfect subordination of labor to capital continues in many lines of production, 92
and continues longer than seems at first glance

9. Marx, *Capital*, vol. III, p. 228.
10. Cf. *supra*, ch. II, p. 17.
11. Marx, *Capital*, vol. III, p. 276.
12. Ibid., vol. III, p. 277.
13. Ibid., vol. III, p. 276.

compatible with the general stage of development."[14] But capitalistic techniques must ultimately invade these sectors as well:

> new lines of production are opened up, especially for the production of luxuries, and these lines take for their basis this relative overpopulation set free in other lines of production by the increase of their constant capital. These new lines start out with living labor as their predominating element, *and go by degrees through the same evolution as the other lines of production.*[15]

This possibility, however, is available to a capitalist economy primarily in the early stages of its growth, when non-capitalist sectors (artisans, individual peasant farmers), account for a sizable portion of national income—and even then only if these sectors sell their products to the capitalist sector at prices more or less corresponding to values (i.e., only if they are not already being exploited as internal colonies). Thus its effect as a counterweight to a falling tendency of the rate of profit can at best be very slight, although expansion into certain types of services remains a possibility throughout.

93 A much more significant counterweight is provided by the general category of "Foreign Trade." This effect, according to Marx, is brought about in two different ways. One is the expansion of trade with other capitalist economies:

> To the extent that foreign trade cheapens partly the elements of constant capital, partly the necessities of life for which the variable capital is exchanged, it tends to raise the rate of profit by raising the rate of surplus-value and lowering the value of the constant capital. It exerts itself generally in this direction by permitting an expansion of the scale of production.[16]

In this sense, as a means for realizing economies of scale, foreign trade is nothing more than the international projection of the immanent tendencies of capitalist evolution previously discussed under the headings "Raising the Intensity of Exploitation" and "Cheapening the Elements of Constant Capital"—and analytically can in no way be separated from them.

Matters are very different with respect to the other domain of foreign trade: trade with a country's colonies. Here, Marx contends, is to be found a most substantial force supporting the rate of profit in the metropolis. In the first place, "in competition with commodities produced in 94 other countries with lesser facilities of production ... an advanced country is enabled to sell its goods above their value ... labor of the advanced countries is here exploited as a labor of a higher specific weight, the rate of profit rises because labor which has not been paid as being of a higher quality is sold as such."[17] (In itself this "comparative advantage" argument implies no exploitation of one economy by another—the capitalists of both are gainers by it. This, however, is totally reversed when the advanced country holds both a monopolistic and monopsonistic position, enforced by direct or indirect political domination. Then the dispersed native producers of primary products will have to sell to a single buyer able to impose a price below that which might be offered by other buyers, while metropolitan manufactured goods are sold at a level artificially maintained through protective tariffs. Trade itself thus becomes a means of colonial exploitation. This, of course, is the general rule—few colonial powers have ever practiced the "open door policy" in their *own* possessions.)

Of no less importance are the profits stemming from direct investment:

> Capitals invested in colonies may yield a higher rate of profit for the simple reason that the rate of profit is higher there on account of the backward level of development, and for the added reason that slaves, coolies, etc., permit a better exploitation of labor.[18]

95

Marx does not develop these points further, since this question "by its special nature is really beyond the scope of our analysis."[19] Nevertheless they form the basis on which the followers of Marx subsequently developed their theoretical analysis of imperialism.[20]

This is, indeed, a point at which the Marxian economic analysis merges completely into politics. Since the general rate of profit includes profits extracted from the colonies, any tendency of this rate of profit to fall cannot be counteracted by mere maintenance of the existing level of colonial profits. What is required is the continuous expansion of the colonial sector relative to a metropolitan economy that is itself expanding.

Once all available territories have been colonized, however, this expansion of the colonial

14. Marx, *Capital*, vol. III, p. 277.
15. Ibid., vol. III, p. 277 (italics mine).
16. Ibid., vol. III, p. 278.
17. Ibid., vol. III, p. 278.
18. Ibid., vol. III, p. 279.
19. Ibid., vol. III, p. 278.
20. Cf. Lenin, *Imperialism, The Highest Stage of Capitalism, with New Data for Lenin's Imperialism*, pp. 138–140.

sector can only come through conquest from another colonial power (i.e., world war), or else through more intensive exploitation of existing
96 colonies, a process which finds political limits in the form of revolutionary nationalist movements and economic limits in the generally backward and unbalanced structure of the colonial economy. (In his pamphlet on *Imperialism*, however, Lenin appears to ignore these economic limits: "The export of capital greatly affects and accelerates the development of capitalism in those countries to which it is exported."[21]) In any case, as capitalism develops in the metropolis imperialism becomes progressively less able to offset a falling tendency of the metropolitan rate of profit, even though colonial "super-profits" might well make the absolute level of that rate higher than it would otherwise be.

Thus we see that, leaving aside for the present the immanent tendencies toward an increase in s' and a relative decrease in Q as compared to T, the "counteracting causes" enumerated by Marx can have at most a temporary effect in supporting the rate of profit, and in the long run must become virtually ineffective.

III.3. Consequences of the "law"

In the introduction to this study we saw that Marx considered the falling tendency of the rate of profit to be the economic expression of "The
97 barrier of the capitalist mode of production." The "law," Marx argued, tends to bring capitalist production to a "standstill" and allows economic progress only at the price of "periodic crises." Accordingly, the long-run consequences which Marx deduced from the "law" are to be understood primarily in terms of his theory of crises.

The basis of this theory is provided by the "circulation schemata" of volume II, and in particular the model of expanded reproduction.[22] The most general form of this model states that in any period net investment in constant capital is equal to the net product of the capital-goods industries ("department I") less the constant capital consumed by the consumption-goods industries ("department II"), $\Delta C = v_1+s_1-c_2$, so that $\Delta C = v_1(1+s')-Qv_2(1+s')t$ (as in the previous chapter t here represents the rate of turnover of the stock of constant capital, assumed equal to the entire capital stock).

If, then, r is the equilibrium rate of growth of the capital stock, the equilibrium level of net investment is given by

$$\begin{aligned} rC &= rQ(v_1+v_2)(1+s') \\ &= v_1(1+s') - Qv_2(1+s')t \end{aligned}$$

It follows that there exists a fundamental relationship of proportionality between the variable capital flow (i.e., the employment) in the two
98 departments, given by the ratio

$$\frac{v_1}{v_2} = \frac{Q(t+r)}{1-rQ}$$

Since this proportion is conceived by Marx as an objective datum established by the path of growth historically followed by the system, Marx maintains that the actual volume of investment, as determined by the decisions of the capitalists, is the key variable determining the whole level of economic activity. This can be expressed as a "multiplier" relationship between changes in net investment and changes in the level of employment (I standing for ΔC):

$$\begin{aligned} \frac{d(v_1+v_2)}{dI} &= \frac{\partial(v_1+v_2)}{\partial I} + \frac{\partial(v_1+v_2)}{\partial Q}\cdot\frac{dQ}{dI} \\ &= \frac{1}{rQ(1+s')} - \frac{C}{Q^2(1+s')}\cdot\frac{dQ}{dI} \end{aligned}$$

This can be translated into a Keynesian-type analysis through the implicit formula for the propensity to save [Y standing for net income, $(v_1+v_2)(1+s')$] given by the reciprocal of

$$\begin{aligned} \frac{dY}{dI} &= \frac{\partial Y}{\partial I} + \frac{\partial Y}{\partial Q}\cdot\frac{dQ}{dI} \\ &= \frac{1}{rQ} - \frac{C}{Q^2}\cdot\frac{dQ}{dI} \\ &= \frac{1}{rQ}\left(1 - \frac{Cr}{Q}\frac{dQ}{dI}\right) \end{aligned}$$

thus

$$\frac{1}{\frac{dY}{dI}} = \frac{rQ}{1-rY\frac{dQ}{dI}}$$

The underlying behavioral assumption would be that the *ex ante* rate of saving (as a percentage of net income) reflects the past rate of accumulation and tends to increase as income increases.

In any case, what is important for Marx is that at every point there exists a level of investment, determined by the past growth pattern of
99 the system, that will maintain the system on its

21. Lenin, *Imperialism, The Highest Stage of Capitalism, with New Data for Lenin's Imperialism*, p. 144.

22. Cf. *infra*, appendix A, pp. 89–90.

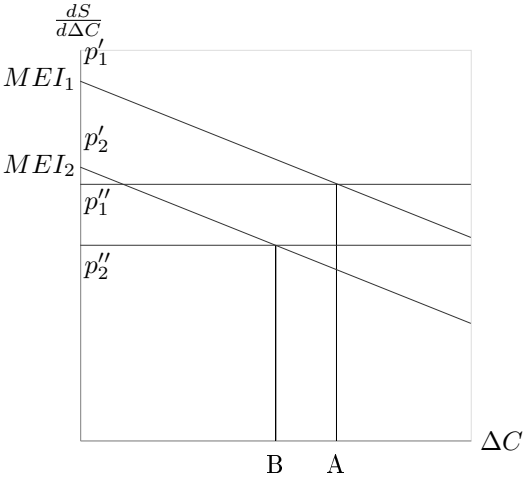
equilibrium growth path, and which is given by the equation $I = rC$.

If in any period I is significantly different from this equilibrium value the effect would be destabilizing. (Marx of course rejects out of hand the theory of automatic equilibration through the market rate of interest.) Thus, if $I > rC$, then $\frac{v_1}{v_2} > \frac{Q(t+r)}{1-rQ}$. This relative increase in employment in the capital-goods industries increases demand for consumer goods, leading the producers of department II to increase their investment, thereby raising aggregate investment still further above the equilibrium level and causing yet further increases in investment until some barrier to the process is reached. Conversely, if $I < rC$, department II will be faced with insufficient effective demand for its products and thus will be led to contract its investment, causing a downward spiral until some support level is found.

Since in this model cycles are initiated by disequilibrating changes in the rate of investment, the determinants of the rate of investment are the prime movers in the process. It is here that Marx places his full emphasis on *the rate of profit*: "The rate of profit, i.e., the relative increment of capital, is above all important for all new offshoots of capital seeking an independent location."[23] The profit rate is "*the fundamental premise and driving force of accumulation.*"[24] Accordingly, the occasion of a "crisis" in the Marxian model is a decline in the *incremental rate of profit* (the "marginal efficiency of investment") below the point at which it would call forth an amount of investment $\Delta C = rC$.

Under the specific assumptions on which Marx derived it, would the falling tendency of the rate of profit be, *in itself*, sufficient to produce such a crisis? These assumptions, of course, are 1) that s' is constant (i.e., that the supply of labor-power over time is infinitely elastic at the given *value* of labor-power) and 2) that Q is an increasing function of the accumulation of capital. In order for the amount and rate of accumulation to be determinate, given a constant s', a further assumption is necessary: investment will continue to the point at which the incremental rate of profit is equal to some given fraction of the previously prevailing rate. This minimum rate of return beyond which further investment will not be undertaken corresponds essentially to the Keynesian "liquidity trap."

The determination of investment in a model governed by these assumptions is illustrated by the following diagram, in which the marginal efficiency of investment schedule is shown in reference to the prevailing rate of profit immediately prior to each time period and to the minimum profitability line p'' corresponding to it. The subscripts denote time periods, not departments of production.



MEI_1 represents the marginal efficiency of investment schedule applying in period 1. p'_1 represents the rate of profit prevailing immediately prior to period 1, and p''_1, assumed equal to $\frac{2}{3}p'_1$, represents the minimum profitability level beyond which investment ceases.

Under our assumptions[25] the MEI schedule is negatively inclined throughout, and drawn from a negative starting-point with coordinates p'_1 and the amount of disinvestment required, under the assumption of a technology that grows steadily more capital-intensive, to maintain a constant organic composition of capital and therefore a constant rate of profit.

The intersection of the period 1 marginal efficiency schedule and minimum profitability line at (A, p''_1) represents the determination of the actual investment in period 1. If this investment is sufficient to maintain the system in equilibrium, this implies that $A = rC_1$ (C_1 is, of course, the total capital stock of period 1).

In period 2, as a result of investment during period 1, both the capital stock and its organic composition have increased and the rate of profit at the start of the period (p'_2) has decreased. Therefore the MEI schedule has shifted downward and to the left, and is now drawn from a starting point at p'_2 and the amount of disinvestment now required to maintain the organic composition of capital and rate of profit constant.

23. Marx, *Capital*, vol. III, p. 304.

24. Ibid., vol. III, p. 304. In view of these categorical statements it is hard to understand how Joan Robinson, on the basis of phrases from vol. I where the category of "profit" has not even been introduced, arrived at the view that Marx thought investment was independent of the rate of profit.

25. I.e., *that the rate of surplus-value is constant* and that Q is an increasing function of capital accumulation.

If the minimum profitability line is maintained in a constant ratio to the base rate of profit (i.e., $\frac{p_1''}{p_1'} = \frac{p_2''}{p_2'}$) the intersection of the period 2 minimum profitability line and marginal efficiency schedule will take place at (B, p_2'').

If, however, the equilibrium growth rate of the capital stock has remained constant investment in period 2 will be insufficient, since the capital stock has increased so that $rC_2 > rC_1$ while actual investment has decreased from A to B. Unless the equilibrium growth rate has meanwhile fallen from $\frac{A}{C_1}$ to $\frac{B}{C_2}$ a "crisis of underinvestment" will occur.

However, it is precisely one of the implications of the Marxian model that a fall in the rate of capital accumulation will necessarily result from a falling tendency of the rate of profit: "the rate of accumulation falls with the rate of profit."[26] The relationship between the rate of profit and
104 the equilibrium rate of growth is determined by $\frac{dr}{dp'} = \frac{v_1(1+s')}{(v_1+v_2)s'}$.[27] Thus it is possible, through continual adjustment of the equilibrium growth rate to the falling rate of profit, for this model of capitalism to exhibit a "crisis free" evolution.

In this case the role of the falling tendency of the rate of profit as "the barrier of the capitalist mode of production" would be exerted through the steady decline in the rate of capital accumulation. This tendency toward stagnation, following from the falling tendency of the rate of profit, "requires for its defeat periodical crises": in either instance, despite the assumed absence of any technical limits to investment and the existence of a positive incremental rate of profit at all levels of investment, the capitalist economy is unable to assure the uninterrupted growth of the productive forces at the accelerating rate technologically feasible.

The actual business-cycle theory of Marx involves only one fundamental change in the foregoing analysis: the assumption of a constant s' is dropped. Whether, in the long run, s' tends to remain constant or to increase, in the course of a given cycle it is subject to substantial fluctuation. Consequently the incremental
105 rate of profit can no longer be treated simply as a function of the organic composition of the marginal investment—the effect of this investment on the rate of exploitation also must be taken into account. Since at a certain point of every cycle the "reserve army of labor" is radically depleted, putting great upward pressure on wages, the shift downward and to the left of the MEI schedule at that point is not correlated with the factors determining the long-term equilibrium rate of growth, and thus cannot be compensated for by a decline in r. Marx, therefore, states the immediate conditions for a crisis in terms of changes in the rate of exploitation:

> an overproduction of capital, not of individual commodities (although the overproduction of capital always includes overproduction of commodities), signifies simply an over-accumulation of capital. In order to understand what this over-accumulation is ... one need only assume it to be absolute. When would overproduction be absolute: overproduction which would affect not just one or another or a few important spheres of production, but would be absolute in its full scope, hence would extend to all fields of production?
>
> The purpose of capitalist production ... is self-expansion of capital, i.e., appropriation of surplus-labor, production of surplus-value, of profit. Thus as soon as capital, in proportion to the laboring population, would have grown to such an extent that neither the absolute labor-time yielded by this population nor the relative surplus-labor-time could be expanded any further (this latter would, moreover, 106
> not be feasible even in the case that the demand for labor would be very strong, hence a tendency for wages to rise) as soon as a point was reached where the increased capital produced no larger, or even smaller, quantities of surplus-value than it did before its increase, there would be absolute overproduction of capital: i.e., the increased capital $C + \Delta C$ would produce no more, or even less, profit than capital C before its expansion by ΔC. In both cases there would be a strong and sudden fall in the general rate of profit, due to a change in the composition of capital on account, this time, not of the development of productivity but of an increase in the money-value of the variable capital (because of increased wages) and the corresponding reduction in the proportion of surplus-labor to necessary labor.[28]

It is, nevertheless, quite wrong to conclude from the foregoing, as does Sweezy, that "Marx is here talking about a kind of fall in the rate of profit different from that implied in the 'law.'"[29] On the contrary, only if the "law" is in continual operation is it legitimate to expect a "*strong and*

26. Marx, *Capital*, vol. III, p. 283.

27. Derived from $\frac{v_1}{v_2} = \frac{Q(t+r)}{1-rQ}$ through substitution $\left(Q = \frac{s'}{p'(1+s')}\right)$.

28. Ibid., vol. III, p. 294 (F.L.P.H. ed., p. 246, German ed., p. 280).

29. Sweezy, *The Theory of Capitalist Development*, p. 152 n.

sudden" fall in the rate of profit to result from a period during which the real wage had increased faster than the average net productivity of labor. The "sudden" fall in the rate of profit at the moment before the crisis is the *combined* effect of an increase in Q and a decrease in s'. 107 These changes, in turn, are the fruit of a period in which net investment is at a level high enough to sustain full employment—and such a period is itself one of the aspects of the "two-faced law with the same causes for a decrease of the rate of profits and a simultaneous increase of the absolute mass of profits."[30]

Marx's theory of the essential nature of the cycle as a whole follows rather simply from his analysis of the point of crisis:

> The equilibrium would be restored under all circumstances through the withdrawal or even the destruction of more or less capital. This would extend partly to the material substance of capital. ... The principal work of destruction would show its most dire effects in a slaughtering of the *values* of capitals ... at the same time still other agencies would have been at work. The stagnation of production would have laid off a part of the working-class and thereby placed the employed part in a situation where it would have to submit to a reduction in wages even below the average.[31]

Thus the depression reduces the organic composition of the employed portion of the existing capital through disinvestment due to depreciation and, especially, to obsolescence, while simultaneously increasing the rate of surplus-value. 108 Therefore a higher rate of profit than previously realized becomes possible. (In terms of the previous diagram, the MEI schedule has shifted upward and to the right.) Meanwhile the sharp fall in the actual rate of profit reduces the minimum profitability criterion used by capitalists in their investment decisions, on the assumption that this criterion is based on the realized profit rate. (If this assumption is not justified, due to strong expectations of a further fall in the rate of profit, the capitalists may even behave perversely by raising their minimum profitability criterion. If that is the case the system is headed for collapse.) Ultimately, in any case, the marginal efficiency of investment must increase enough to generate a quantity of investment larger than that required by the equilibrium growth rate. The depression then passes its trough and gives way to a recovery. "The stagnation of production would have prepared—within capitalistic limits—a subsequent expansion of production."[32] These "capitalistic limits" manifest themselves in the fact that the falling rate of profit produced by a rising organic composition of capital and ultimately a falling rate of exploitation finally brings on a new crisis. "The same vicious cycle would occur once more under expanded conditions of production, with 109 an expanded market and increased productive forces."[33]

The crucial position of the falling tendency of the rate of profit in Marx's economic doctrine emerges most clearly from consideration of the implications of the *absence* of such a tendency. If we assume that the additional capital ΔC required to maintain the "normal" rate of employment of the labor force will not reduce the previous rate of profit, hence will itself be as profitable as the existing capital stock, there is no *systematic* reason why a profit-maximizing capitalism should fail to generate that quantity of investment.

In such an economy the business cycle would have an essentially benign character, serving merely to correct the disproportions resulting from atomistic competition. The economy as a whole would have no immanent barriers whatsoever—its expansion would be limited only by the availability of labor-power and natural resources. The central argument of "scientific socialism," that the capitalist mode of production becomes a fetter on the development of the productive forces, would fall to the ground. There might still be a case for socialism, but it would have to be argued exclusively on a moral, not an economic, basis.

Marx is, therefore, quite consistent in presenting the falling tendency of the rate of profit as 110 "the barrier of the capitalist mode of production." The validity of his theory at this point is a necessary condition underlying the claim of the Marxian system as a whole to general validity.

30. Marx, *Capital*, vol. III, p. 258.
31. Ibid., vol. III, p. 297 (F.L.P.H. ed., p. 249).
32. Ibid., vol. III, p. 299.
33. Ibid., vol. III, p. 299.

IV. Comparison of Marxian and non-Marxian theories of a falling rate of profit

111 The distinctive and salient characteristics of Marx's "law" can be brought out most clearly through contrast with those orthodox, or at any rate non-Marxian, theories which have also predicted a secular fall in the rate of profit. Such theories have been constructed along two main lines: a falling tendency of the rate of profit has been ascribed either to limitations in the field of physical production through the operation of some form of "the law of diminishing returns" or to limitations in the field of realization of profits due to tendencies toward "underconsumption."

Both of these approaches, in embryonic form, can be found in *The Wealth of Nations*. At first Smith attributes the falling rate of profit simply to the effects of competition:

> The increase of stock, which raises wages, tends to lower profit. When the stocks of many rich merchants are turned into the same trade, their mutual competition naturally tends to lower its profit; and when there is a like increase of stock in all the
112 different trades carried on in the same society, the same competition must produce the same effect in them all.[1]

Shortly thereafter he specifically brings in diminishing returns on land, though only in passing, in reference to new colonies:

> As the colony increases, the profits of stock gradually diminish. When the most fertile and best situated lands have been all occupied, less profit can be made by the cultivation of what is inferior both in soil and situation.[2]

Finally Smith reverts to competition:

> As capitals increase in any country, the profits which can be made by employing them necessarily diminish. It becomes gradually more and more difficult to find within the country a profitable method of employing any new capital. There arises in consequence a competition between different capitals, the owner of one endeaveuring to get possession of that employment which is occupied by another. But upon most occasions he can hope to justle that other out of this employment by no other means but by dealing upon more reasonable terms. He must not only sell what he deals in somewhat cheaper, but in order to get it to sell, he must sometimes too buy it dearer. The demand for productive labour, by the increase of the funds which are destined for maintaining it, grows every day greater and greater. Labourers easily find employment, but the owners of capitals find it difficult to get labourers to employ. Their competition raises the wages of labour, and sinks the profits of stock ... the profits which can 113
> be made by the use of a capital are in this manner diminished, as it were, at both ends.[3]

Smith thus seems to put his main emphasis on the implicitly underconsumptionist side: the failure of the market to expand in proportion to production is the assumption underlying his preposition that the increased product can be sold only "on more reasonable terms."

Ricardo, who overlooked the "diminishing returns" aspect of Smith's theory, attacked his predecessor most sharply on this point:

> Adam Smith uniformly ascribes the fall of profits to accumulation of capital, and to the competition which will result from it, without ever adverting to the increasing difficulty of providing food for the additional number of laborers which the additional capital will employ. ... Adam Smith speaks here of a rise of wages, but it is of a temporary rise, proceeding from increased funds before the population is increased; and he does not appear to see that at the same time that capital is increased, the work to be effected by capital is increased in the same proportion. *M. Say has, however, most satisfactorily shown that there is no amount of capital which may not be employed in a country,*

1. Smith, *The Wealth of Nations*, Book I, chapter 9, p. 151.

2. Ibid., Bk. I, ch. 9, p. 157.

3. Ibid., Bk. II, ch. 4, p. 38.

> *because demand is only limited by production.*[4]

Ricardo's own explanation, accordingly, was entirely based on the tendency of money wages
114 to rise as essential foodstuffs became more and more expensive:

> however abundant capital may become, there is no other adequate reason for a fall in profit but a rise of wages, and further it may be added, that the only adequate and permanent cause for the rise of wages is the increasing difficulty of providing food and necessaries for the increasing number of workmen.[5]

This approach was essentially a simple extension of the Ricardian theory of rents since the price of food is determined by its cost of production on the least fertile or least favorably situated land in cultivation, and since the increase in food production needed to maintain the additional workers required by the increased capital stock will involve use of less fertile, higher-cost lands, the price level of all agricultural produce, considered by Ricardo to be the typical wage-good, will increase to its cost at this new margin. The money-wage, assumed to express a subsistence real wage, will necessarily rise in proportion to the increased price of food, and profits decrease by the same amounts:

> The natural tendency of profits then is to fall; for, in the progress of society and wealth, the additional quantity of food required is obtained by the sacrifice of more and more labour. This tendency, this gravitation as it were of profits, is happily
115 checked at repeated intervals by the improvements in machinery, connected with the production of necessaries, as well as by discoveries in the science of agriculture which enable us to relinquish a portion of labour before required, and therefore to lower the price of the prime necessary of the labourer.[6]

Ricardo's view of technological progress as a factor counteracting the falling tendency of the rate of profit has two essential characteristics which continued to play the central role in post-Ricardian classical and neo-classical economic theory on this subject.

Most conspicuous is Ricardo's belief that progress in technology can merely be a partial offset "checking" the workings of a "natural tendency." As John Stuart Mill, in this area a faithful disciple of Ricardo, rationalized this view:

> Agricultural skill and knowledge are of slow growth, and still slower diffusion. Inventions and discoveries, too, occur only occasionally, while the increase of population and capital are continuous agencies. It therefore seldom happens that improvement, even during a short time, has so much the start of population and capital as actually to lower rent, or raise the rate of profits.[7]

Of equally fundamental importance is the implicit assumption underlying this treatment of technological change: improvement in productive techniques is viewed as essentially exogenous to capital accumulation, as a "resisting agency."[8] The expectation of Ricardo and Mill that the rate of profit will fall with capital accumulation thus simply expresses the opinion that the "forces" depressing the rate of profit, principally diminishing returns in agriculture, will prove to outweigh those "forces" increasing it, notably technological progress.
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The neo-classical economists generalized the Ricardian methodology and prediction into the fundamental proposition that a falling tendency of the rate of return on invested capital is the consequence of a declining marginal productivity of capital. This was expressed most categorically by J. B. Clark:

> Capital is the element that is outgrowing labor. We may take the world that exists, instead of an imaginary one, as our illustration. As the accumulation of capital actually goes on, it shows itself more and more in qualitative changes of existing instruments ... *they thus represent a greater outlay incurred for a smaller gain.* ... Tools are, of course, employed in the order of their productivity ... it soon ceases to be possible to add to a working equipment anything that produces a multiple of its own cost in a year, and the interest on the final increment of capital becomes a fraction of that capital itself. *This fraction steadily diminishes as the productive fund grows larger* ... as accumulation proceeds, there are always made costlier machines, representing more capital; and the product that comes from using them is a smaller fraction of their cost ... we are utilizing the opportunities for investment that stand late in the series, and are low in the scale of productivity.[9]
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4. Ricardo, *Principles of Political Economy*, p. 289 (italics mine).

5. Ibid., p. 296.

6. Ibid., p. 120.

7. Mill, *Principles of Political Economy*, Book II, p. 304.

8. Ibid., Bk. II, p. 319.

9. Clark, *The Distribution of Wealth*, pp. 183–186 (italics mine).

Clark is explicitly describing, not the abstract consequences of accumulation under the assumption of static technology, but his view of the true long-run dynamic tendency of "*the world that exists.*" As with Ricardo and Mill, for Clark the balance of forces must necessarily produce a resultant tendency toward diminishing returns.

If, however, the assumption that technology must progress less rapidly than the capital stock increases is challenged, the neo-classical analysis can produce no prediction as to the long-run tendency of the rate of profit. Thus, for instance, Taussig takes a completely agnostic position:

> The more 'capitalistic' application of labor ... may be effective at the same rate, or at an increasing rate, or at a decreasing rate. The outcome depends on the progress of invention, concerning which no rule can be laid down.[10]

Accordingly, whether the rate of profit will rise, fall, or remain constant "*depends on a race* 118 *between accumulation and improvement.*"[11]

These Ricardian and neo-classical theories are essentially contradictory to Marx's analysis of the rate of profit. Marx criticized Ricardo on the grounds that, unwilling to regard capitalism as possessing an immanent barrier but recognizing the existence of such a barrier in the falling rate of profit, he ascribes this tendency "not to production but to nature."[12] Marx therefore rejects the duality between the "natural" tendency to diminishing returns and the human faculty of invention, the counterposition of "Increase in Capital" to "Inventions and Improvements,"[13] the notion of "a race between accumulation and improvement." On the contrary, Marx maintains, "Accumulation itself, and the concentration of capital that goes with it, is a material means of increasing productivity ... the development of capitalist production and accumulation lifts the processes of labor to a higher scale."[14] Thus, in the Marxian view, accumulation of capital and increasing productivity are expressions of a single process.

119 The most fundamental difference between the Marxian and neo-classical theories, however, is this: Under the neo-classical assumptions the rate of profit will tend to fall only if the marginal physical productivity of capital tends to decrease. Marx, on the other hand, not only does not base his theory of the falling tendency of the rate of profit on the expectation that the marginal productivity of capital will decrease, he derives his theory on the explicit assumption of a relationship between capital stock and output that can be termed a historically *increasing* marginal productivity of capital, although Marx, of course, did not use this concept:

> Although a machine becomes absolutely dearer with the growth of its bodily mass, it becomes relatively cheaper. If five laborers produce ten times as many commodities as formerly, this does not increase the outlay for fixed capital tenfold; *although the value of this part of the constant capital increases with the development of productivity, it does not by any means increase in the same proportion.*[15]

In the Marxian system, a declining marginal 120 productivity of capital will, of course, produce a sharply falling rate of profit. What is crucial is that Marx deduces the same tendency of the rate of profit to fall on a basis which admits, indeed assumes, a rising marginal productivity of capital. The seemingly paradoxical nature of this proposition illustrates how completely the Marxian theory of the falling tendency of the rate of profit is bound up with the labor theory of value, under which value, profit, and capital are strictly social terms, expressed in homogeneous units of abstract labor-time, so that the increasing total productivity with capital accumulation implies the decreasing value of the individual unit of product and the stability of the *value* of the total net product of a working day of given length, no matter how rapidly its *mass* may increase.

Marx is sufficiently explicit on this point that his doctrines have seldom been interpreted in a decreasing marginal productivity sense. A notable exception, however, is the attempt of H. D. Dickinson[16] to establish the validity of Marx's theory. Since Dickinson makes the key assumption that "product-per-head increases with capital-per-head but less than proportionally"[17] it is, of course, scarcely surprising that he can claim at the end: "Thus on certain broad and reasonable assumptions regarding the relation between the organic composition of capital and 121 the physical productivity of labor, the general correctness of Marx's theory ... appears to be demonstrated."[18]

Far more frequently, however, Marx's theories have been presented as essentially under-

10. Taussig, *Principles of Economics*, vol. II, p. 12.
11. Ibid., vol. II, p. 27.
12. Marx, *Capital*, vol. III, p. 283.
13. Hicks, *The Theory of Wages*, p. 114.
14. Marx, *Capital*, vol. III, p. 256.
15. Ibid., vol. III, p. 305 (italics mine).
16. Dickinson, "The Falling Rate of Profit in Marxian Economics".
17. Ibid., p. 126.
18. Ibid., p. 129.

consumptionist. Thus Keynes viewed Marx as one of the inhabitants (with Major Douglas and Silvio Gesell) of an underconsumptionist "underworld" in which the insights of Malthus were kept alive during the heyday of "classical economics."

Malthus had argued that Adam Smith was on the right track in attributing the falling rate of profit to the effects of "competition." He accepted Ricardo's analysis of diminishing returns in agriculture, based as it was on his own theory of population, but regarded this as merely the "limiting," not the "regulating," factor governing the rate of profit:

> In the cultivation of land, the cause of the *necessary* diminution of profits is the diminution in the quantity of produce obtained by the same quantity of labor. In manufacture and commerce, it is the fall in the exchangeable value of the same amount of produce.[19]

What in Adam Smith was implicit was made explicit by Malthus—this fall in prices is due to
122 the lack of sufficient "effective demand":

> I cannot by any means agree with you in your observation that 'the desire of accumulation will occasion demand just as *effectually* as a desire to consume' and that 'consumption and accumulation equally promote demand." I confess indeed that I know no other cause for the fall of profits which I believe you will allow generally takes place from accumulation than that the price of produce falls compared with the expense of production, or in other words that the *effective* demand is diminished.[20]

In rejecting "Say's Law" Malthus thus made effective demand depend, not on production, but on a subjective factor, the community's propensity to consume:

> A nation must certainly have the power of purchasing all that it produces, but I can easily conceive it not to have the will.[21]

This "will," Malthus maintained, found its incarnation in the class of "unproductive consumers"—landlords, churchmen, soldiers, government officials, *et al.*,—whose activities served only to maintain aggregate demand without adding in any way to supply:

> There must therefore be a considerable class of persons who have both the will and power to consume more material wealth than they produce, or the mercantile classes could not continue profitably to produce so much more than they consume.[22]

An equilibrium growth path, moreover, could 123
only be maintained on condition of a continual increase in this type of consumption:

> Under all common circumstances, if an increased power of production be not accompanied by an increase of *unproductive* expenditures, it will inevitably lower profits and throw labourers out of employment.[23]

This Malthusian conclusion is but a shade removed from Keynes' dictum:

> Pyramid-building, earthquakes, even wars may serve to increase wealth, if the education of our statesmen on the principles of the classical economics stands in the way of anything better.[24]

Keynes considered the falling rate of profit an accomplished fact:

> Today and presumably for the future the schedule of the marginal efficiency of capital is, for a variety of reasons, much lower than it was in the nineteenth century.[25]

His explanation was, by legitimate avowal, essentially a development and sophistication of the Malthusian theory. Like Adam Smith and Malthus, Keynes believed that as capital became "abundant" its profitability would have to fall:

> It is much preferable to speak of capital 124
> as having a yield over the course of its life in excess of its original cost than as being productive. ... If capital becomes less scarce, the excess yield will diminish, without its having become less productive—at least in the physical sense.[26]

The failure of effective demand to keep up with capital accumulation follows from Keynes' proposition that "the marginal propensity to consume [is] weaker in a wealthy community."[27] One of the main factors determining the Keynesian marginal efficiency of capital schedule, however, is the entrepreneurial expectation regarding "the strength of effective demand from time to time during the life of the investment under consideration."[28] Thus the tendency of the

19. Malthus, *Principles of Political Economy*, p. 275.
20. Malthus, Letter to Ricardo, in Ricardo, *Works and Correspondence of David Ricardo*, vol. VI, p. 132.
21. Malthus, in ibid., vol. VI, p. 141.
22. Malthus, *Principles of Political Economy*, p. 400.
23. Malthus, Letter to Ricardo, in Ricardo, *Works and Correspondence of David Ricardo*, vol. IX, p. 10.
24. Keynes, *The General Theory of Employment, Interest, and Money*, p. 129.
25. Ibid., p. 308.
26. Ibid., p. 213.
27. Ibid., p. 31.
28. Ibid., p. 147.

propensity to save to exceed planned investment continually exercises a depressing influence both on the profitability of existing capital and on the marginal efficiency schedule:

> An act of individual saving means—so to speak—a decision not to have dinner today. But it does *not* necessitate a decision to have dinner or to buy a pair of boots a week hence or a year hence, or to consume any specified thing at any specified date. Thus it depresses the business of preparing today's dinner without stimulating the business of making ready for some future act of consumption. It is not a substitution of future consumption-demand for present consumption-demand—it is a net diminution of such demand. Moreover, the expectation of future consumption is so largely based on current experience of present consumption that a reduction in the latter is likely to depress the former, with the result that the act of saving will not merely depress the price of consumption goods and leave the marginal efficiency of existing capital unaffected, but may actually tend to depress the latter also.[29]

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Marx has one decisive doctrinal point in common with Malthus, Keynes, and all other underconsumptionists—the rejection of "Say's Law." Thus all these economists are at least not blinded by theoretical "objections to the obvious phenomena of overproduction (phenomena which do not pay any attention to these objections)."[30]

But this is merely the posing of the issue. Given the *fact* of periodic overproduction, the real question is whether these phenomena are "cause" or "effect"—whether the fall in the rate of profit is due to tendencies toward underconsumption or, on the contrary, whether the periodic or even persistent failure of effective demand is to be explained by factors entirely within the domain of production. As we have seen, Marx's derivation of the falling tendency of the rate of profit on the basis that "less labor is employed in proportion to the employed capital"[31], adheres strictly to the latter approach. The question remains: to what extent is the undercomsumptionist approach compatible with the Marxian model?

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Marx himself explicitly rejected all the variants of underconsumptionism with which he was familiar. Thus in reply to Adam Smith's explanation of the falling rate of profit, he stated that "the fall in the rate of profit calls forth the competitive struggle among capitalists, not vice-versa. To be sure, the competitive struggle is accompanied by a transient rise in wages and a resultant further temporary fall of the rate of profit."[32]

For the idea of "unproductive consumption," Marx had merely a contemptuous reference to "the phantastic idea of the priest Chalmers that the capitalists pocket so much more profits, the smaller the quantity of the annual product expended by them as capital. The state church then comes to their assistance in order to help them to consume the greater part of the surplus-product instead of capitalising it."[33]

Finally, Marx made the point that if the phenomena of overproduction are ascribed to a distribution of income excessively skewed in favor of the capitalists, this is in effect an outright contradiction of the falling tendency of the rate of profit:

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> Other economists, for example Wakefield, flee to consideration of the *field of employment*[34] for growing capitals. This belongs in the discussion of competition, and is much more a matter of the difficulty for capital to realize an increasing profit; *thus denying the immanent tendency toward a fall in the rate of profit*."[35]

Those economists who, like Sweezy and Joan Robinson, maintain that Marx was, at least in part, an underconsumptionist, have no difficulty in finding numerous citations, above all in volume III, referring to the fundamental contradiction "between the limited conditions of consumption on a capitalist basis and a production which forever tends to exceed its immanent barriers."[36] But, as Mrs. Robinson is keenly aware, overproduction cannot be *explained* by its synonym, underconsumption. It is essential to demonstrate how tendencies toward underconsumption cripple the "inducement to invest" and thus cause crises:

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> Thus to clinch the argument it is necessary to show ... that the rate of profit depends, in the last resort, upon consuming power. It is necessary, in short, to supply a theory of the rate of profit based on the principle of effective demand.

29. Keynes, *The General Theory of Employment, Interest, and Money*, p. 210.

30. Marx, *Capital*, vol. III, p. 302.

31. Ibid., vol. III, p. 288.

32. Ibid., vol. III, p. 301.

33. Ibid., vol. III, p. 288.

34. In English in the original.

35. Marx, *Grundrisse der Kritik der Politischen Ökonomie (Rohentwurf)*, p. 640, cited in Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 29.

36. Marx, *Capital*, vol. III, p. 301.

> This Marx fails to do, for he had meanwhile worked out his theory of the falling tendency of profit, based on the principle of the rising organic composition of capital. In volume III this theory is inextricably mixed up with the underconsumption theory, and the two lines of thought are not brought into any clear relation with each other. The theory of the falling rate of profit is a red herring across the trail, and prevented Marx from running the theory of effective demand to earth.
>
> Marx evidently failed to realize how much the orthodox theory stands and falls with Say's Law, and set himself the task of discovering a theory of crises which would apply to a world in which Say's Law was fulfilled, as well as the theory which arises when Say's Law is exploded. This dualism implants confusion in Marx's own argument, and, still more, in the arguments of his successors.[37]

Joan Robinson's proposition that Marx derived the falling tendency of the rate of profit in terms of "a world in which Say's Law was fulfilled" (concurred in by Güsten—"Marx deduced the law of the falling tendency of the rate of profit under the assumption that Say's Law of Markets is valid. Although Marx was among the earliest and sharpest critics of this theorem, for his long-run theory he waived all arguments based on deficient effective demand.")[38] provides
129 an approach by which a clearer understanding of Marx's relationship to underconsumptionism can be gained.

Marx definitely assumed that, under normal circumstances, capitalists would be able to realize on the market all the "value," including the surplus-value, contained in the total social product. "*Periodically*," to be sure, "too many commodities are produced to permit of the realization of the value and surplus-value contained in them under the conditions of distribution and consumption peculiar to capitalist production, that is, too many to permit of the continuation of this process without ever recurring explosions."[39]

But this situation is merely an aspect of periodic crises, one of the ways in which the "slaughtering of the *values* of capitals" is effected. As such it is strictly effect, not cause. The falling tendency of the rate of profit, as a fundamental long-term "law" of the Marxian model, applies precisely to the *normal* situation in which effective demand is sufficient for the realization of all the value embodied in the commodity product, and not to the moments of "periodically recurring explosion."

Does this, however, mean that Marx in practice accepts Say's Law? To answer we must be clear as to precisely what Say's Law itself means. 130
For this purpose the most exact formulation is undoubtedly that of Keynes:

> The classical theory assumes, in other words, that the aggregate demand price (or proceeds) always accommodates itself to the aggregate supply price. . . .[40]

Once Say's Law is correctly formulated, its essential difference from the Marxian assumption should be strikingly clear. Say's Law asserts the equality of an *ex post* magnitude, "proceeds," to an *ex ante* schedule, "aggregate supply price." Marx, however, states the identity of proceeds and aggregate value—and *both* of these are *ex post* magnitudes. This identity is thus of essentially the same nature as the Keynesian identity between savings and investment.

The "aggregate supply price" schedule in Marx is the same as in all classical and neo-classical economics; the cost of production of each output plus the given rate of return on the capital involved. But this rate of return is given as the prevailing average in the immediate past. If the falling tendency of the rate of profit is in operation, the *realized* rate of return based on the identity of proceeds with aggregate value must be *less* than this "given" expected rate of profit, and thus *the effective demand must be less than the aggregate supply price.* 131

Looked at from the angle of "effective demand" what this means is that capitalists seek to sell their goods on the market for an aggregate price (in labor-units) that will include enough profit to allow them the same return on invested capital that they have been able to gain in the immediately preceding period. *Ex hypothesi*, however, this is excluded, since the commodities produced contain an insufficient amount of surplus-value. The capitalists would therefore have to sell their products for less *value* than they had expected to receive in order to dispose of them all. The products would be sold at their aggregate *value*, but this aggregate *value* is less than their aggregate price of production *ex ante*. The difference between the two aggregates will appear to be "deficient effective demand."

Accordingly, far from being deduced under the assumption that Say's Law is valid, Marx's law

37. Robinson, *An Essay on Marxian Economics*, pp. 50–51.

38. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 36.

39. Marx, *Capital*, vol. III, p. 303.

40. Keynes, *The General Theory of Employment, Interest, and Money*, p. 26.

of the falling tendency of the rate of profit is directly and completely contradictory to Say's Law—but in a clearly defined way. The rate of profit does not fall because there is not enough effective demand; on the contrary, *there is deficient effective demand because the rate of profit is falling.* The essential meaning of overproduction is "production of too many means of production and necessaries of life to permit of their
132 serving as means for the exploitation of laborers *at a certain rate of profit.*"[41]

Marx is therefore not at all inconsistent in rejecting both Say's Law and underconsumptionism. The basis for his critique of capitalism is not underconsumption, it is *underproduction.* "It is not a fact that too many necessities of life are produced in proportion to the existing population. The reverse is true. Not enough is produced to satisfy the wants of the great mass decently and humanely."[42] The phenomenon of "periodical overproduction of wealth in its capitalistic and self-contradictory form"[43] is to Marx essentially the surface sign of the underlying barrier to the capitalist mode of production, manifested concretely in the falling tendency of the rate of profit which itself testifies that "the real barrier of capitalist production is capital itself."[44]

The incompatibility of underconsumptionism with the main body of the Marxian system is legitimately a matter of slight concern to Joan
133 Robinson, since she discards the basic unifying principle of that system, quantification in units of labor-time. For Sweezy, who professes to accept and defend the Marxian value theory, this cannot be the case. Therefore, if he is to bring in underconsumptionism in order to "supplement his [Marx's] work at a point where it is incomplete," this critic of Marx must, in terms of the basic categories of the Marxian system, "demonstrate that capitalism has an inherent *tendency* to expand the capacity to produce consumption goods more rapidly than the demand for consumption goods."[45]

Sweezy seeks to prove this through the argument that over time a steadily increasing proportion of the social product tends to be invested in means of production, so that "the ratio of the rate of growth of consumption to the rate of growth of means of production declines."[46] He then argues that the proportion between the stock of means of production and the output of consumption goods tends to remain constant, so that "the ratio of the rate of growth in the output of consumption goods to the rate of growth of means of production remains constant," and therefore "there is an inherent tendency ... for consumption to lag behind the output of consumption goods."[47] 134

It has been pointed out by several critics that the assumption of a constant proportion between the *total* stock of means of production and the output of consumption goods lacks any foundation whatsoever.[48] More significant, this assumption is quite inconsistent with the proposition that an increasing proportion of the social product will consist of investment goods.

Sweezy develops his argument on the basis of a model suggested by the Austrian Social-Democratic theorist Otto Bauer. He starts by defining national income per unit period of time in value terms (I) as made up of variable capital (w), surplus-value consumed (l), and surplus-value accumulated (k). Thus

$$\underline{I = w + l + k} \qquad (1.)$$

He makes the assumption that I and all its 135
components increase steadily, that workers have a constant unitary marginal propensity to consume while capitalists' MPC is fractional and declining, and that the organic composition of capital is rising ("accumulation rises as a proportion of surplus-value and investment rises as a proportion of accumulation.") Accordingly both w and l can be considered functions of k:

$$w = f(k) \text{ such that } 0 < f'(k) < 1 \text{ and } f''(k) < 0 \qquad (2.)$$

and

$$l = \phi(k) \text{ such that } 0 < \phi'(k) < 1 \text{ and } \phi''(k) < 0^{49} \qquad (3.)$$

Sweezy then makes the key assumption that "the technically determined relation between the

41. Marx, *Capital*, vol. III, p. 303 (italics mine).

42. Ibid., vol. III, p. 302.

43. Ibid., vol. III, p. 303.

44. Ibid., vol. III, p. 293.

45. Sweezy, *The Theory of Capitalist Development*, p. 180.

46. Ibid., p. 182.

47. Ibid., p. 183.

48. Cf. Lerner, "Marxism and Economics", p. 83: "*output* is not the same as *consumption.* It includes not merely consumption but also the output of additions to equipment and to stocks of goods in process. Sweezy appears to have been much too dazed by the whirl of different ratios to notice this."

49. The mathematics here is somewhat sloppy. For w and l *always* to grow less rapidly than k, $\frac{Ew}{Ek}$ and $\frac{El}{Ek}$ should always be less than unitary, so that inequalities (2) and (3) should be $0 < f'(k) < \frac{w}{k}$ and $0 < \phi'(k) < \frac{l}{k}$. This, however, does not affect the further argument.

stock of means of production and output of consumption goods remains constant" so that "investment is proportional to the increase in consumption goods output. Hence if the increase in consumption in the time dt is $dw + dl$, there will be required an addition to means of production, say c, such that, where λ is the factor of
136 proportionality

$$\underline{c = \lambda(dw + dl)}\text{"}^{50}\ (??) \tag{4.}$$

On this basis Sweezy proceeds to his demonstration that c, "the rate of investment required by the growth of consumption," must behave in contradictory fashion to k "the rate of investment dictated by the typical capitalist behavior pattern,"[51] the contradiction to be proven by $\frac{dc}{dt} \neq \frac{dk}{dt}$.

From the previous equations, he derives

$$\frac{dc}{dt} = \lambda\left(\frac{d^2I}{dt^2} - \frac{d^2k}{dt^2}\right) \tag{5.}$$

and

$$\underline{\frac{d^2I}{dt^2} = [f'(k) + \phi'(k) + 1]\frac{dk}{dt} + [f''(k) + \phi''(k)]\left(\frac{dk}{dt}\right)^2} \tag{6.}$$

On the assumption that the absolute increase in national income per unit period of time is constant or decreasing, $\frac{d^2I}{dt^2} \leq 0$, it follows from the above that

$$\underline{\frac{d^2I}{dt^2} - \frac{d^2k}{dt^2} < 0} \tag{7.}$$

so that

$$\frac{dc}{dt} < 0 \tag{8.}$$

However it is also evident that

$$\underline{\frac{dk}{dt} = \frac{\frac{dI}{dt}}{f'(k) + \phi'(k) + 1} > 0} \tag{9.}$$

"Taken together" Sweezy triumphantly con-
137 cludes, "(8) and (9) indicate a contradiction. Capitalists tend to increase the rate of investment ($\frac{dk}{dt} > 0$) but the way they allow consumption to grow warrants only a declining rate of investment ($\frac{dc}{dt} < 0$)."[52]

This "proof," alas, rests on a monstrous piece of confusion. Sweezy's definitions and assumptions are all in *value* terms—but suddenly, with equation (4), he switches into "*real*" quantities, "means of production" and "consumption goods," without revealing the slightest awareness of what he has done; and what he has done is, quite simply, to make nonsense out of his whole argument.

If the organic composition of capital is rising, λ, as the relationship between the increase in the *value* of the output of department II and the increase in the *capital stock* required to permit this expansion, cannot possibly be constant—*it must continually increase*. Moreover it must increase by a larger amount in every successive period of time under Sweezy's assumption that "investment" rises as a percentage of "accumulation"[53] (i.e., if Q, $\left(\frac{C}{v(1+s')}\right)$, increases with time, and $\frac{l+w}{v+s}$ decreases with time, then λ, a function 138
of the change in $\frac{C}{l+w}$, must increase still more.) Thus $\frac{d\lambda}{dt} > 0$ and $\frac{d^2\lambda}{dt^2} > 0$ are necessary implications of Sweezy's own model and, in addition, $\frac{d\lambda}{dt}$ is an increasing function of k: $\frac{d\lambda}{dt} = \psi'(k) > 0$.

Consequently a proper analysis of Sweezy's model leads to the correct equation:

$$\underline{\frac{dc}{dt} = \lambda\left(\frac{d^2I}{dt^2} - \frac{d^2k}{dt^2}\right) + \psi'(k)\left(\frac{dI}{dt} - \frac{dk}{dt}\right)} \tag{5a.}$$

It is clear that $\frac{dc}{dt}$ is not necessarily negative, since the second term of the equation is always positive and may well have absolute value greater than the first term. The contradiction "proven" by Sweezy disappears, as was to be expected once it was revealed to be the simple consequence of Sweezy's contradictory assumptions regarding the organic composition of capital.

Equation (5a) in fact leads to conclusions very different from those claimed by Sweezy. It can be shown that there *must* exist values of k such that $\frac{dc}{dt} = \frac{dk}{dt}$—i.e., all real roots of the equation:

$$\frac{dI}{dt}\left(\frac{1 - \psi'(k)[f'(k) + \phi'(k)]}{f'(k) + \phi'(k) + 1}\right) = \lambda\left(\frac{d^2I}{dt^2} - \frac{d^2k}{dt^2}\right) \tag{10.}$$

Sweezy's method of "establishing the tendency to underconsumption" thus tends to prove the very opposite—the thesis of Tugan-Baranovsky that "given a proportional distribution of social 139
production"[54] there can be no general underconsumption.

The essential point is that it is k, the actual investment, that equilibrates production and consumption. The excursion into underconsumptionism serves again to show that, in the Marxian model, the critical factor is *the incentive to*

50. Sweezy, *The Theory of Capitalist Development*, p. 188.

51. Ibid., p. 188.

52. Ibid., p. 189.

53. Therefore even in "real" terms and even accepting Sweezy's assumption of a constant ratio between output and means of production, λ cannot remain constant unless the proportional division of means of production between the sectors *also* remains constant, contradicting the prior assumption.

54. Quoted in ibid., p. 169.

invest, and that in this model overproduction *results from but does not cause* insufficient investment. The strategic variables remain those determining the rate of profit from within the sphere of production-relations. Underconsumption cannot be brought to the aid of Marx's critique of capitalism without exploding his system and substituting for it an essentially different type of economic analysis.

V. Theoretical criticisms of the law

140 An attack on the theoretical validity of the law of the falling tendency of the rate of profit from *within* the basic postulates of the Marxian system can be based on only two grounds: it can be argued that Marx was wrong to contend that capitalist development necessarily involved a rising organic composition of capital; or, granting that as an assumption, it can be argued that a rising organic composition of capital does not necessarily result in a falling rate of profit, since the increase in relative surplus-value stemming from the increased productivity of labor may be sufficient to compensate for the increasing organic composition, producing a constant or even a rising rate of profit.

In evaluating these criticisms we will begin with the latter. The Marxian expectation of a steadily rising organic composition of capital is thus to be taken as a valid assumption for this part of the discussion. In the next stage the legitimacy of the basic proposition itself will be discussed.

V.1. Relative surplus-value as compensation for the rise in organic composition

141 As we have seen, in Marx's derivation of the falling rate of profit the rate of exploitation is assumed to remain constant, so that:

$$\frac{dp'}{dt} = -\frac{s'}{Q^2(1+s')}\frac{dQ}{dt}$$

In her critique of Marx, Joan Robinson maintains that this argument is inconsistent, incorrect, and at best tautological:

> Marx's law of the falling tendency of profits then consists simply in the tautology: when the rate of exploitation is constant, the rate of profit falls as capital per man increases. Marx can only demonstrate a falling tendency in profits by abandoning his argument that real wages tend to be constant. This drastic inconsistency he seems to have overlooked.[1]
>
> Marx's theory, as we have seen, rests on the assumption of a constant rate of exploitation. Certain causes which may lead to a rise in the rate of exploitation he treats as offsetting tendencies. ... To these tendencies, which all help to raise the rate of exploitation, there are obvious limits and Marx argues that they cannot be sufficiently strong to offset the falling tendency of the rate of profit. This may be readily admitted. But the rise in the rate of exploitation which comes about through a rise in productivity, with constant hours and intensity of work, and constant real wages, is not limited in the same way. *Productivity may rise without limit, and, if real wages are constant, the rate of exploitation rises with it.*[2]

In chapter I we showed that Marx, far from arguing that "real wages tend to be constant," allows theoretically for a rising tendency of the real wage.[3] The reproach of "inconsistency" is 142 thus entirely based on the common misconception of Marx's theory of wages.

Is it, moreover, justified to state that Marx's theory of the falling rate of profit "rests on the assumption of a constant rate of exploitation"? Mrs. Robinson herself recognizes, in a different context, that this theory is "based on the principle of the rising organic composition of capital."[4] On many occasions Marx makes it very clear that he believes his prediction of a falling rate of profit to be entirely compatible with a rising rate of exploitation. For instance, virtually at the beginning of his exposition, he writes:

> The law of the falling tendency of the rate of profit, which is the expression of the same, or even of a higher, rate of surplus-value, says in so many words: Since the aggregate mass of the living labor operating the means of production decreases in comparison to the value of these means of production, it follows that the unpaid labor, and that portion of value in which it is expressed, must decline as compared to the value of the advanced total capital. Or, an ever smaller aliquot part of the invested total capital is converted into living labor, and this capital absorbs in proportion to its magnitude less and less surplus-labor, although the proportion of

1. Robinson, *An Essay on Marxian Economics*, p. 36.
2. Ibid., p. 38.
3. Cf. *supra*, ch. II, pp. 16–18.
4. Robinson, *An Essay on Marxian Economics*, p. 50.

> the unpaid part of the employed labor may simultaneously grow as compared with the paid part.[5]

Marx is therefore neither inconsistent nor tautological—the crucial point, however, is
143 whether he is *correct* in claiming that increases in the rate of exploitation resulting from the higher productivity of labor cannot systematically raise the rate of exploitation enough to compensate for the increase in the organic composition of capital.

Sweezy charges that this claim is completely unfounded:

> If both the organic composition of capital and the rate of surplus-value are assumed variable, as we think they should be, then the direction in which the rate of profit will change becomes indeterminate. All we can say is that the rate of profit will fall if the percentage increase in the rate of surplus-value is less than the percentage decrease in the proportion of variable to total capital.[6]

144 > It is not possible to demonstrate a falling tendency of the rate of profit by beginning the analysis with the rising organic composition of capital.[7]

Marx, of course, was well aware of this objection, and attempted to answer it. His refutation was based on the existence of an absolute limit to the amount of surplus-value that any given number of workers could produce:

> To the extent that the development of productivity reduces the paid portion of the employed labor, it raises the surplus-value by raising its rate; but to the extent that it reduces the total mass of labor employed by a certain capital, it reduces the numerical factor by which the rate of surplus-value is multiplied in order to calculate its mass. Two laborers, each working twelve hours daily, cannot produce the same mass of surplus-value as 24 laborers each working only two hours, even if they could live on air and did not have to work for themselves at all. In this respect, then, the compensation of the reduction in the number of laborers by means of an intensification of exploitation has certain impassible limits. It may, for this reason, check the fall of the rate of profit, but cannot prevent it entirely.[8]

145 Marx uses an extreme example, and, moreover, an unclear one, since he does not state whether the two hours worked by each of the 24 laborers represents their surplus working time or their total working time (and if the latter, at what rate of surplus-value are they working? Do they also "live on air"?).

His basic point, nonetheless, is a simple one and quite plausible. The rate of profit is a ratio between two coordinate variables, surplus-value per man and capital invested per man. The first of these has an "impassible limit"—the duration of the working day. The second, however, has no *finite* limit—in a completely automated economy it would approach infinity. As the two variables approach their limits the ratio between them must therefore approach zero.

Güsten considers that "this argument is faulty" because Marx "constructs a linear relationship between the increase in productivity and the increase in surplus-value."[9] This "linear relationship," however, was in no way implied in the foregoing citation which says nothing at all about the relation between increases in productivity and surplus-value. The weakness is nevertheless a real one: even though there must always be a potential increase in Q large enough to decrease p' whatever the change in s', it does 146 not follow that as Q increases to this value p' must fall *steadily and systematically*.

Marx's basis for expecting this steady fall was stated most explicitly in a passage from the rough draft of *Capital*:

> The greater the surplus-value appropriated by capital because of the augmented productivity ... or the smaller the already established fraction of the working day

5. Marx, *Capital*, vol. III, p. 252.

6. Sweezy, *The Theory of Capitalist Development*, p. 102. In his own formulation of the question Sweezy falls into hopeless confusion. His definition of the organic composition of capital is $q = \frac{c}{c+v}$ and the rate of profit $p' = s'q' \quad \left(q' = 1 - q = \frac{v}{c+v}\right)$. This is, on its face, meaningless since the symbols used stand for flow variables, and the rate of profit is based on the stock of invested capital. But in any case it is impossible to make sense of the formula $q' = 1 - q$, since the algebraic operation can be performed only if $\frac{c+v}{c+v}$ is identically equal to unity, and as we have seen this can never be the case, since the two "v's" represent different quantities: the "v" in the numerator stands for the living labor-power entering into the commodity-product, while the "v" in the denominator represents merely the infinitesimal "stock of variable capital."

7. Ibid., p. 105. Though Maurice Dobb, more than Sweezy, is concerned about demonstrating his orthodoxy, he comes to substantially the same conclusion: "That [Marx] provided no *a priori* proof that one set of influences would dominate the other was an omission which, I believe, was ... made advisedly because it would have been alien to his whole historical method to suggest that any answer could be abstractly given." (*Political Economy and Capitalism*, p. 109).

8. Marx, *Capital*, vol. III, p. 290.

9. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 40.

> which provides an equivalent for the workers, so much the smaller is the increase in surplus-value which capital can obtain from an increase in productivity. Surplus-value increases, but in ever diminishing proportion to productivity. To the extent that capital is already developed ... so much the more frightfully must it increase productivity even to expand (i.e., to increase surplus-value) by a lessened proportion—because its barrier always remains the proportion between the fraction of the day which expresses necessary labor and the entire working-day. Only within these boundaries can it move.[10]

Rosdolsky maintains that this argument is sufficient to establish Marx's contention, and Güsten essentially agrees with him, with the proviso that "the rate of profit must *finally* fall ... previously, however, the rate of profit can also rise over time, since while the rate of surplus-value is low, surplus-value increases with relative speed."[11] (I.e., if the real wage is constant and $s' < 1$, a given percentage increase in productivity will cause a more-than-proportional increase in surplus-value.)

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Even here, however, the argument is seriously incomplete, since it relates the increase in surplus-value only to the increase in productivity and not to the increase in the organic composition of capital required to bring it about. Since, however, Marx assumes in effect that the "marginal productivity of capital" is an *increasing* function of capital per man (i.e., that productivity increases more than proportionally with organic composition), surplus-value can increase less rapidly than *productivity* while maintaining the same proportion to *capital*. The essential problem can only be solved on the basis of the explicit functional relationship between *surplus-value* and *organic composition*.

This relationship must be conceived strictly in the long-run sense, abstracting completely from all short and intermediate term fluctuations. In other words, we must start with a dynamically stable model, whose parameters are assumed to remain constant over time.

The variables of the system, then, are:

Q The organic composition of capital

s' The rate of exploitation

p' The rate of profit

Π The index of net labor-productivity

w The index of real wages

t Time

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Its parameters are given by the following basic assumptions:

(1) Labor-productivity is increasing continually and *at a constant rate*.

(2) Relative changes in productivity have a constant and more than proportional relationship to changes in the organic composition of capital (i.e., $\frac{E\Pi}{EQ}$, the elasticity of Π with respect to Q, is constant and exceeds unity).

(3) Relative changes in the real wage have a direct, constant, but less than proportional relationship to changes in labor-productivity (i.e., $\frac{Ew}{E\Pi}$ is constant, positive, and less than unity).

Thus these parameters are

$$r = \log_e \frac{\Pi_t}{\Pi_{t-1}}$$

$$u = \frac{E\Pi}{EQ} > 1$$

$$b = \frac{Ew}{E\Pi} \qquad (0 < b < 1)$$

From the assumption $u = \frac{E\Pi}{EQ}$ can be derived the equation expressing productivity as a function of organic composition:

$$u = \frac{E\Pi}{EQ} = \frac{d\Pi}{dQ} \cdot \frac{Q}{\Pi} \quad , \quad \Pi = \Pi(Q)$$

$$\frac{d\Pi}{dQ} = \frac{u\Pi(Q)}{Q} \quad , \quad \Pi = \int \frac{u\Pi(Q)}{Q} dQ$$

$$\boxed{\Pi = aQ^u}$$ [12]

This is Marx's long-run "production function," 149
in which changing technology is the primary determinant of changes in productivity and must involve under capitalist conditions the change in social relationships expressed by a rising organic composition of capital. Because it is based on technological change it is *irreversible*—at every point in time Q is conceived as having a unique and determinate value.[13]

10. Marx, *Grundrisse der Kritik der Politischen Ökonomie (Rohentwurf)*, p. 246, cited in Rosdolsky, "Zur Neueren Kritik des Marxschen Gesetzes der Fallenden Profitrate", p. 221.

11. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 46.

12. a, of course, is the constant of proportionality based on the value of Π arbitrarily chosen when $t = 0$ (i.e., $a = \frac{Q_0^u}{\Pi_0}$).

13. This in no way implies that Marx's *short-run* model involves "fixed coefficients." The contrary is the case. Every single machine has its own unique implicit "organic composition," depending on the value originally invested in it; its age, deterioration, and obsolescence; and the amount of labor required for its operation. Which of these machines are used to bring about short-run changes in production is determined through the market.

Given the values of r, u, and b, and the values when $t = 0$ of s' and Q, the value of p' at every point of time is determined.

If $s'_0 = \sigma$ and $Q_0 = \theta$, then $\Pi_0 = a\theta^u$ and, since s', $\frac{\text{surplus labor}}{\text{necessary labor}}$ is equivalent to $\frac{\text{surplus product}}{\text{necessary product}}$, $\frac{\Pi}{w} - 1$, then $w_0 = \frac{a\theta^u}{1+\sigma}$.

At every time t it follows that

$$\Pi_t = a\theta^u e^{rt}$$

and

$$w_t = \frac{a\theta^u}{1+\sigma} e^{brt}$$

150 Accordingly the rate of exploitation, s'_t, is determined by $\frac{a\theta^u(1+\sigma)e^{rt}}{a\theta^u e^{brt}} - 1$

$$\boxed{s'_t = (1+\sigma)e^{(1-b)rt} - 1}$$

Similarly the organic composition of capital, Q_t, is determined by $\sqrt[u]{\theta^u e^{rt}}$

$$\boxed{Q_t = \theta e^{\frac{rt}{u}}}$$

From the basic formula for the rate of profit, it follows that

$$\boxed{p'_t = \frac{(1+\sigma)e^{(1-b)rt} - 1}{\theta(1+\sigma)e^{\frac{rt(u+1-bu)}{u}}}}$$

From this it is easy to derive the rate of change of p' at every point in time

$$\frac{dp'}{dt} = \frac{(1-b)r(1+\sigma)e^{(1-b)rt} - [(1+\sigma)e^{(1-b)rt} - 1]\left[\frac{r(u+1-bu)}{u}\right]}{\theta(1+\sigma)e^{\frac{rt(u+1-bu)}{u}}}$$

$$\boxed{\frac{dp'}{dt} = -\frac{r[u(1-b) - s']}{u\theta(1+\sigma)e^{\frac{rt(u+1-bu)}{u}}}}$$

It is evident that the condition for a falling tendency of the rate of profit, $\frac{dp'}{dt} < 0$, is simply

$$\frac{s'}{1-b} > u$$

The conclusion of this analysis is that, despite Sweezy's discovery that "It is not possible to demonstrate a falling tendency of the rate
151 of profit by beginning the analysis with the rising organic composition of capital," Marx was completely justified in his derivation of a falling rate of profit from a rising organic composition of capital. When Marx wrote it was generally accepted as an empirical fact that the rate of profit had tended to fall: accordingly it was legitimate to assume that the inequality $\frac{s'}{1-b} > u$ already prevailed. Since b and u are parameters of the system, changes in this inequality depend on changes in s'. But if s' is to decrease over time this requires that $b > 1$, so that $\frac{dp'}{dt}$ must always be negative, while if s' increases the inequality must increase.

Consequently Marx's prediction of a falling rate of profit is the necessary expression of his basic proposition: that the rising organic composition of capital is "*but another expression for the increased productivity of labor.*"[14] It is thus the tendency of the organic composition, not of the rate of exploitation, that is the decisive theoretical test of Marx's argument.

V.2. Must the organic composition of capital increase?

Since, from a theoretical standpoint, the falling rate of profit depends entirely on the rising organic composition of capital, the crucial arguments against Marx's theory are those which challenge the rising tendency of the organic composition. 152

The starting point of these criticisms is that Marx merely proclaims that Q must tend to rise, but provides no reason why this must be so. Thus Hans Peter writes:

> The increase of productivity must now come to expression in the rise of Q. No reasons will be given for this proposition—it will merely be continually repeated.[15]

Marx himself, moreover, seems in at least one place to admit that this is the case:

> Considered abstractly, the rate of profit may remain the same, even though the price of the individual commodity may fall as a result of an increase in the productivity of labor and a simultaneous increase in the number of these cheaper commodities, for instance, if the increase in the productivity of labor extended its effects uniformly and simultaneously to all the elements of the commodities, so that the total price of the commodities would fall in the same proportion in which the productivity of labor would increase, while on the other hand the mutual relations of the different elements of the price of commodities would remain the same. The rate of profit might even rise, if a rise in the rate of surplus-value were accompanied by a considerable reduction in the value of the

14. Marx, *Capital*, vol. III, p. 253.

15. Peter, *Einführung in die politische Ökonomie*, Stuttgart, 1950, p. 106, cited in Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 26 n.

> elements of constant, and particularly of fixed, capital. But, in reality, as we have seen, the rate of profit will fall in the long run.[16]

Güsten's reproach to this passage can hardly be disputed:

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> But this casual remark, 'as we have seen,' is not correct since, as Peter rightly observed, only the continually repeated *assertion* of a rising organic composition is to be found in the foregoing sections. At the decisive moment in his argument it ill becomes a theoretician of Marx's stature to appeal to 'reality' as against 'abstract consideration.'[17]

The essence of the matter is stated clearly by Güsten:

> In the long run Q will increase only if productivity in the producer goods industries increases more slowly than capital intensity (= technical composition).[18]

The crucial problem, to which Marx failed to give a systematic solution, is therefore to show the immanent necessity for a rising tendency of the ratio, in "real" terms, between means of production and net output.

Marx's attempts, mainly in *Theorien über den Mehrwert*, to demonstrate such a tendency, amounted essentially to the contention that the increase of productivity in the sectors dependent on natural conditions, such as agriculture, lags behind the increase of productivity in industry.

Güsten's critique of this line of reasoning is conclusive: an argument based on such a "lag" is itself subject to all the arguments raised by Marx

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against the *Ricardian* theory of the falling rate of profit, notably that it constitutes a "flight from economics ... into organic chemistry."[19] Moreover, even granting this lag, the organic composition of capital will not increase unless the increase of productivity in those sectors is *also* less than the increase of technical composition in them.

Does this, however, mean that Güsten is justified in writing that since Marx "admits in somewhat concealed fashion that this evolution [technical progress] need not lead to a rising organic composition if the increase of productivity is everywhere equivalent ... therewith collapses the thesis that the rise in the organic composition is 'but another expression for the rising productivity of labor'"?[20]

This judgment is valid only if it can be shown that "neutral" technological progress, in the sense of a constant ratio between means of production and output, is a *theoretically possible* case in the Marxian model.[21] Though Marx, as we have seen, nowhere presents a proof that technological progress under capitalism must be "capital-using" rather than "capital-saving" or "neutral," he at least indicates two lines of argument which can serve to establish this crucial point.

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The first of these, which Güsten develops extensively in a different context, his discussion of Joan Robinson's theory of economic growth,[22] rests on Marx's theory of the role of the industrial reserve army. The existence of the "surplus laboring population" is, according to Marx, "a condition of existence of the capitalist mode of production."[23] The reserve army is necessary to capitalism because without it no rapid expansion of production would ever be possible without creating a situation of over-full employment in which wages would rise so rapidly as to reduce surplus-value: without the reserve army, a capitalist economy would continually come up against what Joan Robinson calls "the inflation barrier." Thus the industrial reserve army is "the pivot upon which the law of demand and supply of labor works. It confines the field of action of this law within the limits absolutely convenient to the activity of exploitation and to the domination of capital."[24]

What, then, are the implications of "neutral" technological progress? It is immediately evident that if the organic composition of capital

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is constant, the capital stock cannot grow faster than the labor force. *There can be no reserve army in this situation*, since as long as additional workers are available there will be no barrier to increased investment.

The essential point is that "neutral" technological progress creates a full-employment situation in which there are irresistible pressures for a rapid increase in wages. Even aside from the ability of organized workers to enforce wage demands in these circumstances, unless wages were rising so fast that profits and savings were reduced to a level consistent with the rate of

16. Marx, *Capital*, vol. III, p. 269 (German edition, p. 258).

17. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 56.

18. Ibid., p. 52.

19. Marx, *Grundrisse der Kritik der Politischen Ökonomie (Rohentwurf)*, p. 639, cited in Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 58.

20. Ibid., p. 59.

21. Non-neutral progress of the "capital-saving" variety cannot be possible if neutral progress is itself impossible, ("means of production" here denotes only fixed capital.)

22. Ibid., chs. VII–X.

23. Marx, *Capital*, vol. I, p. 693.

24. Ibid., vol. I, p. 693.

growth of the labor force, the high rate of profit would stimulate a ratio of savings (≡ investment) to capital stock greater than this labor force growth rate.

In this situation, with wages tending to rise and profits to fall, it is obvious that every entrepreneur will seek to substitute capital for the "scarce" factor, labor. This "substitution," of course, is realized through investment—the "innovations" chosen for realization will be those most labor-saving.[25] In this way technological progress ceases to be "neutral" and becomes
157 labor-saving, causing the organic composition of capital to increase.

It is therefore surprising that, after developing this argument with enormous thoroughness, Güsten concludes that it gives no support to Marx's theory of a rising organic composition of capital because it "assumes an alteration in the relative factor-prices and thereby is excluded as an explanatory factor in relation to the law of the profit rate."[26]

It is precisely because the alteration of "relative factor-prices" is the necessary consequence of *neutral* technological progress that it provides support for Marx's theory: this is what demonstrates that the capitalist economy has an inevitable bias, that economic growth tends to be shunted off the neutral and on to the capital-using growth path.

The second line of argument whereby a rising organic composition of capital can be derived on a Marxist basis is a logical one, starting from the assumption, which Güsten claims leads to "collapse" of the rising organic composition thesis, that "the increase of productivity is everywhere equivalent."

The point, as stated earlier, is to show that the technical composition of capital must tend to
158 increase faster than the productivity of labor. As we have seen, both technical composition (means of production per man) and labor-productivity (net real output per man) are ratios in which the numerator is expressed in *real* terms (i.e., as a quantity of use-values) and the denominator in *value* terms (i.e., as a quantity of labor-time).

The productivity of labor is the net mass of use-value produced divided by the living productive social labor required for its output. The technical composition of capital is the mass of use-values accumulated in the form of means of production, divided by the amount of living productive social labor required to set them in motion. This, in effect, is how Marx uses these categories when he writes that the value-increase of constant capital "*nur entfernt das Wachstum der wirklichen Masse der Gebrauchswerte darstellt.*"[27]

If these two ratios were *independent*, there would be no reason why technical composition had to increase more rapidly than labor productivity. But in fact the two are not independent.

The use-value of a *capital*-good is composed of two aspects: it is required for the production of *things*, and at the same time it is required for the production of *relative surplus-value*. Its 159
utility is therefore a combination of its *capacity-increasing* effect and of its *labor-saving* effect.

We can therefore assume that, as long as any extra labor is available, the use-value of a capital-good will increase proportionally with its capacity, assuming no increase in the productivity of labor—two identical machines will have twice the use-value of one. Now if use-value were *only* determined by capacity, the movement of technical composition and of labor-productivity would be identical: if capacity were doubled and labor input increased by 50 %, *both* ratios would be represented by $\frac{200}{150} = 1.333\ldots$. Since, however, a machine of given capacity has more use-value insofar as it permits a higher productivity of labor, the use-value of the new machine will be more than 200, and consequently the technical composition of capital *will exceed* 1.333..., the index of labor productivity.

This logical demonstration that technical composition *must* increase more than proportionally with labor-productivity confirms Marx's contention that, in his model, the increased organic composition of capital "*is but another expression for the increased productivity of labor*" and that therefore it is "*a logical necessity*" of the development of the capitalist mode of production "to give expression to the average rate of surplus-value by a falling rate of average profit." 160

V.3. Summary

What has been accomplished in this chapter has been to establish the theoretical validity, given the postulates and assumptions of his system, of Marx's derivation of the "Law of the Falling Tendency of the Rate of Profit." The rising tendency of the organic composition of capital has been shown to be bound, as a "*logical necessity*," to the increasing productivity of labor, and a falling rate of profit has been shown to follow

25. Cf. Hicks, *The Theory of Wages*, p. 125. While "autonomous" inventions, according to Hicks, are random and therefore on balance *neutral*, "induced" inventions tend to be *labor-saving*.

26. Güsten, "Die langfristige Tendenz der Profitrate bei Karl Marx und Joan Robinson", p. 139.

27. Marx, *Kapital*, vol. III, p. 239. Cf. ch. I, *supra*, pp. 7–8.

inescapably from a rising organic composition of capital.

We thus will be working with two concrete and empirically verifiable predictions generated by the Marxian model. If the Marxian system is to uphold its claim to general validity as the basis for any scientific understanding of society and of history it must be able to withstand the empirical test of these predictions.

VI. Calculation of the Marxian rate of profit, rate of surplus-value, and organic composition of capital: The United States, 1900 – 1960 (current dollars)

VI.1. Basic procedure

161 In accordance with the interpretation of the Marxian definitions presented in the first part of this study the rate of profit has been calculated as the ratio between *aggregate net surplus-value* and the *capital stock*; the rate of surplus-value as the ratio between *aggregate net surplus-value* and *aggregate variable capital*; and the organic composition of capital as the ratio between the *capital stock* and the *sum of surplus-value and variable capital*. All these were computed on the basis of the aggregate non-farm private business economy. Since in Marxian terms government (both general and non-profit government enterprises) and private households, inasmuch as they employ no productive labor[1] and therefore produce no surplus-value, are "non-capitalist" sectors of the economy, investment in and property income originating from these sectors were excluded from the computation. In this stage of the computation the basic variables for each year
162 were calculated as quantities *of current dollars*.

VI.2. Capital stock

The denominator of the rate of profit and numerator of the organic composition of capital, the capital stock, was defined by Marx as the value, net of depreciation, of the physical capital involved in the total production and circulation process. This stock has been computed as the aggregate of *producer durable equipment*, *structures*, *inventories*, and *fuel and mineral reserves* in the capitalist sector. It was derived as the cumulated net investment in each category of capital asset.

To express capital and depreciation in current dollars a price-index based on the consumer purchasing power of the dollar was used. This was necessary since the existing price-indexes for capital goods, based essentially on labor and materials costs, do not fully account for improvements in the quality of capital goods produced, and thereby overstate the actual increase in capital-goods prices over a long period.[2] Deflation of capital expenditures by a 163

1. Cf. *supra* ch. II, p. 19.

2. Cf. Terborgh, *Sixty Years of Business Capital Formation*, pp. 2–4 (Mimeographed supplement):

> "the customary deflation of capital expenditure figures by the available indexes of plant construction costs and equipment prices is unreliable and misleading. ... So far as we can make out, the available indexes of equipment prices reflect changes in prices *per unit of equipment* ... this might be worth having if the so-called pieces were the same from year to year, but as everyone knows most items of equipment are constantly being improved in performance and efficiency.... Not even this much can be said for the indexes of plant construction costs. Since each structure is unique, it is impracticable to price units of *output* (finished construction). What the indexes price is units of *input* (materials and site labor). Obviously this approach makes no allowance for improvements in productive efficiency in the construction operation itself. The omission gives the index an added upward bias *over and above* the bias it shares with the index of equipment prices. ...
>
> ... Instead, we measure changes in *real investment* from year to year, this being defined as investment in dollars of constant purchasing power. This differs from the usual deflation by the substitution of an index of the general purchasing power of the dollar for the indexes of specific capital goods prices discussed above. ... We use throughout as our deflator the broadest available measure of changes in the purchasing power of the dollar, the "implicit" deflator for the privately produced gross national product, computed by the Department of Commerce."
>
> This conclusion, however, is illogical. The "implicit" deflator for private GNP is actually a weighted average which includes the capital goods deflators that have been judged "unreliable and misleading." The only consistent procedure is to reject these indexes altogether,

consumption price-index gives a value of the capital stock expressing the current price equivalent of the *purchasing-power* originally "frozen" in the shape of capital goods (or, in neo-classical terms, the original "sacrificed consumption,") instead of a direct estimate of current reproduction cost. Viewed from another angle, the value derived in this way can be considered the best approximation to reproduction cost, given the assumption of equal rates of productivity change in both capital-goods and consumer-goods departments.

In the computation of capital consumption, the "double-rate declining balance" method was used, as the most realistic of the various conventional methods of depreciation accounting.[3]

VI.3. Surplus-value

Marx defined surplus-value as the share of the national income (net of capital consumption) available for consumption and investment by the capitalist class, (i.e., after-tax net property income [profit, interest, and rent] originating in the capitalist sector). In the present computation the capitalist sector was subdivided into *corporate* and *non-corporate* sectors. For each, surplus-value was computed gross of nominal depreciation and other capital charges. Net profit was determined by subtracting estimated actual consumption of capital from the combined gross surplus-value of the two sub-sectors, after this combined gross-surplus-value was adjusted for the non-productive governmental expenditure paid for through direct taxes on nominal property income.

The non-corporate stream of gross surplus-value was derived in the following way:

The total income of unincorporated businesses, composed of income of unincorporated enterprises, inventory valuation adjustment, and charged depreciation, was reduced by the incomes of farmers, financial intermediaries, and professional practitioners. To the quantity thus determined were added estimated net interest and net rent originating in the same sectors. Finally, from this aggregate were deducted the revenues ascribable to labor services of proprietors engaged full-time in their own businesses, as estimated on the basis of the average annual earnings of full-time employees in each industry. The quantity thus derived represents surplus-value gross of depreciation and of direct personal taxes originating in the non-corporate sector.

The exclusion of the *Finance, Insurance, and Real Estate* industry group was necessary to avoid double counting, since to the extent that net profit in this sector originates in the area of the economy included in this study it is already accounted for as net rent and net interest flowing from the other sectors.[4] Professional practitioners were excluded under the assumption that the totality of their net income represents payment for their own labor services.

In the determination of corporate gross surplus-value a similar procedure was followed, again excluding *Agriculture* and *Finance, Insurance, and Real Estate*. One additional component was included: salaries of corporate officers, who are considered by Marx as capitalists, recipients of surplus-value.[5] Rent from both corporate and non-corporate sectors was taken net of estimated real-estate taxes.

Aggregate gross surplus-value was arrived at by deducting from these income streams the estimated portion of them paid as direct taxes imposed upon individual recipients of surplus-value. The final step in the computation of *net profit* was simply to deduct estimated actual capital consumption from aggregate gross surplus-value.

VI.4. Variable capital

Although surplus-value is defined by Marx as net property income originating in the capitalist sector, he defines variable capital, not as net labor income originating in that sector but as that portion of net labor income received by *productive* laborers alone.

Productive laborers, as shown earlier,[6] were defined as those employees in the capitalist sector whose work is part of the process of actual *production* of commodities, in contradistinction to those workers whose functions, though socially necessary in present-day society, are involved in administration and distribution, but do not contribute to physical production of goods and services.

Gross variable capital, accordingly, was computed as the portion of total employee compensation in the commodity-producing industries of the capitalist sector (*Agricultural Services,*

and rely only on the Personal Consumption Expenditures deflator as a measure of "the general purchasing power of the dollar."

3. Cf. Terborgh, *Realistic Depreciation Policy*, pp. 149–153.

4. Theoretically, a portion of the value of office buildings, etc. used by these industries, corresponding to the excluded income, should be deducted from the total capital stock. This however, was not attempted since an accurate estimate was impracticable.

5. Cf. *supra*, ch. II, p. 21.

6. Cf. *supra*, ch. II, pp. 18–20.

Forestry, and Fisheries, *Mining*, *Manufacturing*, *Construction*, *Transportation*, *Communications*, *Public Utilities*, and *Services*) received by the productive laborers employed in each industry.

Net variable capital was derived by deducting from gross variable capital the estimated portion of it paid as direct taxes by individual recipients of labor income.

VI.5. The basic ratios

Once the current-dollar values of the capital
168 stock, variable capital, and surplus-value have been calculated, the fundamental ratios of the Marxian system (*organic composition of capital*, *rate of profit*, and *rate of surplus-value*) are directly given.

This calculation, however, differs from the strict Marxian concept of these ratios in one fundamental respect: it is carried out in current prices through a price-index relating the money value of the national income to *the sum of use-values making up the national income* and *not* to *the quantity of productive labor-time required to produce those use-values*. In other words, it is based on calculations in terms of purchasing power over units of final consumption, and not over units of factor input.

It is clear that the deflator used to determine the current dollar value of capital stock and depreciation as measured by a "labor-value" index will increase more rapidly than the deflator measured by a "use-value" index, *precisely to the extent that the net productivity of labor increases*, since the index of the net productivity of labor is simply the ratio of the two denominators: national income in use-values over the labor-value of the national income.

Therefore, to the extent that the index used to translate the original cost of fixed capital into the current-dollar total needed to determine
169 the portion of gross income that actually represents capital consumption rises less rapidly than would a "labor-value" index, to that extent the current value of the capital stock and the amount to be deducted from gross surplus-value as depreciation are less than would be the case if a "labor-value" index was used. Ratios computed on the basis of these totals must give a biased image of their "true" Marxian correlatives. Thus, as against their values under the strict Marxian definitions, the rate of profit and rate of surplus-value will show an upward, and the organic composition of capital a downward, bias, all increasing with time (insofar as net productivity tends to increase with time).

Calculation in these terms, nevertheless, is entirely relevant to the Marxian model. It is, in fact, necessary, in order to estimate the strength of the most important "counteracting cause" resisting the workings of the "Law of the falling tendency of the rate of profit": the effect of increasing labor net productivity in increasing the purchasing power of gross surplus-value.

Despite the desirability, from a social-accounting viewpoint, of taking induced obsolescence into account as a real cost of investment through a labor-value concept of capital consumption, it may realistically be hypothesized that the investment behavior of entrepreneurs will reflect their expectation of return on investment in units of final purchasing 170
power rather than of labor-time. Thus, even if a falling tendency of the rate of profit were found to exist in labor-value terms, this tendency could scarcely have the drastic consequences Marx ascribed to it unless it also became manifest in terms of the values that are immediately related to capitalistic motivations, i.e., in terms of a purchasing-power concept of investment and profitability.

Accordingly, the preliminary hypothesis to be tested is this:

As computed in terms of a price-index based on consumption purchasing power, the Marxian rate of profit in the U. S. non-farm economy will show a significant tendency to decrease over the period 1900–1960.

Invalidation of this hypothesis would not in itself refute Marx's theory, but it would cast substantial doubt upon his conclusions from the theory.

VI.6. Results

The fundamental ratios and the current-dollar quantities of surplus-value, variable capital, and the capital stock for each year from 1900 to 1960, 171
as calculated according to the procedure just described, are given in table VI–1 and presented graphically (to semi-log scale) in charts VI–1 and VI–2. Summary data on which table VI–1 is based are presented in appendix B.

The trend of the rate of profit over the entire period was computed on the basis of a regression with the rate of profit as the dependent, and time as the independent, variable. All years in the period were used, except for the years of deep depression (1931–1935) and of the second World War (1941–1945).

On a linear basis, this regression is

$$p' = 13.0570 - .1083t \text{ (t counted from 1900)}$$

with correlation coefficient $r = -.8053$

On a logarithmic basis the regression is

$$\log p' = 2.57669 - .01085t$$

with correlation coefficient $r = -.8021$

VI.7. Sources and methods

176 The statistical sources used were:

U. S. Department of Commerce; *National Income, 1929–1953*, *U. S. Income and Output*, *Survey of Current Business*, July 1962 (which continues all series taken from *U. S. Income and Output* through 1960—all references hereafter to *U. S. Income and Output* should be considered to include reference to the July 1962 *Survey of Current Business* for the years 1956–1960), *Historical Statistics of the U. S., Colonial Times to 1957*, and *Statistical Abstract of the U. S., 1962*.

U. S. Bureau of Labor Statistics; *Employment and Earnings (B.L.S. Bulletin 1312)*

U. S. Departments of Labor and Commerce; *Construction Volume and Costs, 1915–1956* and subsequent issues of *Construction Review*

U. S. Internal Revenue Service; *Statistics of Income* (annual)

U. S. Bureau of the Census; *Census of Manufactures, 1954* and *Census of Manufactures, 1958*, and *Census of Mineral Industries, 1958*

R. Goldsmith; *A Study of Saving in the United States*

J. Kendrick; *Productivity Trends in the U. S.*

G. Terborgh; *Sixty Years of Business Capital Formation*

S. Kuznets; *National Income and its Composition, 1919–1938*

R. Martin; *National Income in the U. S., 1799–1938*

A. Capital stock

177 1. *Price index* (appendix B, table B–I). The price index used to express capital stock and depreciation in current dollars was, for 1929–1960, the Gross National Product *Personal Consumption Expenditures* Deflator (*U. S. Income and Output*, table VII-2, p. 220) linked in 1929 to the Bureau of Labor Statistics *Consumer Price Index* (*Historical Statistics of the U. S., Colonial Times to 1957*, table E113, p. 176) and in 1913 to the Snyder Cost of Living Index as given by Goldsmith (*A Study of Saving in the United States*, vol. I, table T-16, p. 377).

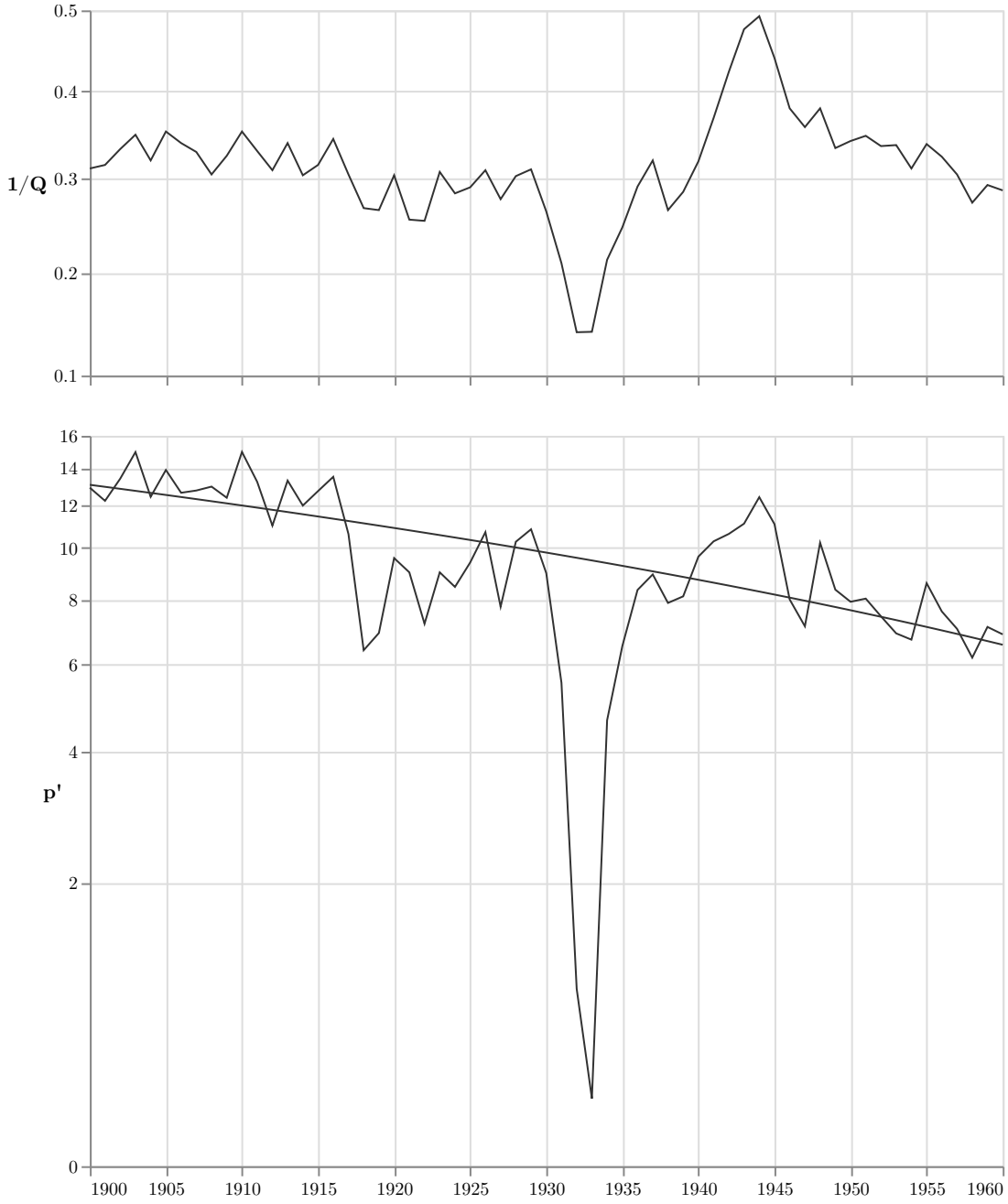
2. *Producer durable equipment* (appendix B, table B–II, col. *a*). For the period 1929–1960 non-farm private purchases of Producer Durable Equipment were estimated as the residual after deduction of farm PDE purchases as estimated by the Securities and Exchange Commission (*U. S. Income and Output*, tables V-3 and V-9, pp. 190, 194, and *National Income, 1929–1953*, tables 6 and 31, pp. 166, 208, extended to 1929 by table 32, p. 210) from total private purchases of Producer Durable Equipment (*U. S. Income and Output*, table I-1, p. 118). For the period 1899–1928 the figures used are those given by Goldsmith (*A Study of Saving in the United States*, vol. I, table P-5, p. 877). As Goldsmith's estimate of business investment in passenger automobiles is considerably below that of the Office of Business Economics, his estimate of this component for 1900–1928 was increased by the percentage necessary to equalize aggregate PDE expenditures according to the two concepts in 1929. The initial estimate of the stock of Producer Equipment at the end of 1928 was taken from Goldsmith (*A Study of Saving in the United States*, vol. III, table W-1, p. 14) reduced by the percentage of agricultural equipment in this stock, as given in *Historical Statistics of the U. S., Colonial Times to 1957*, p. 152. 178

Gross investment in Producer Equipment was broken down into groups of different average life-expectancy on the basis of the percentage breakdown implicit in Goldsmith's figures for 1900–1945, projected to 1954 on the basis of *U. S. Income and Output*, table V-5, p. 192. Since the OBE has not continued this series beyond 1954, the percentage breakdown used for 1955–1960 was that of total expenditures for the period 1947–1954.

3. *Business structures* (appendix B, table B–II, col. *b*). Investment in business plant was taken as the sum of the following seven series of private structures put in place: *Industrial*, *Office & Warehouse*, *Store, Restaurant & Garage*, *Miscellaneous Non-residential*, *Public Utility*, *Non-housekeeping Residential*, and *All Other Private* structures.

These series, for the period 1915–1960, were taken from *Construction Volume and Costs, 1915–1956* (*Supplement to Construction Review*, 1957) and subsequent volumes of *Construction Review*. They were extended back to 1900 by the estimates given by the Machinery and Allied Products Institute in the statistical notes supplementary to *Sixty Years of Business Capital Formation*. 179

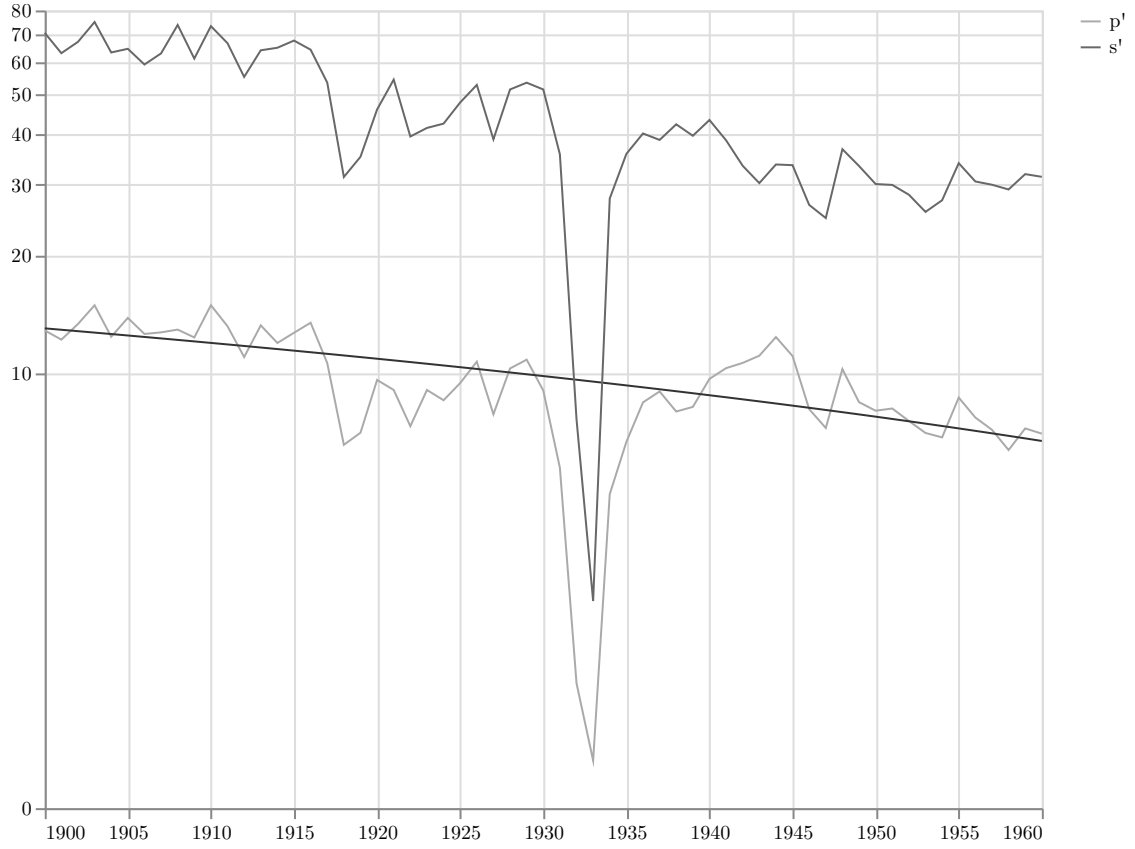
Chart VI–1.: Rate of profit and organic composition of capital (inverted), 1900–1960 (current dollar basis)



The stock of business structures at the end of 1899 was taken from Goldsmith (*A Study of Saving in the United States*, vol. III, table W-1, p. 14). Business plant was depreciated, as by Goldsmith, on the basis of a 50 year life-span.

4. *Fuel and Mineral Development Expenditures* (appendix B, table B–II, col. *c*). Expenditures for mining development for the period 1900–1960 were estimated as by Goldsmith as 3 % of the value of coal and minerals extracted, and were taken from *A Study of Saving in the United States*, vol. I, table R-15, p. 601; *Historical Statistics of the U. S., Colonial Times to 1957*, pp. 350–351; and *Statistical Abstract of the U. S., 1962*, pp. 712–713. They were depreciated, as by Goldsmith, on the basis of a 40 year life-span.

Chart VI–2.: Rate of profit and rate of surplus-value, 1900–1960 (current dollar basis)



Oil and Gas Well Drilling expenditures for 1900–1945 were taken from Goldsmith (*A Study of Saving in the United States*, vol. I, table R-14., p. 600) and, for 1946–1960, from *U. S. Income and Output*, table V-3, p. 190. They were depreciated, as by Goldsmith, on the basis of a 25 year life-span.

The initial value of each series was derived from 1899 expenditures on the basis of the average ratio of capital stock to gross investment for Producer Equipment in 1899.

5. *Inventories* (appendix B, table B–II, col. *d*). The aggregate value of non-farm business inventories at the end of 1950 was taken from *National Income, 1929–1953*, p. 136. This total was cumulated forward and backward by the sum *Net Inventory Change* less *Inventory Valuation Adjustment* as given for 1929–1960 in *U. S. Income and Output*, table I-1, p. 118 and table I-8, p. 126, and, for 1900–1928, by Goldsmith (*A Study of Saving in the United States*, vol. I, table P-19, p. 903).

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B. Capital consumption (appendix B, table B–III)

Capital consumption for every category of depreciable asset was calculated on the basis of the life-spans used by Goldsmith (*A Study of Saving in the United States*, vol. I, table P-7, p. 878) which he, in turn, took from the Internal Revenue Service *Bulletin F, 1942*. Depreciation on each component of the capital stock in a given year was calculated by dividing the value in current prices of that component at the start of the year, plus $\frac{1}{2}$ the gross investment for that year, by $\frac{1}{2}$ the average life-span.

The method of computation of capital consumption and of the mid-year value of each component of the capital stock is shown in exhibit A, which gives the computation of the stock and depreciation of aggregate business structures for 1948 and 1949.

C. Total gross surplus-value

1. *Corporate gross surplus-value* (appendix B, table B–IV). Gross surplus-value originating in the corporate sector was estimated

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as the sum of *corporate book profits*, *inventory valuation adjustment*, *officers' salaries*, *net interest*, *net rent*, and *capital charges* (including depreciation charges and capital investment charged to current expense).

(a) *Corporate book profits*: For 1929–1960 total after-tax corporate profit (including depletion charges) was taken from *U. S. Income and Output*, table I-12, p. 134, reduced by after-tax profit in the *Agriculture* and *Finance, Insurance, & Real Estate* sectors as given in *U. S. Income and Output*, table VI-7, p. 205, and *National Income, 1929–1953*, table 20. This series was extended back to 1921 by *Statistics of Income* totals and to 1900 on the basis of the estimates of corporate net profits given by Goldsmith (*A Study of Saving in the United States*, vol. I, table C-5, p. 917).

(b) *Corporate officers' salaries*: For 1929–1960 corporate officers' salaries were taken from *U. S. Income and Output*, table I-12, p. 134, less officers' salaries in the *Agriculture* and *Finance, Insurance, & Real Estate* sectors as given in *Statistics of Income*. For 1919–1928 all these totals were taken from *Statistics of Income*. The series was extended back to 1900 on the basis of net corporate dividend payments for the previous year as estimated by Martin, *National Income in the U. S., 1799–1938*, table 13, p. 42.

182 (c) *Net interest*: For 1926–1960 corporate net interest was taken from *Statistics of Income* total net interest payments by non-financial, non-agricultural corporations. This series was extended to 1919 on the basis of *Statistics of Income* figures for total interest paid by these corporations, and to 1900 on the basis of interest paid by manufacturing corporations, as given by Goldsmith (*A Study of Saving in the United States*, vol. I, table C-13, p. 925).

(d) *Net rent*: For 1933–1960 corporate net rent was taken from *Statistics of Income* total net rent and royalty payments by non-financial, non-agricultural corporations, extended to 1929 on the basis of *Statistics of Income* figures for total rent and royalty receipts by the Finance, Insurance, & Real Estate sector. The whole series was reduced by the ratio of non-income taxes paid to rent received for Real Estate corporations, as given annually in *Statistics of Income*. This final series was extended to 1900 on the basis of net rental payments from manufacturing industries, as estimated on the basis of census figures by Martin.

(e) *Capital charges*: Depreciation charges by non-financial, non-agricultural corporations for 1946–1960 were taken from *U. S. Income and Output*, table VI-18, p. 216. For 1900–1945 total corporate depreciation charges as given by Goldsmith (*A Study of Saving in the United States*, vol. I, table C-41, p. 955) were reduced by the percentage of tax depreciation taken by the agri- 183
culture and financial sectors, as given annually for 1919–1945 in *Statistics of Income*, and estimated for years between 1900 and 1918 as the 1919–1921 average of this ratio.

Capital outlays charged to current expense were taken as the total oil and gas well-drilling and mining development expenditures shown in table B–II, col. *c*.

(f) *Inventory valuation adjustment*: Corporate non-farm inventory valuation adjustment was taken from *U. S. Income and Output*, table I-8, p. 126, and *A Study of Saving in the United States*, vol. I, table P-19, p. 903.

2. *Unincorporated business gross surplus-value* (appendix B, table B–V). Gross surplus-value originating in the unincorporated-business sector (i.e., all unincorporated business with the exception of the *Farm*, *Finance, Insurance & Real Estate*, and *Professional* sectors) was estimated as the sum of *proprietors income*, *inventory valuation adjustment*, *net interest*, *net rent*, and *depreciation charges*, less the *wage-equivalent* for the work of proprietors working full-time in their own business.

(a) *Proprietors income*: Income of unincorporated enterprises for 1946–1960 was taken from *U. S. Income and Output*, table VI-4, p. 202, and, for 1929–1945, from *National Income, 1929–1953*, table 17, p. 182. This sum was reduced by *Finance, Insurance & Real Estate* income, and by the income of *Farm* and *Professional* pro- 184
prietors, estimated as a percentage of their respective sector totals by in-

terpolation between and extrapolation forward from the benchmark estimates for 1929, 1939, and 1945 given in *National Income, 1929–1953*, p. 77 on the basis of the percentage division of National Income within each sector as shown in *U. S. Income and Output*, table I-10, p. 130. The series was extended back to 1900 on the basis of the estimate of entrepreneurial income in these sectors given by Martin, *National Income in the U. S., 1799–1938*, table 10, p. 39.

(b) *Depreciation charges*: Non-corporate depreciation charges for 1946–1960 were taken from *U. S. Income and Output*, table VI-19, p. 217. This series was projected back to 1900 on the basis of estimates of depreciation charges on unincorporated business commercial and industrial structures and producer durable equipment given by Goldsmith (*A Study of Saving in the United States*, vol. I, tables R-10, R-13, P-12, and P-13, pp. 595, 599, 891, 893).

(c) *Net interest*: Net interest from unincorporated business was estimated on the basis of "Net Interest from Sole Proprietorships and Partnerships" as shown in *U. S. Income and Output*, table I-12, p. 134, extended to 1900 on the basis of the estimate of net interest received by individuals given in Martin, *National Income in the U. S., 1799–1938*, table 4, p. 21. To derive the net interest component for each year these estimates were multiplied by the ratio of *proprietors income* in the sectors covered to total *proprietors income*.

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(d) *Net rent*: Net rental payments from the covered sectors of unincorporated business for 1959 were taken from *Statistics of Income* for that year, the first in which these figures have been given. On the assumption that rental payments from wholesale and retail trade in 1929, as derived in Martin, *National Income in the U. S., 1799–1938*, table 33, p. 79, from the *1930 Census of Business*, were evenly divided between corporate and non-corporate sectors, net non-corporate payments in that year were estimated by applying the 1959 ratio between total net rent from the sectors covered and total rental payments from the unincorporated wholesale and retail trade sector. This estimate was projected back to 1900 on the basis of Martin's estimate of total rent from wholesale and retail trade, and forward to 1959 on the basis of net corporate rent from wholesale and retail trade, as shown in *Statistics of Income*. The 1960 figure was estimated by projecting the average annual increase for the previous two years. The tax ratios previously derived for corporate net rent were applied to the entire series.

(e) *Inventory valuation adjustment*: Inventory valuation adjustment for 1929–1960 was taken from *U. S. Income and Output*, table I-8, p. 126, and, for 1900–1928, was taken from Goldsmith (*A Study of Saving in the United States*, vol. I, table P-19, p. 903).

(f) *Wage-equivalent*: The number of proprietors engaged in full-time work in each industrial sector for 1929–1960 was derived by subtracting "Full Time Equivalent Employees" as given in *U. S. Income and Output*, table VI-13, p. 211 and *National Income, 1929–1953*, table 25, p. 196, from "Persons Engaged in Production" ("This series measures man-years of full-time employment by persons working for wages or salaries [as shown in table VI-13] and by active proprietors of unincorporated enterprises")[7] given in *U. S. Income and Output*, table VI-16, p. 214 and *National Income, 1929–1953*, table 27, p. 202. This series was projected back to 1900 on the basis of aggregate private non-agricultural employment (taken from *Historical Statistics of the U. S., Colonial Times to 1957*, pp. 73 and 75). The aggregate wage-equivalent was determined, for 1929–1960, by multiplying the number of proprietors engaged in full-time work in each sector covered by the average annual wage in that sector, as given in *U. S. Income and Output*, table VI-15, p. 213, and *National Income, 1929–1953*, table 27, p. 200, and, for 1900–1928, by multiplying the estimated total number of full-time working proprietors by the

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7. U. S. Department of Commerce, *U. S. Income and Output*, p. 214.

average private non-agricultural wage, as projected back from 1929 on the basis of the wage indexes compiled (for 1919–1928) by Kuznets and (for 1900–1918) by Douglas, as given in *Historical Statistics of the U. S., Colonial Times to 1957*, p. 91.

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3. *Direct taxes on gross surplus-value* (appendix B, table B–VI). For 1917–1960 direct taxes paid out of gross surplus-value were calculated on the basis of the estimated effective tax rate paid by upper-bracket income recipients. This rate was estimated, on the basis of the figures given in *Statistics of Income*, by dividing total tax paid by total income for those returns extending to but not including the bracket containing the return with rank, cumulated from the top, equal to 5 % of total "Persons Engaged in Production—Private Industries" as given for 1946–1960 in *U. S. Income and Output*, table VI-15, p. 214, for 1929–1945 in *National Income, 1929–1953*, table 28, p. 202, and, for 1917–1928, in Kendrick, *Productivity Trends in the U. S.*, p. 306.

   The effective final rate of taxes on gross surplus-value was determined by multiplying this Federal Income Tax rate by the ratio between total (*Statistics of Income*) income tax payments and all other Federal, State, and Local personal tax payments, as given for 1929–1960 in *U. S. Income and Output*, tables III-1 and 2, pp. 164–5, and *National Income, 1929–1953*, tables 8 and 9, extended to 1917 on the basis of ibid., table A-II-b, pp. 296–7.

   The portion of gross surplus-value subject to tax was determined by deducting from

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   total gross surplus-value the sum of capital charges (estimated as above), inventory valuation adjustment (estimated as above), and undistributed corporate profits, as given for 1946–1960 in *U. S. Income and Output*, table VI-9, p. 207, and, for 1929–1945 in *National Income, 1929–1953*, table 22, extended to 1919 by the estimate of corporate net saving in Kuznets, *National Income and its Composition, 1919–1938*, table 22, and to 1917 by the estimate of corporate net profit less dividend payments in Martin, *National Income in the U. S., 1799–1938*, p. 42.

   The series of total direct taxes paid on gross surplus-value was extended back to 1900 by the estimate of total personal tax payments in Kendrick, *Productivity Trends in the U. S.*, table A-II-b.

D. Variable capital (appendix B, table B–VII)

1. Total *employee compensation* for each industry group (*Manufacturing*, *Mining*, *Construction*, *Transportation*, *Public Utilities and Communications*, *Services*,[8] *Agricultural Services, Forestry, and Fisheries*) was taken from *U. S. Income and Output*, table VI-I, p. 200, and *National Income, 1929–1953*, table 14, for 1929–1960, extended back to 1919 by the estimates given in Kuznets, *National Income and its Composition, 1919–1938*, table 50, and to 1900 by

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   the estimates given in Martin, *National Income in the U. S., 1799–1938*.

2. Gross *labor income* originating from each industry was estimated by deducting from total employee compensation the corresponding total of corporate officers salaries as given for 1919–1960 in *Statistics of Income* and extended back to 1900 by the previously derived series of aggregate officers' salaries (with the exceptions of the *Services* and *Transportation, Communications, and Public Utilities* groups, for which *Statistics of Income* cautions that its pre-1929 figures are seriously incomplete and for which, therefore, it was the 1929 estimate of *gross labor income* itself that was extended back by the Kuznets and Martin series).

3. Gross *productive-labor* income was obtained by multiplying gross labor income by the estimated percentage of it received by productive laborers. In the specific industries this percentage was derived as follows:

   (a) *Manufacturing*: The *Census of Manufactures* definition of "production-related worker" is virtually identical to the Marxian definition of "productive laborer."[9] Accordingly, the percentage of labor income received by productive laborers is indicated by the percentage of total payroll (excluding

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   corporate officers' salaries) shown in the census as received by production workers. This percentage is given in the *Census of Manufactures, 1958*, vol. I, pp. 1–3, for the years 1899, 1904,

8. After exclusion of employee compensation for employees of households, professionals, and non-profit enterprises.

9. Cf. *supra*, ch. II, pp. 19–20.

1909, 1914, 1919, 1921, 1923, 1925, 1927, 1929, 1933, 1935, 1937, 1939, 1947, and annually from 1949 to 1958. For other years between 1919 and 1960 the percentage of income received by productive laborers was estimated by interpolation on the basis of the ratio of "production workers" to "all employees," as given in *Employment and Earnings (B.L.S. Bulletin 1312)*. For the period 1900–1919 it was estimated by linear interpolation between the benchmark figures given by the census.

(b) *Transportation; Communications and Public Utilities; Services; and Agricultural Services, Forestry, and Fisheries*: In the absence of either census or survey data on the percentage of production workers in these industry-groups, the percentage of production-worker income determined for manufacturing was used to estimate gross productive-labor income originating in them.

(c) *Mining*: The *Census of Mineral Industries, 1958*, vol. I, pp. 1–4, gives data on the percentage of production workers and production-worker wages for the years 1902, 1909, 1919, 1929, 1939, 1954 and 1958. Using the percentage of labor income received by production workers in those years as benchmarks, this percentage for other years was determined, for 1947–1960, by interpolation on the basis of the ratio of production workers to all employees given in *Employment and Earnings (B.L.S. Bulletin 1312)* and, for 1900–1946, by interpolation on the basis of the percentages previously determined for manufacturing.

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(d) *Construction*: *Employment and Earnings (B.L.S. Bulletin 1312)* shows, for 1947–1960, the number of "construction workers" and of "all employees" in the construction industries. For these years the percentage of labor-income received by productive laborers was derived by multiplying the percentage determined for manufacturing by the ratio between the number of productive laborers (as a proportion of all employees) in *Construction* and in *Manufacturing*, as given by *Employment and Earnings (B.L.S. Bulletin 1312)*. The series was extended back to 1900 on the basis of the percentages previously determined for manufacturing.

4. *Direct taxes* on variable capital, for 1929–1960, were estimated on the basis of the average tax rate applying to *all but the upper brackets*. This rate was determined by deducting upper-bracket total income and federal income tax paid, (as already calculated to determine the tax rate on gross surplus-value) from, respectively, total personal income (as given in *U. S. Income and Output*, table II-1, p. 144) and total *Statistics of Income* personal income tax payments, then dividing this residual tax by the residual income.

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As in the case of direct taxes on gross surplus-value, the effective final rate of direct taxes on variable capital was determined by multiplying this federal income tax rate by the ratio of total personal tax payments to federal income tax payments.

The 1929 rate of taxation of variable capital was extended back to 1900 by the series of total personal tax payments as a percentage of GNP taken from Kendrick, *Productivity Trends in the U. S.*, table A-II-b.

VI.8. Evaluation of data

The reliability of data in all the statistical series diminishes as they go back toward 1900, and is clearly much lower for the early years. For the period since 1929 all series except net rent from unincorporated business are taken directly from estimates by the Office of Business Economics and the Internal Revenue Service which are judged by these sources to be the most reliable available, and from Census and Bureau of Labor Statistics data.

For the pre-1929 period the quality of estimates ranges from fairly reliable, in the case of wage data and of most statistics from the corporate sector (with the exception of net rent), to highly unreliable, in the case of non-corporate gross surplus-value. Consequently, the pre-1920 estimates should be taken essentially as indicating the general order of magnitude of the rate of profit, rate of surplus-value, and organic composition of capital in that period.

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As an approximation of this sort, the pre-1920 data are fairly satisfactory. This measure of confidence is based on the facts that even the least reliable estimates have no evident bias in either direction, that the general level of all ratios is quite stable throughout the entire pre-war period, and that the fluctuations in the rate of

profit conform to the known cyclical pattern. The seeming anomaly of the steep decline of the rate of profit in the years 1918–1919 is to be explained by the rapid increase in money wages (almost 50 % over the two years), the institution of significant income taxation for the first time, and the substantial negative inventory valuation adjustment due to sharp price increases.

The general trend of the rate of profit emerging from these data tends strongly to confirm the hypothesis tested. The computed regressions show a clear and statistically significant tendency of the Marxian rate of profit to decline over time. This tendency is shown most strikingly by simple comparison of the 1929 rate
194 of profit, 11.00 %, to the 6.87 % achieved in the most recent peak year, 1960.

The trend of the organic composition of capital is not as strongly marked, but is also upward over the entire period, even after the spectacular fall in World War II. In 1960 its value was 3.48, against 3.20 in 1929 and 2.86 in the earliest peak year, 1903.

The rate of surplus-value, concerning which Marx provided no systematic basis for prediction, shows a major decline over the 60 years, contrary to Marx's expectation.

Table VI–1.: Fundamental ratios, 1900–1960 (millions of current dollars)

Year	(a) Variable capital	(b) Surplus-value	(c) Capital stock	(d) s' (%)	(e) p' (%)	(f) Q
1900	4328	3055	23677	70.59	12.90	3.21
1	4750	2993	24514	63.01	12.21	3.17
2	5130	3444	25708	67.13	13.40	3.00
3	5569	4176	27913	74.99	14.96	2.86
4	5458	3453	27808	63.26	12.42	3.12
5	6116	3949	28440	64.57	13.89	2.83
6	6576	3889	30797	59.14	12.63	2.94
7	6879	4329	33945	62.93	12.75	3.03
8	5866	4328	33392	73.78	12.96	3.28
9	6892	4214	34063	61.14	12.37	3.07
1910	7521	5512	36820	73.29	14.97	2.83
11	7485	4986	37704	66.61	13.22	3.02
12	8131	4485	40785	55.16	11.00	3.23
13	8690	5564	41851	64.03	13.29	2.94
14	8009	5202	43450	64.95	11.97	3.29
15	8413	5688	44729	67.61	12.72	3.17
16	10572	6792	50296	64.25	13.50	2.90
17	12640	6754	63661	53.43	10.61	3.28
18	15986	5013	78306	31.36	6.40	3.73
19	18288	6431	93058	35.17	6.91	3.76
1920	22679	10420	108791	45.95	9.58	3.29
21	16332	8873	98533	54.33	9.01	3.91
22	16830	6639	92176	39.45	7.20	3.93
23	21153	8757	97239	41.40	9.01	3.25
24	20121	8536	100894	42.42	8.46	3.52
25	20731	9907	105434	47.79	9.40	3.44
26	22154	11684	109220	52.74	10.70	3.23
27	22013	8547	110092	38.83	7.76	3.60
28	22178	11401	110967	51.41	10.27	3.30
29	23151	12366	114219	53.41	10.83	3.22
1930	19467	10008	111484	51.41	8.98	3.78
31	15177	5411	98092	35.65	5.52	4.76
32	10978	826	83598	7.52	.99	7.08
33	10816	230	77937	2.13	.30	7.06
34	13593	3772	81313	27.75	4.64	4.68
35	15053	5381	82557	35.75	6.52	4.04
36	17697	7102	85023	40.13	8.35	3.43
37	20975	8115	90898	38.69	8.93	3.12
38	16802	7100	89939	42.26	7.89	3.76
39	18179	7200	88707	39.61	8.12	3.50
1940	20546	8897	92293	43.30	9.64	3.13
41	27760	10719	10471	38.61	10.29	2.71
42	37836	12646	119108	33.42	10.62	2.36
43	46413	14057	126698	30.29	11.09	2.10
44	48085	16189	130529	33.67	12.40	2.03
45	44428	14899	13477	33.54	11.07	2.27

Year	(a) Variable capital	(b) Surplus-value	(c) Capital stock	(d) s' (%)	(e) p' (%)	(f) Q
1946	46060	12319	153762	26.75	8.01	2.63
47	53422	13255	186151	24.81	7.12	2.79
48	59090	21692	212080	36.71	10.23	2.63
49	55232	18435	220438	33.38	8.36	2.99
1950	62024	18689	235590	30.13	7.93	2.92
51	71787	21519	267667	29.98	8.04	2.87
52	75473	21399	287680	28.35	7.44	2.97
53	81278	20892	302882	25.70	6.90	2.96
54	77163	21200	316048	27.47	6.71	3.21
55	83938	28474	331251	33.92	8.60	2.95
56	89116	27245	358544	30.57	7.60	3.08
57	91345	27412	389315	30.01	7.04	3.28
58	86538	25276	408549	29.21	6.19	3.65
59	94350	30079	423721	31.88	7.10	3.41
1960	97459	30597	445616	31.39	6.87	3.48

Sources:

Column *a* (Variable capital): Appendix B, table B–VII.

Column *b* (Surplus-value): Appendix B, table B–VI.

Column *c* (Capital stock): Appendix B, table B–II.

Column *d* (s' [rate of surplus-value]): Column *b* divided by column *a*.

Column *e* (p' [rate of profit]): Column *b* divided by column *c*.

Column *f* (Q [organic composition of capital]): Column *c* divided by column *a* plus column *b*.

Table VI–2.: Exhibit A: Aggregate business structures, 1948–1949. (col. b in %, all others in $ millions)

Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)
1948	69492.8	105.79	73516.4	6030	3061.3	76485.1	75000.8
1949	76485.1	99.11	75804.4	5721	3146.6	78378.8	77091.6

Explanation:

Col. a: Value of aggregate structures at end of previous year (col. f for previous year).

Col. b: Price-index for current year divided by price-index for previous year.

Col. c: Initial value of structures for current year (col. a multiplied by col. b).

Col. d: Gross investment in business structures during current year.

Col. e: Value of capital consumption for current year (col. c plus $\frac{1}{2}$ col. d divided by 25, half the assumed 50-year average life span for business structures.)

Col. f: Terminal value of structures for current year (col. c plus col. d minus col. e).

Col. g: Average (mid-year) value of structures for current year (col. c plus col. f divided by 2).

VII. Calculation of the Marxian rate of profit, rate of surplus-value, organic composition of capital, and net productivity of labor: The United States, 1900 – 1960 (labor-value units)

VII.1. Basic procedure

196 Computation of the rate of profit, rate of surplus-value, and organic composition of capital in strict accordance with Marx's concepts requires that the basic categories of his system (variable capital, surplus-value, capital consumption, capital stock) be calculated in terms of the basic quantitative unit of the Marxian system: *the hour of socially necessary labor-time*.

Calculation on this basis requires one new set of data in addition to those developed in the previous chapter: the series of *total man-hours of productive labor actually performed* each year. Since the same portion of the economy was covered, and the conceptual approach was the same, as in the preceding chapter, the relevant annual current-dollar series could be taken directly from the data of that chapter. These series are: *variable capital, gross surplus-value, gross investment in fixed capital, rate of capital consumption, and value of inventories*.

197 Each of these must be transformed from a set of dollar magnitudes into the corresponding quantities of hours of socially necessary labor-time, in order to determine *net* surplus-value, capital consumption, and the total capital stock. The key problem, therefore, is to determine the ratio at which current dollars of a given year represent hours of labor-time, the *labor-content of the current dollar*.

Marx defined the labor-content of the price unit as the ratio between the *number of hours of productive labor* performed during the year, and the *money-value of the net product* of that year, the latter term being identically the *money net income of productive laborers and capitalists*.[1]

An equivalent definition, which allows direct calculation in labor-units and is therefore preferable in the current context, is the ratio between the labor-value of the *gross* income, the *sum of current productive labor and capital consumption*, and the money-value of the gross income, the *sum of variable capital and gross surplus-value*. It is this latter definition, therefore, that was used in this chapter to calculate the labor-content of the current dollar.

Net surplus-value in labor-units is thus determined by deducting from the number of hours 198 of productive labor performed during a year the current-dollar total of variable capital multiplied by the labor-content of the current dollar.

Of the four variables determining the labor-content of the current dollar, two (*current-dollar variable capital* and *current-dollar gross surplus-value*) are directly known from the calculations of the previous chapter, and one (*current input of productive labor-time*) is directly established in this chapter. The fourth, *labor-unit capital consumption*, requires indirect computation.

In any given year capital consumption consists of two components: depreciation of the capital stock on hand at the beginning of the year and depreciation of fixed capital put in place during the year. Assuming that the initial labor-unit value of the stock of fixed capital is known, it remains necessary to ascertain depreciation of the current year's gross investment in fixed capital.

Simultaneous determination of these two variables is achieved through an iterative solution. No matter to how many decimal places the quantities are calculated, for each level of precision there exists one and only one pair of values for *capital consumption* and *labor-content of the current dollar* consistent with each other. From any starting point successive approximations will finally yield these figures.

The remaining problem was determination of 199 the labor-unit value of the stock of fixed capital at the start of 1900. Beginning with the

1. Cf. *supra*, ch. I, p. 6.

current-dollar value of fixed capital at the start of 1900, as established in the previous chapter, it was possible through a similar iterative process to derive a figure for the labor-content of the 1900 dollar which, multiplied by the original current-dollar capital stock, would yield an initial labor-value of fixed capital consistent with that labor-content of the 1900 dollar.

This figure, however, if unadjusted, would pronouncedly overstate the 1900 rate of profit and understate the 1900 organic composition of capital. This is due to the fact, established in the previous chapter,[2] that estimation of current-dollar fixed capital through a price-index with use-value denominator will understate the value of capital stock and of capital consumption relatively to estimation through a price-index with labor-time denominator if the productivity of labor is increasing over time.

Since the initial underestimate of the labor-unit value of fixed capital would disappear progressively as the original capital stock was depreciated, the trend of the rate of profit would show a serious downward bias, and the trend of the organic composition of capital would show an equally strong upward bias.

200 Thus in order to remove this distortion and to make the original estimate of the labor-unit value of the capital stock methodologically homogeneous with the subsequent estimates of the value of the capital stock it was necessary to correct for this understatement through a substantial increase in the original current-dollar estimate of the stock of fixed capital at the start of 1900.

Calculation according to the procedure outlined above yields theoretically correct estimates of the Marxian categories *variable capital*, *surplus-value*, and *capital stock* and of the fundamental Marxian ratios. The latter now include not only the *organic composition of capital*[3] and the *rates of profit and surplus-value*, but also the *net productivity of labor*, expressed (given the appropriate price-index) as *base-year dollars produced per man-hour of productive labor*. For every year labor net productivity is equal to the reciprocal of *the product of the labor-content of the current dollar and the price index for that year*.

201 There thus are three hypotheses to be tested:

1. The Marxian rate of profit in the U. S. nonfarm economy will show a tendency to decline over the period 1900–1960.

2. The organic composition of capital will show a tendency to increase over the same period.

3. The net productivity of labor will tend to increase *more than proportionally with* the organic composition of capital (i.e., in the equation $\Pi = aQ^u$, u will prove to be greater than unity).

Invalidation of any of these hypotheses on the basis of data measured in labor-units would constitute empirical evidence contradicting the "Law of the Falling Tendency of the Rate of Profit" as formulated by Marx.

VII.2. Results

The fundamental ratios and the labor-unit quantities of surplus-value, variable capital, and the capital stock, as calculated for each year from 1900 to 1960 according to the procedure just described, are set forth in table VII–1 and presented graphically (to semi-log scale) in charts VII-1, VII-2, VII-3, and VII-4. Summary data on which table VII–1 is based are presented in appendix C.

Testing of the hypotheses set forth above yielded the following results:

202 1. The trend of the rate of profit over the entire period was computed on the basis of a regression with the rate of profit as the dependent, and time as the independent, variable. All years in the period were used, except for the years of deep depression (1931–1935) and of the Second World War (1941–1945).

   On a linear basis, this regression is

$$p' = 11.8500 - .1277t$$
   (t counted from 1900)

   with correlation coefficient $r = -.8790$

   On a logarithmic basis the regression is

$$\log p' = 2.51108 - .01619$$

   with correlation coefficient $r = -.9065$

2. The drastic decline in the organic composition of capital during the Second World War and the slow return of the organic composition to its pre-war level made it effectively

2. Cf. *supra*, ch. VI, p. 55.

3. *Organic composition of capital* as computed is a true reflection of the Marxian ratio only if unemployment, including short-time work, is at its minimum level. This minimum percentage may vary over time (particularly if Marx was correct in his expectation that the "industrial reserve army" would tend to increase relatively to the employed labor force). But in every given business cycle it may be assumed to approximate the actual rate of unemployment during the prosperity phase.

impossible to compute the trend of the organic composition of capital through a regression covering the entire period. Instead, separate trends were computed for the pre-war and post-war periods.

(a) For the pre-war period, the years used were the business-cycle peak years 1910, 1920, 1923, 1926, 1929, and 1937; the prosperous year 1905 (when productivity was at a relative peak) and the last real peacetime years, 1915 and 1940. The trend of the organic composition of capital was computed on the basis of a semi-logarithmic regression with the organic composition of capital as the dependent, and time as the independent, variable.

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This regression is:

$$\log Q = 1.11485 + .00754t$$
(t counted from 1900)

with correlation coefficient $r = .967$

(b) For the post-war period all years from 1947 through 1960 except for the recession years 1949, 1954, and 1958 were used. As for the pre-war period, the regression was computed on a semi-logarithmic basis.

This regression is:

$$\log Q = 1.09380 + .02382t$$
(t counted from 1947)

with correlation coefficient $r = .982$

3. The relationship between the net productivity of labor (Π) and the organic composition of capital (Q) was computed through regressions with the logarithm of net productivity (in 1954 dollars per man hour) as the dependent, and the logarithm of the organic composition of capital as the independent, variable. As in the computation of the trend of the organic composition of capital separate regressions were computed for the pre-war and post-war periods, using the same years as were used for the trend of the organic composition of capital.

(a) For the pre-war period this regression was:

$$\log \Pi = 1.80587 \log Q - 2.11056$$
($\Pi = .12118Q^{1.80587}$)

with correlation coefficient $r = .888$

(b) For the post-war period this regression is:

$$\log \Pi = 1.15331 \log Q - .70135$$
($\Pi = .49583Q^{1.15331}$)

with correlation coefficient $r = .966$

VII.3. Sources and methods

In addition to the series taken directly from chapter V, the statistical sources used in this chapter were: John W. Kendrick, *Productivity Trends in the U. S.*; U. S. Bureau of the Census, *Census of Manufactures—1958* and *Census of Mineral Industries—1958*; and the U. S. Bureau of Labor Statistics, *Bulletin 1312, Employment and Earnings.* 210

A. Manhours of productive labor (appendix C, table C–I)

The basic series of employee manhours worked annually per industrial division was obtained from unpublished worksheets of the National Bureau of Economic Research underlying the annual manhour estimates published in *Productivity Trends in the U. S.*

The percentage of this working time constituting productive labor was determined in the same way as wages for productive labor were estimated in the previous chapter:

1. *Manufacturing.* Manhours worked were allocated between productive and unproductive labor on the basis of the ratio of *production workers* to *all employees* given by the *1958 Census of Manufactures* (I, 1-3) for the years 1899, 1904, 1909, 1914, 1919, 1921, 1923, 1925, 1927, 1929, 1933, 1935, 1937, 1939, 1947, and annually from 1949 to 1958. For other years between 1919 and 1960 the ratio of productive laborers to all employees was estimated by interpolation on the basis of the ratio of "production workers" to "all employees" as given in *Employment and Earnings.* For the period 1900-1919 it was estimated by linear interpolation between the benchmark figures given by the census. 211

2. *Transportation; Communications and Public Utilities; Services; and Agricultural Services, Forestry, and Fisheries.* The allocation of manhours derived for manufacturing was used to estimate manhours of productive labor worked in these industry groups.

3. *Mining.* The ratio of "production workers" to "all employees" given by the *1958 Census of Mineral Industries* (I, 1-4) for the years 1902, 1909, 1919, 1929, 1939, 1954, and 1958 was taken as the basis for allocation of manhours between productive and unproductive labor. For other years between 1947 and 1960 this ratio was estimated by interpolation on the basis of the ratio of "production workers" to "all employees" given in *Employment and Earnings*, and between 1900 and 1946 by interpolation on the basis of the percentages previously determined for manufacturing.

4. *Construction.* For 1947-1960 the ratio used to allocate manhours was taken from the ratio of "construction workers" to "all employees" given by *Employment and Earnings.* This series was extrapolated back to 1900 on the basis of the percentages previously determined for manufacturing.

B. Capital stock, capital consumption, and the labor-content of the current dollar (appendix C, table C–II)

212 1. *Depreciation rate.* The average depreciation rate established in the previous chapter for each year (defined as current-dollar capital consumption for the year divided by the mid-year value of the stock of fixed capital) was used as the depreciation rate for the same year in this chapter, since the division of current gross investment into groups of differing average life-expectancy, on which the whole computation of stock and consumption of fixed capital is based, is not changed by any change in the unit of measurement (and the consequent implicit price-index) used.

2. *Initial determination of the labor-content of the 1900 dollar.* The current-dollar valuation of aggregate fixed capital at the beginning of 1900 was taken from the data of the preceding chapter as a starting point. This value was expressed in units of one million hours of socially necessary labor-time by the following method:[4]

   (a) The initial approximate labor-content of the 1900 dollar was determined by dividing manhours of productive labor worked during 1900 by the sum of current-dollar variable capital and *net* surplus-value.

   (b) The current-dollar value of fixed capital at the start of 1900 was converted into labor units through multiplying it by the first approximation to the labor-content of the 1900 dollar. 213

   (c) Depreciation on the initial capital stock in labor units was calculated through multiplication by that year's depreciation rate.

   (d) The second approximation to the labor-content of the 1900 dollar was determined through dividing the sum of man-hours worked, initial capital consumed, and estimated new capital consumed by the sum of current-dollar variable capital and *gross* surplus-value (i.e., capitalist-sector gross income).

   (e) Approximate labor-unit current investment was determined through multiplying 1900 current-dollar gross investment by the second approximation to the labor-content of the 1900 dollar.

   (f) Approximate depreciation on current investment was calculated through multiplying $\frac{1}{2}$ the figure established in step (e) by the year's depreciation rate.

   (g) The third approximation to the labor-content of the 1900 dollar was determined to six decimal places through dividing the sum of manhours worked, initial capital consumed, and new capital consumed (per step f) by current-dollar gross income.

   (h) The initial labor-unit value of fixed capital was recomputed on the basis of the estimated labor-content of the 1900 dollar established by step (g). 214

   (i) Steps (c) through (h) were repeated until the figure established by step (g) was repeated.

   The labor-unit value of fixed-capital at the end of 1900 was determined as the algebraic sum of initial value of fixed capital, current gross investment, original capital consumed, and new capital consumed.

3. *Annual determination of the labor-content of the current dollar.* For each year the initial labor-unit value of fixed capital is identically the value of fixed capital at the end

4. This computation is presented in detail in exhibit A appended to this chapter.

of the previous year. With this as a starting point, the program for computing the labor-content of the current dollar consists of steps (c) through (g) described above, reiterating steps (e) through (g) until the figure established in (f) is repeated.

4. *Correction of bias.* Fixed capital in labor-units and the labor-content of the current dollar were calculated through 1929. The mid-year fixed capital estimates for 1925 through 1929 were then reconverted into "current dollars" through multiplication by the labor-content estimate for each year. These estimates were then compared to the current-dollar estimates of the stock of fixed capital derived in the previous chapter.

   It was revealed by this comparison that the 1925–1929 current-dollar estimates based on a labor-value index were approximately 15 % above those based on a use-value
215 index, although the two totals for 1900 were identical. Fifteen per cent was therefore taken as an indicator of the approximate bias in the 1900 current-dollar estimate of fixed capital.

   Accordingly, the final calculation of all quantities in labor-units was carried out according to the procedure described above, but using as a starting point the previous estimate of current-dollar fixed capital at the start of 1900 *multiplied by* 1.15.

C. Computation of basic categories and ratios

1. *Capital stock.* The capital stock for each year was calculated through multiplying the current-dollar value of inventories by the labor-content of the current dollar for that year, and adding this quantity to the mid-year value of the stock of fixed capital.

2. *Variable capital.* Variable capital for each year was determined through multiplying current-dollar net income of productive laborers by the labor-content of the current dollar for that year.

3. *Surplus-value.* Surplus-value for each year was determined by subtracting labor-unit variable capital from total manhours of productive labor worked in that year.

4. *Net productivity of labor.* The net productivity of labor for each year was determined through dividing the reciprocal of the price-
216 index used in the previous chapter by the labor-content of the current dollar for that year. Since 1954 is the base year of the index, net productivity of labor for every year is computed in *1954 dollars per manhour.*

VII.4. Evaluation of data

Since the data used in this chapter are basically the same as those used in the previous chapter, the considerations regarding reliability and interpretation of the data expressed in that chapter (pp. 62–63) apply fully to the present chapter.

The pattern of results emerging from the current-dollar calculation is confirmed by computation in units of socially necessary labor-time. As expected, the basic trends were shown more strongly than in the previous chapter — the rate of profit tended to decline by 1.62 % per year, as against a rate of decline of 1.09 % in the previous calculation; and the organic composition of capital increased by 31 % from 1903 to 1960, as against an increase over the same span of 22 % shown previously.

These results tend strongly to confirm all the hypotheses tested.

It should be noted that the tendency of the Marxian rate of profit to decline, as is to be observed from chart VII-1, cannot be viewed as
217 a smooth and sustained process. Within each of two sub-periods, the pre-World-War I years 1900–1915 and the decade 1920–1929, no significant over-all fall in this rate took place (apart from cyclical fluctuations,) though the average rate in 1920–1929 was substantially lower than that of 1900–1915; and the Great Depression and Second World War resulted in a recovery of the Marxian rate of profit to well above its 1929 peak. Only within the post-World War II sub-period (1946–1960) is a sustained falling tendency to be observed. This pattern cannot entirely be ascribed to the "counteracting" factors which, Marx contended, made the fall in the rate of profit a gradual tendency whose net effect should be clear only over the long run. To a very significant extent the stepwise fall reflects the demarcation between periods of different burdens of taxation on the U. S. economy. This factor will be discussed in the following chapter.

Chart VII–1.: Rate of profit and organic composition of capital (inverted), 1900–1960 (labor-unit basis)

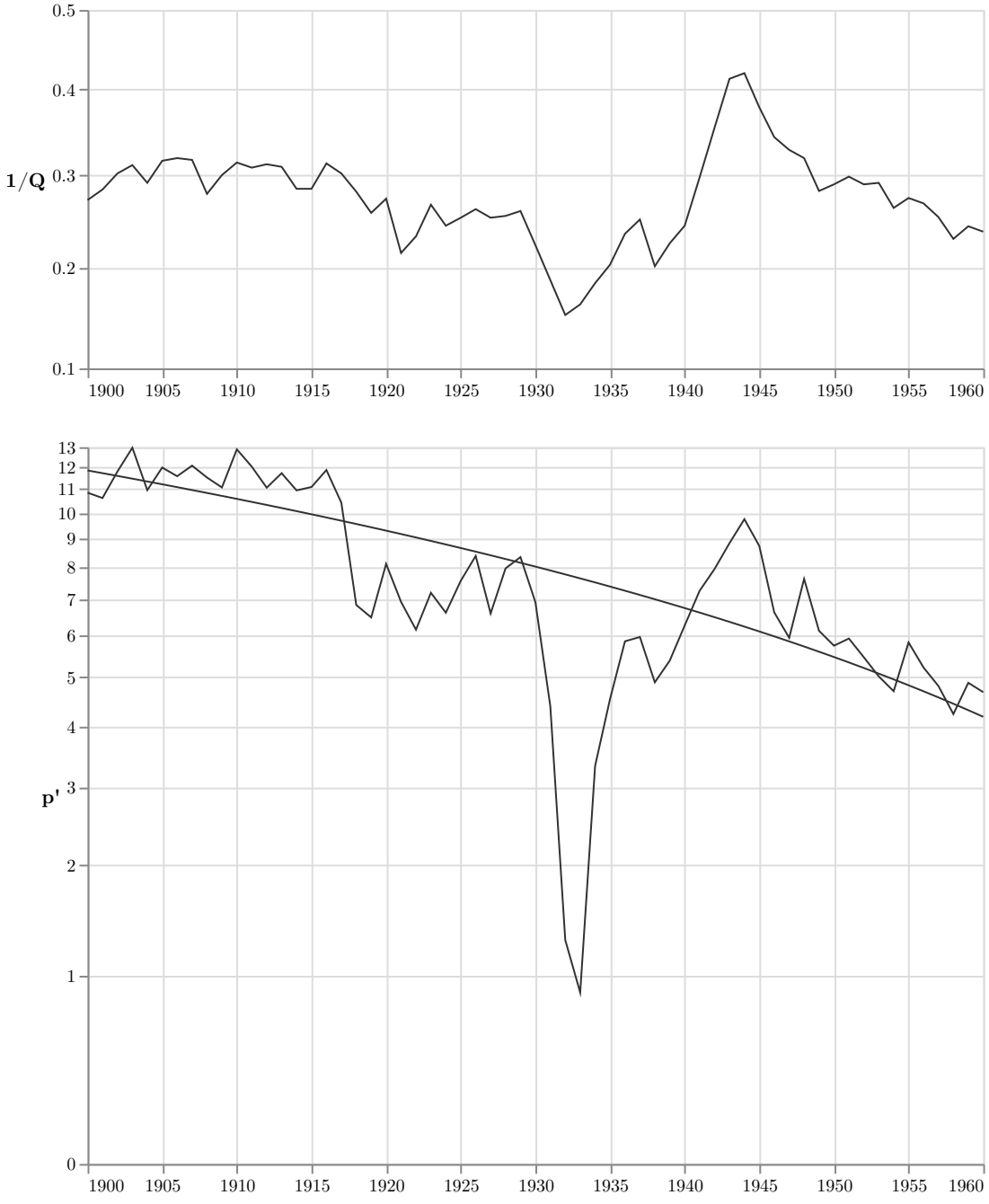


Chart VII–2.: Rate of profit and rate of surplus-value, 1900–1960 (labor-unit basis)

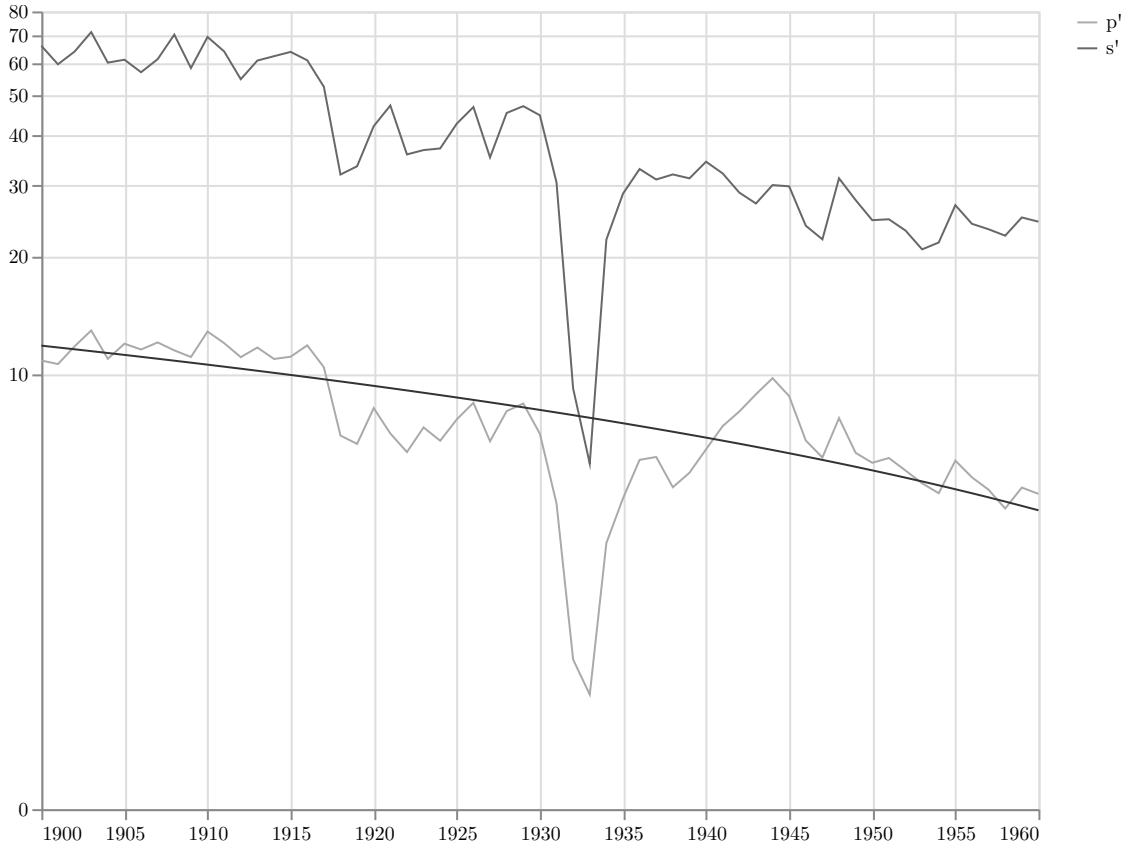


Chart VII–3.: Organic composition of capital, selected years, 1900–1960

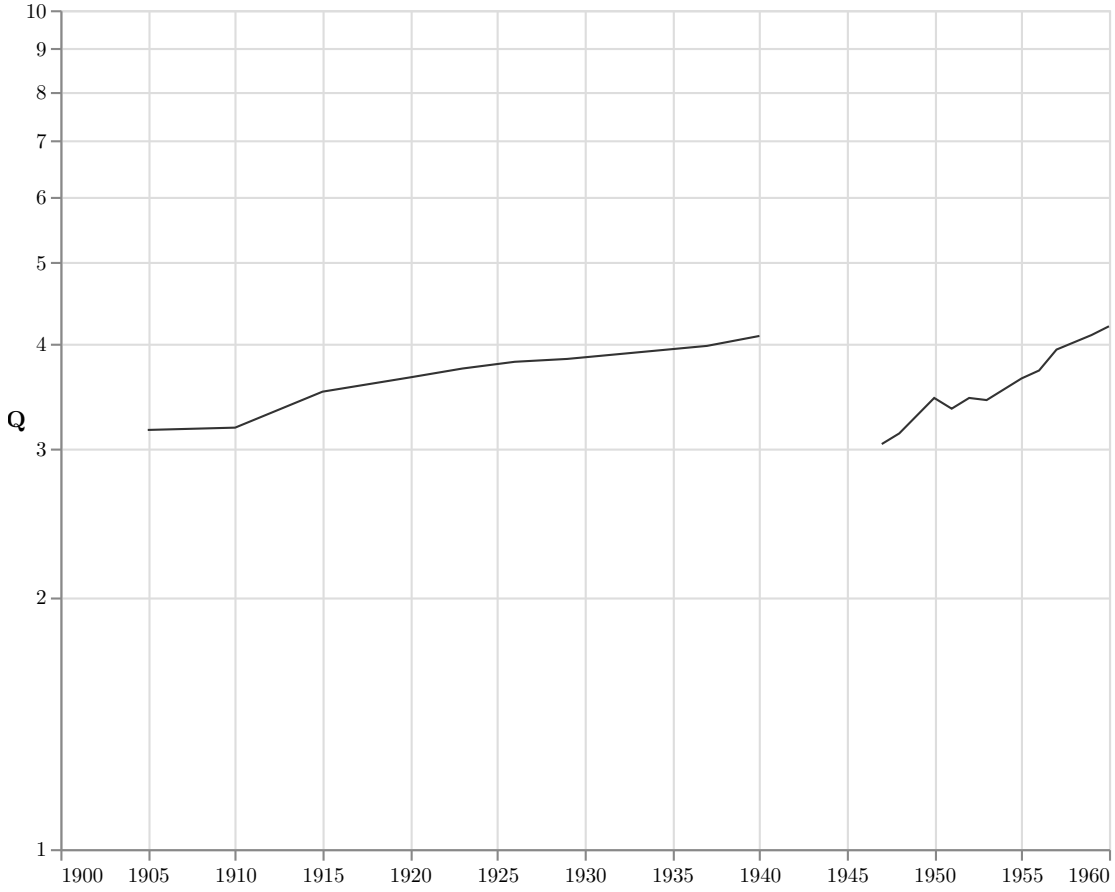


Chart VII–4.: Labor productivity and organic composition of capital, selected years, 1900–1960

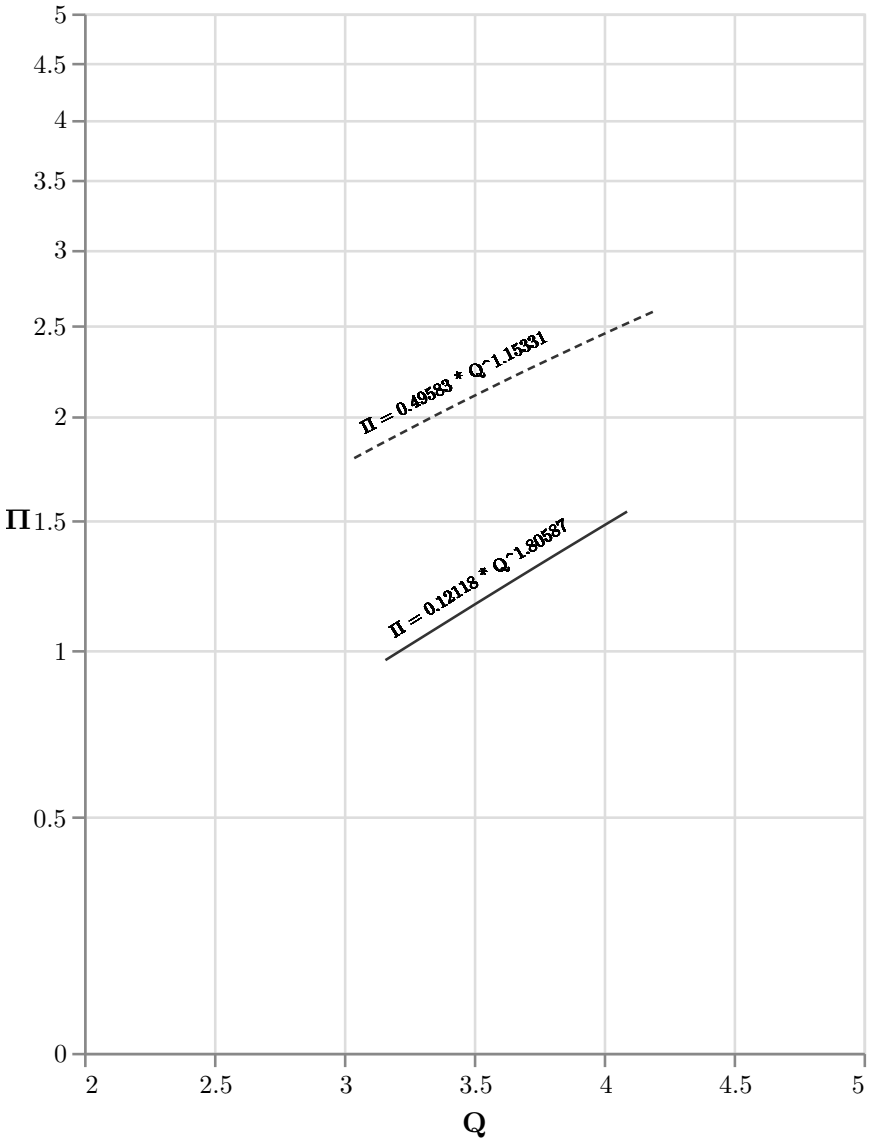


Table VII–1.: Fundamental ratios, 1900–1960 (millions of productive-labor manhours)

Year	(a) Variable capital	(b) Surplus-value	(c) Capital stock	(d) s'	(e) p'	(f) Q	(g) Π
1900	14796.6	9768.4	90143.6	66.02	10.84	3.67	1.0372
1	16270.5	9687.5	91269.6	59.54	10.61	3.52	1.0137
2	17146.8	10961.2	92898.8	63.93	11.80	3.31	1.0169
3	17081.8	12175.2	93865.0	71.28	12.97	3.21	1.0429
4	17330.9	10414.1	95090.7	60.09	10.95	3.43	1.0278
5	18808.5	11490.5	95870.0	61.09	11.99	3.16	1.0613
6	20295.6	11557.4	99830.4	56.95	11.58	3.13	1.0167
7	20473.1	12546.9	103885.8	61.28	12.08	3.15	.9967
8	17398.0	12229.0	106143.7	70.29	11.52	3.58	1.0579
9	20413.9	11900.1	107512.3	58.29	11.07	3.33	1.0593
1910	20053.0	13913.0	107944.2	69.38	12.89	3.18	1.1126
11	20781.1	13297.9	110541.5	63.99	12.03	3.24	1.0685
12	22818.7	12495.3	112997.8	54.76	11.06	3.20	.9854
13	22096.4	13434.6	114662.3	60.80	11.72	3.23	1.1063
14	20573.0	12816.0	117131.5	62.30	10.94	3.51	1.0796
15	20386.4	13011.6	117289.7	63.82	11.09	3.51	1.1312
16	23805.6	14494.4	122136.1	60.89	11.87	3.19	1.1341
17	26264.3	13783.7	132492.4	52.48	10.41	3.31	1.0451
18	30157.1	9644.9	141287.3	31.98	6.83	3.55	.9809
19	27586.1	9246.9	142757.3	33.52	6.48	3.87	1.0662
1920	27000.1	11356.9	140169.4	42.06	8.11	3.65	1.1663
21	20281.5	9583.5	138622.6	47.25	6.92	4.64	1.2541
22	23950.6	8584.4	139570.7	35.85	6.15	4.29	1.1679
23	27502.5	10103.5	140597.7	36.74	7.19	3.74	1.2555
24	25466.4	9442.6	142815.2	37.08	6.61	4.09	1.2862
25	25479.5	10867.5	143708.4	42.66	7.56	3.95	1.2909
26	25808.0	12086.0	144267.8	46.84	8.38	3.81	1.3512
27	27791.1	9793.9	148642.3	35.25	6.59	3.95	1.2702
28	25808.3	11689.7	146885.5	45.30	7.96	3.92	1.3950
29	26232.4	12348.6	148143.4	47.07	8.34	3.84	1.4327
1930	23050.3	10304.7	149034.2	44.71	6.91	4.47	1.4314
31	21139.5	6464.5	147409.1	30.58	4.39	5.34	1.3649
32	20464.5	1873.5	146957.5	9.15	1.28	6.58	1.1536
33	22177.3	1266.7	144265.9	5.71	.88	6.15	1.0887
34	20153.2	4444.8	133577.0	22.05	3.33	5.43	1.4170
35	20552.3	5894.7	130021.3	28.68	4.54	4.92	1.5070
36	22936.9	7569.1	129469.9	33.00	5.85	4.24	1.5714
37	24836.5	7720.5	129595.6	31.09	5.96	3.98	1.6592
38	19529.1	6248.9	127792.3	32.00	4.89	4.96	1.7276
39	21664.2	6780.8	126143.6	31.30	5.38	4.43	1.7055
1940	22867.3	7866.7	125747.7	34.40	6.26	4.09	1.8078
41	29241.3	9412.7	129933.5	32.18	7.25	3.36	1.7878
42	35980.4	10381.6	130766.9	28.86	7.94	2.82	1.7673
43	41360.2	11215.8	127000.8	27.12	8.83	2.42	1.7264
44	39338.9	11885.1	122080.1	30.12	9.74	2.38	1.7818
45	35119.2	10502.8	120352.5	29.91	8.73	2.64	1.7818

Table VII–1.: (continued) Fundamental ratios, 1900–1960 (millions of productive-labor manhours)

Year	(a) Variable capital	(b) Surplus-value	(c) Capital stock	(d) s'	(e) p'	(f) Q	(g) Π
1946	35167.8	8397.2	126966.1	23.88	6.62	2.91	1.7121
47	36906.8	8147.2	137098.1	22.08	5.94	3.04	1.7110
48	34329.8	10748.2	140986.4	31.31	7.62	3.13	1.9232
49	32020.6	8851.4	144680.6	27.65	6.12	3.54	1.9446
1950	34467.6	8494.4	148108.2	24.65	5.74	3.45	2.0017
51	36953.2	9157.8	154679.3	24.78	5.92	3.35	2.0236
52	37505.6	8712.4	159670.8	23.23	5.46	3.45	2.0534
53	39202.4	8169.6	162697.7	20.84	5.02	3.43	2.0942
54	35537.5	7703.5	164056.8	21.68	4.70	3.79	2.1713
55	35755.5	9604.5	165148.7	26.86	5.82	3.64	2.3382
56	37136.5	8962.5	171557.9	24.14	5.22	3.72	2.3503
57	36300.6	8495.4	176559.1	23.40	4.81	3.94	2.3942
58	33501.5	7553.5	178246.6	22.55	4.24	4.34	2.4074
59	34793.3	8712.7	178506.6	25.04	4.88	4.10	2.4993
1960	34590.3	8453.7	180851.4	24.44	4.68	4.20	2.5591

Sources:

Column a (Variable capital): Table VI-1, column a multiplied by table C-II, column e.

Column b (Surplus-value): Table C-I, column g less column a of this table.

Column c (Capital stock): Table C-II, column c.

Column d (s' [rate of surplus-value]): Column b divided by column a.

Column e (p' [rate of profit]): Column b divided by column c.

Column f (Q [organic composition of capital]): Column c of this table divided by table C-I, column g.

Column g (Π [net productivity of labor]): Table C-II, column f divided by table C-II, column e.

Exhibit VII-A: Initial determination of the labor-content of the 1900 dollar

A. Information from basic series:

(1) Depreciation rate ..... .0592867

(2) Total productive labor (millions of manhours) 24,565

(3) Current-dollar gross income (millions of dollars) 8,875

(4) Current-dollar gross investment (millions of dollars) 1,551

B. Supplementary data:

(5) Current-dollar value of fixed capital at start of 1900 (millions of dollars) 18,169.4

(6) Revised initial value of fixed capital (18,169.4 × 1.15) ..... .20,894.8

(7) Current dollar net income (from chapter VI, table VI-I) (millions of dollars) 7,383

(8) First estimate of labor-content of 1900 dollar [(2) ÷ (7)] 3.3272

(9) First estimate of labor-value of fixed capital, start of 1900 [(6) × (8)] 69,521.2

C. Computation:

Iteration	(h)	(c)	(d)	(e)	(f)	(g)
1.	69,521.2	4,121.7	3.406328	5,283.2	156.6	3.405348
2.	71,154.1	4,218.5	3.416777	5,299.4	157.1	3.416836
3.	71,394.1	4,232.7	3.418512	5,302.1	157.2	3.418524
4.	71,429.4	4,234.8	3.418772	5,302.5	157.2	3.418772
5.	71,434.6	4,235.1	3.418808	5,302.6	157.2	3.418808
6.	71,435.3	4,235.2	3.418819	5,302.6	157.2	3.418819
7.	71,435.5	4,235.2	3.418819	5,302.6	157.2	3.418819

Year-end value of fixed capital—72,345.7

(Explanation of computation procedure is given in section III-B-3 of this chapter.)

Exhibit VII-B: Calculation of the labor-content of the 1901 dollar

A. Basic data:

(1) Depreciation rate ..... .0591517
(2) Total productive labor 25,958
(3) Current-dollar gross income 8,875
(4) Current-dollar gross investment 1,606
(5) Value of fixed capital at end of 1900 ..... 72,345.7

B. Computation:

(c_1)	(5) × (1)	4,279.4
(d_1)	[(2) + (c) + $\left(\frac{c}{25}\right)$] ÷ (3)	3.4263
(e_1)	(4) × (d)	5,502.6
(f_1)	$\frac{1}{2}$(e) × (1)	162.7
(g_1)	[(2) + (c) + (f)] ÷ (3)	3.425363
(e_2)	(4) × (g)	5,501.1
(f_2)	$\frac{1}{2}(e_2)$ × (1)	162.7

Year-end value of fixed capital

(5) - (c) + (e_2) - (f_2) 73,404.7

(Explanation of computation procedure is given in section III-B-3 of this chapter.)

VIII. Conclusions

VIII.1. The confrontation of Marx's predictions with the facts

220 This study has made it clear that the U. S. rate of profit as defined by Marx, whether calculated on a labor-unit or current-dollar basis, has fallen drastically over the past sixty years. The organic composition of capital has simultaneously increased, though not in as pronounced a way. The facts of the modern U. S. economy thus tend to confirm, at least in general outline, the "law" that Marx regarded as basic to his general theory of capitalist development.

At the same time, however, this study has revealed another major tendency which Marx definitely did not predict and which contradicts his anticipations: the decline of the rate of surplus-value from a range of 35–50 % in the 1920's (and of 55–70 % in the pre-World War I period) to a range of 20–27 % in the last decade.

Marx, of course, excluded a decline in the rate of surplus-value as an explanation of a falling rate of profit:

> The falling tendency of the rate of profit is accompanied by a rising tendency of the rate of surplus-value, i.e., in the degree of
221 exploitation of labor. Nothing is more absurd, therefore, than to account for a fall in the rate of profit by a rise in the wage-rate, although exceptionally this may also be the case.[1]
>
> The rate of profit sinks not because the laborer is less exploited but because less labor is employed in proportion to the employed capital in general.[2]

How drastically this tendency contradicts Marx's explicit prediction is shown by the fact that the *quantity* (the "mass") of surplus-value fell by almost a third between 1929 and 1960, from 12,349 to 8,454 labor-units (the 1960 total, in fact, was less than the total for any year before 1931!). Yet Marx repeatedly, and most forcefully, insists on the "law that a fall in the rate of profit due to the development of productiveness is accompanied by an increase in the mass of profit":[3]

> As the process of production and accumulation advances therefore, the mass of available and appropriated surplus-labor, and hence the absolute mass of profit appropriated by the social capital, *must* grow. Along with the volume, however, the same laws of production and accumulation increase also the value of the constant capital in a mounting progression more rapidly than that of the variable part of capital, invested as it is in living labor. Hence, the same laws produce for the social capital a growing absolute mass of profit, and a falling rate of profit.[4] 222

The question is therefore posed: to what extent does the observed fall in the rate of profit reflect the cause posited by Marx (i.e., the increasing organic composition of capital) as against the explanation Marx excluded?

A quantitative answer can be indicated on the basis of the data. Comparing the level of the key variables (labor-unit basis) in 1905 to their level in 1960, we see that the rate of profit decreased from 11.99 % to 4.68 %, an annual rate of -1.72 %; the organic composition of capital increased from 3.16 to 4.20, an annual rate of 0.52 % (for its reciprocal, a rate of -0.52 %); and the rate of surplus-value decreased from 61.09 % to 24.44 %, so that the percentage of the working-day forming surplus-value ($\frac{s'}{1+s'}$) decreased at an annual rate of -1.20 %. Thus 30 % of the observed fall in the rate of profit between these dates is accounted for by the increase in the organic composition of capital, and 70 % is accounted for by the decrease in the rate of surplus-value.

A falling tendency of the rate of surplus-value implies a tendency of hourly real wages to rise 223 more rapidly than the net productivity of labor. (I.e., in terms of the model in chapter V, b, the elasticity of the real wage with respect to labor-productivity, has a value greater than unity.) From the data shown in appendix D, table II, it will be seen that this elasticity has kept a fairly uniform level throughout the period: real wages have tended to increase about 1.3 times as fast as labor net productivity.

It is in this connection that the "unproductive expenditures," with which Gillman mistakenly attempted to rescue Marx, have real signif-

1. Marx, *Capital*, vol. III, p. 281.
2. Ibid., vol. III, p. 288.
3. Ibid., vol. III, p. 264.
4. Ibid., vol. III, p. 256.

icance. It is obvious that the "necessary but unproductive costs"[5] of maintaining the commercial and governmental apparatus have increased vastly during this century, not only absolutely but also relatively to the total national product. These expenses, like the necessary allowance for consumption of fixed capital, must be deducted from the total goods and services produced by the capitalist sector in order to determine the *net product* available for consumption and investment by the capitalists and workers.

It follows that, since an increasing relative amount of a worker's direct physical product constitutes constant capital, his *net productivity* grows less rapidly than his *gross productivity*. This is clearly shown by the indexes of gross and net labor productivity given in appendix D, table I. The index of real wages, which increases faster than the index of net productivity, grows (after 1929) more slowly than the index of gross productivity. The lag of net productivity behind gross productivity thus more than accounts for the actual observed decline in the rate of surplus-value.

The existence of such a lag, indeed, is required by Marx's model of capitalist development. Marx explicitly predicts that the organic composition of capital will tend to increase, and that the rate of turnover of the stock of capital (i.e., the efficiency with which this stock is utilized) will also tend to increase. It follows that the relative share of the value of the gross product consisting of constant capital must tend over time to increase.

Questions necessarily arise, however, if this argument is applied not only to the expansion of distributional and administrative overhead costs required by the increasing sophistication and complexity of the productive apparatus, but also to the weight of taxation. The increase in the tax burden during the past half-century has been largely, though not entirely, caused by the increase in direct and indirect military expenditures. Such expenditures, of course, have political causes, and cannot be treated as simple reflections of changes within the capitalist *economic* system.[6]

To what extent do these "politically determined" costs account for the actual decline in the rates of surplus-value and profit? If not for them, might not the rate of surplus-value even have increased enough to counteract the increased organic composition of capital and thereby totally to prevent a fall in the rate of profit?

In order to reply to these questions it was necessary to isolate the effect of national, state, and local taxes upon the rate of surplus-value, and thereby upon the rate of profit. This was done for every year by expanding the net totals of variable capital and (labor-unit depreciation) surplus-value by the amounts previously deducted as direct personal and corporate taxes. The ratio between these two aggregates gave a new "expanded rate of surplus-value gross of taxes" which could then be applied to the total man-hours of productive labor and organic composition of capital established in chapter VII to produce an "expanded total surplus-value gross of taxes" and an "expanded rate of profit gross of taxes" for each year. The degree of expansion indicates the effect of changes in the structure and rates of taxation upon the amount and rate of profit.

The results of this computation (presented in appendix D, table IV and charts I and II) can be summed up in a single pair of figures: in 1905 the "expanded rate of profit gross of taxes" was 12.88 % (11.99 % on the previous basis,) and in 1960 the "expanded rate of profit gross of taxes" was 7.95 % (4.88 % on the previous basis.) Thus over this span the "expanded rate of profit gross of taxes" fell at an annual rate of *.88 %*, as against an annual rate of decrease of *1.72 %* for the observed Marxian rate of profit. Comparison of the two figures shows that the increasing tax burden is sufficient explanation for an annual rate of decrease of .84 % in the rate of profit, or nearly 50 % of the observed rate of decrease.[7]

The effect of taxation is therefore far from a full explanation for the fall in the rate of profit. It is, however, a vary substantial partial explanation for the fall in the rate of surplus-value, which, we have seen, accounts for 70 % of the observed decline in the Marxian profit-rate.

Marx's explanation of the falling tendency of the rate of profit as a result of a rising organic composition of capital thus appears, on the basis of the data for the entire period, to be at least partially adequate: even apart from the unforeseen decrease in the rate of surplus-value, the rate of profit would still have fallen significantly over the period, and for the reason Marx specified.

5. Marx, *Capital*, vol. II, p. 151.

6. In the strict Marxian sense, it is true, they ultimately do reflect changes in the economic base. Marxists have contended that in the last analysis wars among capitalist states are fought for basically economic objectives, and that this is particularly so in the "epoch of imperialism."

7. A maximum estimate of this effect is given by comparison of the regression coefficient for the "expanded rate of profit gross of taxes", -.00619, to the regression coefficient for the observed profit-rate derived in chapter VII, -.01619. This would indicate that increased taxation can account for almost 62 % of the observed rate of decline.

VIII.2. The phases of 20th-century U. S. economic development

The problem of explaining the falling rate of profit appears in a somewhat different light if the general trend of development is analyzed in terms of a division into separate periods.

It is clear at first glance that, in terms of the variables relevant to this study, the 20th-century U. S. economy has gone through at least three[8] distinct periods: the pre-1929 era; the great depression and second World War; and the post-war period.

It can be contended that the years 1930–1945 constitute a qualitative break in American history: that the society emerging from the second World War was psychologically, sociologically, and economically of a different sort from
228 the one that crashed in 1929. I myself would accept this view only with grave reservations (it is, for instance, obviously false in regard to the U. S. Congress and dubious at best in regard to the stock market and the American League). In terms of Marxian economics, however, the years of depression and war brought truly decisive changes at basic points.

(a) In the most spectacular sense the years 1930–1945 were marked by "*slaughtering of the values of capitals.*" Between 1930 and 1945 the capital stock fell from 149 billion to 120 billion labor units, a net disinvestment of some 20 % (in only one other year of the entire period, 1921, was there any disinvestment at all). At the same time this was a period of rapid technological and scientific advance, so that in 1945 much of the remaining capital stock was already obsolescent.

(b) The depression and war years saw the formation and consolidation of mass industrial unions in the basic sectors of American industry, with a corresponding change in the institutional structure of the labor market. At the same time the government budget and tax system emerged as a major economic fact (i.e., as a major factor restraining the growth of *net* labor-productivity).

In comparison to 1929, the situation in 1946 (so far as our statistics are concerned) was marked by two major changes:

- the rate of surplus-value had fallen by
229 virtually 50 % (from 47 % to 24 %)
- the organic composition of capital as computed had fallen by about 25 % (from 3.84 to 2.91).

If the post-1945 period is judged on its own, certain sharp differences from the pre-war epoch become apparent. In the first place, after 1946 the falling tendency of the rate of surplus-value is completely arrested: fluctuations continue within a relatively narrow range, but without discernible trend. (The fact that this stability has been accompanied by steadily growing unemployment, however, indicates that in a full-employment situation the balance might well swing to the side of labor.)

Secondly, technological progress has been extremely capital-intensive, as indicated by the value of 1.153 (as against 1.811 in the pre-war period) obtained for u in the equation $\Pi = aQ^u$ (cf. ch. VII, p. 69). Consequently the organic composition of capital increased from 1946 to 1960 by 45 % (from 2.91 to 4.20).

The result has been an overall fall in the rate of profit at a pace much faster than the trend for the whole 1900–1960 period. This is, in fact, virtually an "ultra-Marxian" picture—a situation in which the organic composition of capital is rising rapidly and in which the "counteracting causes" are mainly inoperative.

There can at this point be no conclusive answer to the question whether this picture will 230
continue to apply even for the next decade: not only because 15 years is too short a period to support a firm prediction, but also because there is no assurance that this is indeed a "normal" period in its own right, and not merely a phase of recovery to some much longer-term trend.

If, however, we accept tentatively the hypothesis that the post-war parameters will continue to apply in the next decade, it is difficult to escape the stagnationist implications of the Marxian theory, since a 1.5 % annual growth rate of the capital stock (the 1953–1960 average) permits less than a 2 % growth rate of net product when $u = 1.153$. Whether or not this proves to be the case depends to a large degree on political and social factors that we cannot go into here. In the purely economic sense, however (i.e., abstracting from changes in the institutional context), the Marxian model leaves virtually no room for a real acceleration in the growth rate.

8. A case can be made out for treating the pre-World War I years as a separate period. However justified this may be, it is not best to do so in the present context, partially for considerations of the precision of the data (cf. *supra* ch. VI, p. 62) but mainly since the division would not reflect a drastic break in the same sense as the others do.

VIII.3. Bearing on the Marxian system

What, then, is the bearing of this study upon the Marxian theoretical structure as a whole?

It is plain, despite the scope, power, and basic clarity of his thought, that Marx left his system of economic analysis in a crude and unfinished form, that many vital concepts were poorly defined, and that essential parts of his model were
231 not developed beyond the stage of artificial and unrealistic schemata. The endeavor to make an empirical test of one of the major "laws" of this model, therefore, required the clarification and reformulation of these aspects of Marx's doctrine.

If this book has made a theoretical contribution, it has not done so through development of any new theories on a Marxian basis, or through a new critique of Marx. What has been accomplished has been:

(1) To state or restate the basic categories of Marx's system in a way which establishes both their coherence with each other and their identifiability to empirically knowable economic magnitudes.

(2) To validate the "law of the falling tendency of the rate of profit" both as a vital part of Marx's model of economic development under capitalism and as a logically correct and necessary deduction from the basic premises of the Marxian system.

(3) To demonstrate *practically* that the Marxian model can be tested by the facts of the U. S. economy.

The data developed through this test, as presented in the previous chapters and in this conclusion, speak for themselves. They show clearly that Marx was no infallible prophet, that certain of his predictions proved to be invalid. But they also confirm that Marx was correct on the issues he regarded as decisive: the rising tendency of
232 the organic composition of capital and the falling tendency of the rate of profit.

Confirmation on this vital score is not in any sense "confirmation" of the Marxian economic theory as a whole—something which is in any case conceivable only through the integration of vast amounts of post-Marxian theory into the Marxian structure. What this study has shown is not that Marx is "right" or "wrong" — the point is, *that he is relevant.*

Appendices

A. Analysis of the Bortkiewicz-Sweezy criticism of Marx's solution to the "transformation problem"

234 This solution to the "transformation problem" was of considerable theoretical importance to Marx because it maintained the equality of value and price in aggregate terms while showing that prices of production are ultimately dependent upon values and must change in a determinate way with changes in value $\left(\frac{dP}{dZ} = \phi\right)$. It has, however, been criticized as being inconsistent with other essential aspects of the Marxian system.

This criticism was developed by Bortkiewicz[1] together with an alternative solution, and both his criticism and "solution" were presented and endorsed by Sweezy in *The Theory of Capitalist Development.*

The criticism, as Sweezy states it, is that "the Marxian method of transformation results in a violation of the equilibrium of simple reproduction."[2] The Marxian model of "simple reproduction", of course, requires that in an economy divided into two "departments," dept. I producing means of production and dept. II means of consumption, the constant capital consumed in
235 dept. II be exactly replaced by the new product (variable capital plus surplus-value) in dept. I so that the total capital stock neither increases nor decreases: $c_2 = v_1 + s_1$. If, however, the organic composition of capital is different in the two lines, then s_1 is *unequal* to p_1, and consequently $v_1 + p_1$ will be unequal to c_2. Marx's error, according to Sweezy, stems from the fact that

> In his price scheme the capitalists' outlays on constant and variable capital are left exactly as they were in the value scheme; in other words, the constant capital and the variable capital used in production are still expressed in value terms. Outputs, on the other hand, are expressed in price terms.[3]

If this criticism is valid it has grave implications: both the uniform rate of profit and the relationship of simple reproduction are necessary features of the basic Marxian macro-economic equilibrium model, and if the two are contradictory the system as a whole fails to meet the elementary test of internal consistency. Moreover, if the contradiction can be resolved only by allowing the sum of prices of production to diverge from the sum of values this would negate the essential meaning of the Marxian "law of value" itself, knocking the central prop out from under 236
the entire structure.[4]

1. "On the Correction of Marx's Fundamental Theoretical Construction in the Third Volume of *Capital*", reprinted as an appendix to Hilferding, *Böhm-Bawerk's Criticism of Marx.*

2. Sweezy, *The Theory of Capitalist Development*, p. 114.

3. Ibid., p. 115.

4. Since it concludes with a sum of prices unequal to the sum of values, the Sweezy-Bortkiewicz "solution" is thus in fact no solution but rather the proclamation of the absence of any solution to the problem with which Marx was concerned. Without entering upon a detailed analysis of the Bortkiewicz-Sweezy method, it should be noted that, though pretending to generality, it applies only under the impossible condition of the absence of fixed capital and equal periods of turnover for the variable and constant portions of the circulating capital. Moreover its entire approach, which separates out a third department producing only "luxury goods" which then are treated as the *numeraire* for the whole system (on the ground that gold is produced in this department) is quite invalid and leads to the conclusion, ridiculous in Marxist terms but which Sweezy actually considers an important insight, that "the rate of profit depends only upon the conditions of production existing in those industries which contribute directly or indirectly to the make-up of real wages. Conditions existing in industries catering solely to capitalists' consumption are relevant only in so far as they influence conditions in the wage-goods industry" (p. 124).

In any case gold, as it comes from the refiner, is never any sort of "luxury good": it is partly raw material, *constant capital*, to be used in the production of "luxury goods," "workers consumer goods" and industrial materials of many sorts; the rest constitutes means of circulation. In this latter capacity it can be treated as a "department of production" in itself, as Marx suggests in volume II (though the moment the domestic monetary unit is made inconvertible the production of gold becomes merely one line of industry among many) but at the level of abstraction involved in the discussion of prices of production the *numeraire* is simply irrelevant: all that is necessary is that prices and values be calculated

In one sense the Sweezy-Bortkiewicz criticism can be answered quite simply. Marx expressed the relationship between value and price of production as a function of the relationship between
237 the organic composition of capital characteristic of *each specific industry* and the organic composition of the social capital as a whole. Sweezy and Bortkiewicz, on the other hand, pose the problem in terms, not of specific industries, but of entire "departments of production."

But, although Marx at one point[5] does use an arithmetic illustration involving a higher organic composition in department I, what reason is there to expect the organic composition of capital to be different in the two departments? Differences among industries rest on the specific *technical* characteristics of each industry, in a modern economy embracing hundreds or thousands of distinguishable "industries." On what is based the supposed difference between the two departments of production, each of which is an enormously aggregative entity?

Most industries, it must be remembered, belong simultaneously to *both* departments, since their classification is not along technical lines but by whether they sell to individual final consumers or to intermediary enterprises. Accordingly, to assert the existence of a *characteristic* difference between the organic compositions in departments I and II involves the implicit assumption of a substantial correlation, positive or negative, between organic composition of capital
238 in an industry and the percentage of its output sold to individual final consumers.

The existence in reality of such a correlation is most improbable, since it is evident that even among industries entirely within department I there are to be found whole groups with relatively labor-intensive technology (machine-tool production, for instance,) alongside extremely capital-intensive sections like primary metallurgy. There is thus every reason to make the opposite assumption, that of a *zero* correlation between organic composition and departmental classification.

Given this assumption it follows that the average organic composition is virtually equal in the two departments. In this case, of course, the product of each department would have a total price equal to its total value, and all relationships expressed in average (i.e., aggregative) terms between the departments would be absolutely unaltered. The equilibrium of simple reproduction would not be disturbed, and the system as a whole would be internally consistent.

Is the foregoing a satisfactory reply to these theoretical criticisms? For most practical purposes it undoubtedly is, at least as far as the basic Marxian aggregates are concerned. However, from a theoretical standpoint it is inadequate for two reasons: first of all, even if it is most improbable that organic composition should be
239 correlated with departmental classification, it is still theoretically possible, so that if the Marxian system is generally valid it must also hold in this special case; and second, every specific industry requires different material elements for its constant and variable capital, so that it by no means follows that if in the aggregate these commodities are sold at their values this will be true for the industry in question. Accordingly the expansion of the simple-reproduction scheme into an input-output type table for the entire economy is essentially a development from the two sector model in which values and prices of production are *unequal* in each department.

For these reasons, then, it is necessary to show directly the applicability of Marx's method of transforming values into prices of production to the two sector model with systematically differing organic compositions in the two departments. To do this it is necessary to be clear on the exact significance of the category "value" in this model.

As we saw, the direct objection to Marx's transformation formula was that in going from the value of a commodity, $c+v+s$, to its price of production, $c+v+p$, it allows only for the change between s and p, leaving c and v the same.

Marx, for his part, was well aware that "Since the price of production may vary from the value of a commodity, it follows that the cost-price of
240 a commodity containing this price of production may also stand above or below that portion of its total value which is formed by the value of the means of production [including labor-power, s.m.] consumed by it."[6] He did not, however, consider this to contradict his transformation formula[7] as expressed in the statement that: "A capitalist selling his commodities at their price of production recovers money in proportion to the value of the capital consumed in their production and secures profits in proportion to the

in the same units, which is precisely what Bortkiewicz and Sweezy do not do.

These are secondary objections. The fundamental thing wrong with the Sweezy-Bortkiewicz method, as we will see in the following pages, is that it fails to understand the Marxian category *value* as it is concretised in relation to price of production.

5. Marx, *Capital*, vol. II, p. 596.

6. Ibid., vol. III, p. 194.

7. Cf. ibid., vol. III, p. 242, where Marx specifically reaffirms the proposition that all commodities produced by capitals of average composition will have prices of production equal to their values.

aliquot part which his capital represents in the total social capital."[8]

These two citations, however, certainly seem contradictory, and Marx nowhere attempts a specific resolution of this contradiction. It is nevertheless possible to demonstrate that the contradiction is merely apparent, and to do so in a manner implicitly indicated by Marx's formulations themselves.

The key is to be found in the fact that in his general formulation Marx speaks of "the value of the capital consumed in ... production" 241 ("die Wertgrösse des in der Produktion von ihm verzehrten Kapitals"[9]) while in discussing the supposed secondary deviation from value he refers to "the *value of the means of production* consumed" ("der Wert der in sie eingehenden Produktionsmittel"[10]). The crucial point is to understand that these are *different* quantities.

As we saw at the outset, for Marx "*Capital is not a thing*"—it is a social relationship. The "things" through which this relationship between people is expressed are defined specifically as capital only by that role—they are not capital in themselves.

It is here that Marx's differentiation between the two primary forms of circulation, C—M—C and M—C—M', takes on central importance. In C—M—C value is passive, a mere "equivalent form," reflecting the immanent attributes of commodities as products of social labor. For that reason this form of circulation is quite independent of the mode of production, as valid for a primitive as for a capitalist society.

On the contrary, value is "*the active factor*" in the M—C—M' circuit, in which the physical object is merely "a disguised mode of existence" of "*value itself.*" M—C—M' is "the general formula for *capital*" 242 precisely because the capitalist mode of production is essentially characterized by the self-expansion of value. Hence the "value" of a thing has a radically different meaning depending on whether it is as a use-value part of the social final product, the end of a C—M—C process; or whether it is an intermediary stage in an M—C—M' circuit: in other words, whether it is viewed as *commodity* or as *capital*.

The essential error of Sweezy and Bortkiewicz is that when they ask "how much value does this capital good transfer to the product?" they answer "its own value as determined at the time of its production." But in this way they simply negate its character as *capital*—they treat the production of value as a relationship among things, not among people.

As constant or variable capital the "capital good" according to Marx is nothing but the "disguised form" of "value itself." At the extremes of the M—C—M' process "value itself" stands out in its general form, as pure money. The "capital good," as a disguise for the money, can transfer to its product *only the value for which it stands*, only the value-equivalent of its actual monetary cost to the capitalist who uses it. If he paid for it at more or less than its value this, as Marx states, is of absolutely no consequence to him so long as it really cost the prevailing market price. The difference between the value created by its production and its price of production has *already* been transferred to other capitalists 243 through the average rate of profit. Henceforth, "however scurvy it may look," it is really "in faith and truth money ... and a wonderful means whereby out of money to make more money."

Accordingly, in the Marxian formulae $c+v+s$ and $c+v+p$, c and v are indeed value expressions: they express the value of the capital consumed, and Sweezy is dead wrong to take Marx to task for treating them as such. This does not, of course, imply that they are independent of the transformation of values into prices of production, that is, of capitalist production itself! On the contrary, they, and the quantitative relationships based upon them, must be regarded as determined by the total process of capitalist production, a process in which the formation of prices of production is an essential part.

On the basis of this approach, identifying "cost price" to the *value* of capital consumed, it is now possible to test Marx's transformation method in the case of a two-sector economy in which each department is treated as a separate industry having its own characteristic organic composition of capital.

The general model[11] of simple reproduction in this case, with λ_1, λ_2, s', and t as parameters, 244 consists of seven equations in seven variables (z_1, z_2, ϕ_1, ϕ_2, v_1, v_2, Q).

$$Q\lambda_1 v_1(1+s')t + v_1(1+\lambda_1 s') = z_1\phi_1 \qquad \text{(I)}$$
$$Q\lambda_2 v_2(1+s')t + v_2(1+\lambda_2 s') = z_2\phi_2 \qquad \text{(II)}$$

(determination of prices of production in the two departments)

8. Marx, *Capital*, vol. III, p. 187.

9. Marx, *Kapital*, vol. III, p. 184.

10. Ibid., vol. III, p. 190.

11. It is simple, not expanded, reproduction which represents the general case of macro-economic equilibrium. Expanded reproduction along an equilibrium path requires merely alteration of equations III and VII in accordance with the unique rate of growth of income and capital stock. In this case ($Q_1 = Q_2$), equation III would be: $v_1(1+s'\lambda_1) = Q\lambda_2 v_2(1+s')t + Qr(v_1+v_2)(1+s')$.

$$v_1(1+s'\lambda_1) = Q\lambda_2 v_2(1+s')t \qquad \text{(III)}$$

(simple reproduction)

$$v_1(1+s')(1+Q\lambda_1 t) = z_1 \qquad \text{(IV)}$$
$$v_2(1+s')(1+Q\lambda_2 t) = z_2 \qquad \text{(V)}$$

(determination of values in the two departments)

$$z_1\phi_1 + z_2\phi_2 = z_1 + z_2 \qquad \text{(VI)}$$

(aggregate identity between value and price of production)

$$z_1 + z_2 = P_{-1} \qquad \text{(VII)}$$

(total value of gross product determined and constant).

By substitution and elimination this reduces to three equations:

$$Q\lambda_1(1+s')t + (1+\lambda_1 s') = (1+s')(1+Q\lambda_1 t)\phi_1 \qquad \text{(Ia)}$$

$$(1+\lambda_1 s') + \frac{(1+\lambda_1 s')(1+\lambda_2 s')}{tQ\lambda_2(1+s')} = (1+\lambda_1 s')\left(1+\frac{1}{tQ\lambda_2}\right)\phi_2 \qquad \text{(IIa)}$$

$$(1+s')(1+Q\lambda_1 t)\phi_1 + (1+\lambda_1 s')\left(1+\frac{1}{tQ\lambda_2}\right)\phi_2 = (1+s')(1+Q\lambda_1 t) + (1+\lambda_1 s')\left(1+\frac{1}{tQ\lambda_2}\right) \qquad \text{(IIIa)}$$

245 Solving for ϕ_1 and ϕ_2 we get the expression already derived,[12]

$$\phi_i = \frac{Q\lambda_i t + \frac{1+\lambda_i s'}{1+s'}}{1+Q\lambda_i t}$$

Once the numerical value of Q is determined the values of the other variables are easily obtained. The total result is a solution to the "transformation problem" in which the prices of production are derived in the way indicated by Marx; in which the equilibrium of simple reproduction is maintained both in terms of price and of physical assets; and in which the overall total of prices is equal to the total of values.

The significance of this solution, like that of any equilibrium model, is largely formal: it shows that the Marxian categories are self-consistent, that the formal system contains no internal inconsistency, no logical contradiction. It is therefore justified to treat observable economic aggregates as representatives of the corresponding Marxian categories, even though most individual price relationships deviate from their equilibrium levels. This is of particular importance for the rate of profit which has meaning only as a relationship between aggregates.

12. Editor's note: See p. 24.

B. Tables supplementary to chapter VI

Note: Sources for these tables are described in the section of chapter VI on "Sources and methods".

Table B–I.: Price index (1954 = 100)

Year	Index	Year	Index
1900	28.20	1930	59.00
1901	28.20	1931	52.60
1902	29.42	1932	46.50
1903	31.26	1933	44.80
1904	30.64	1934	47.60
1905	30.64	1935	48.60
1906	31.87	1936	49.10
1907	33.71	1937	50.90
1908	31.87	1938	49.80
1909	31.87	1939	49.20
1910	33.71	1940	49.70
1911	33.71	1941	53.10
1912	36.16	1942	59.50
1913	35.55	1943	65.00
1914	36.06	1944	68.60
1915	36.48	1945	71.00
1916	39.16	1946	76.50
1917	46.05	1947	84.60
1918	54.04	1948	89.50
1919	62.18	1949	88.70
1920	72.02	1950	89.90
1921	64.21	1951	96.00
1922	60.17	1952	98.00
1923	61.26	1953	99.00
1924	61.43	1954	100.00
1925	63.03	1955	100.40
1926	63.53	1956	102.10
1927	62.36	1957	105.10
1928	61.60	1958	107.30
1929	61.60	1959	108.50
		1960	110.10

Sources described in chapter VI, section III, (p. 56)

Table B–II.: Capital stock, 1900–1960 (millions of current dollars)

Year	(a) Producer durable equipment	(b) Business structures	(c) Fuel and mineral development expenditures	(d) Inventories	(e) Total
1900	5238.5	12576.3	522.8	5339	23677
1	5524.7	13070.5	548.6	5370	24514
2	5906.1	13631.1	574.9	5590	25708
3	6546.1	14783.9	631.8	5951	27913
4	6625.7	14723.4	640.9	5815	27808
5	6890.9	14993.8	661.1	5894	28440
6	7625.9	16003.4	712.5	6455	30797
7	8646.1	17459.9	786.4	7053	33945
8	8447.6	16960.9	773.1	7210	33392
9	8529.9	17385.4	800.9	7347	34063
1910	9255.7	18854.4	877.8	7832	36820
1	9489.7	19255.8	905.7	8053	37704
2	10462.5	21044.3	1010.2	8268	40785
3	10761.8	21164.8	1036.2	8888	41851
4	11254.5	21896.0	1100.3	9199	43450
5	11501.4	22430.9	1151.9	9645	44729
6	12647.4	24479.0	1304.3	11865	50296
7	16553.4	29349.9	1670.8	16087	63661
8	21282.6	34910.8	2152.4	19960	78306
9	25811.8	40543.1	2656.1	24047	93058
1920	30472.9	47545.4	3305.6	27467	108791
1	27175.1	42851.8	3124.3	25382	98533
2	25252.6	40532.4	3029.2	23362	92176
3	26233.4	42102.6	3219.8	25683	97239
4	27098.4	43390.5	3364.4	27041	100894
5	28421.3	45851.4	3591.8	27550	105434
6	29378.9	47864.7	3788.8	28188	109220
7	29447.7	48801.6	3851.0	27992	110092
8	29611.5	49946.4	3875.2	27534	110967
9	30589.4	51766.7	3953.7	27909	114219
1930	30021.1	51131.2	3860.6	26471	111484
1	26470.8	46083.4	3431.9	22106	98092
2	22451.0	40305.7	3018.2	17832	83598
3	20527.5	38008.1	2895.7	16506	77937
4	21055.5	39399.1	3066.2	17692	81313
5	21317.5	39512.4	3171.5	18556	82557
6	22081.0	39303.8	3294.4	20344	85023
7	24059.0	40549.2	3590.6	22699	90898
8	24244.1	39519.6	3698.4	22477	89939
9	24182.7	38760.0	3804.0	21960	88707
1940	25544.5	39104.8	4011.6	23632	92293
1	29312.4	42102.7	4482.5	28273	104171
2	33808.5	47194.8	5152.1	32952	119108
3	36195.4	50619.5	5680.3	34239	126698
4	37882.8	52211.5	6128.7	34306	130529
5	40524.2	53251.6	6566.8	34234	134577
1946	46950.4	58565.5	7316.6	40930	143762

Table B–II.: (continued) Capital stock, 1900–1960 (millions of current dollars)

Year	(a)	(b)	(c)	(d)	(e)
1947	57931.4	67921.7	8375.1	51923	186151
8	68753.1	75000.8	9300.5	59026	212080
9	74086.0	77091.6	9729.6	59531	220438
1950	81025.1	80837.2	10430.8	63297	235590
1	91298.6	89864.8	11885.4	74618	267667
2	98935.9	95872.4	12481.2	80391	287680
3	105428.7	101406.6	14056.5	81990	302882
4	111203.1	107374.5	15245.4	82225	316048
5	116341.9	113364.9	16489.7	85054	331251
6	125455.1	122131.2	18958.8	92899	358544
7	137689.9	133518.6	19752.1	98354	389315
8	145672.5	143520.7	20957.8	98398	408549
9	149878.7	151330.8	21854.8	100657	423721
1960	156535.1	160237.5	22871.5	105972	445616

Table B–III.: Capital consumption, 1900–1960 (millions of current dollars)

Year	(a) Producer durable equipment	(b) Business structures	(c) Fuel and mineral development expenditures	(d) Total
1900	540.9	513.3	33.0	1097.2
1	564.3	583.5	34.6	1132.4
2	604.3	556.4	36.3	1197.0
3	674.3	603.4	39.9	1317.6
4	680.0	501.1	40.7	1321.8
5	708.0	612.0	41.9	1361.9
6	785.9	653.2	45.1	1484.2
7	894.0	712.6	49.9	1656.5
8	878.7	692.3	49.1	1620.1
9	896.5	709.6	51.2	1657.3
1910	980.4	769.6	56.2	1806.2
1	1011.3	785.7	58.1	1855.1
2	1118.5	859.0	64.6	2042.1
3	1158.0	863.9	67.0	2088.9
4	1217.1	893.7	71.7	2182.5
5	1259.6	915.5	75.3	2350.4
6	1449.9	999.1	85.6	2534.6
7	1914.0	1198.0	110.3	3222.3
8	2526.4	1424.9	143.2	4094.5
9	3106.9	1654.8	178.4	4940.1
1920	3660.4	1940.6	224.6	5825.6
1	3232.5	1749.1	214.4	5196.0
2	2978.2	1654.4	209.3	4841.9
3	3123.9	1718.5	223.8	5066.2
4	3252.6	1771.0	234.9	5258.5
5	3468.5	1871.5	252.4	5592.4
6	3611.7	1953.7	268.1	5833.5
7	3634.8	1991.9	273.8	5900.5

Table B–III.: (continued) Capital consumption, 1900–1960 (millions of current dollars)

year	(a)	(b)	(c)	(d)
8	3660.5	2038.6	276.3	5975.4
9	3825.4	2112.9	282.6	6220.9
1930	3766.3	2087.0	276.8	6130.1
1	3275.5	1881.0	246.5	5403.0
2	2721.5	1645.1	216.9	4583.5
3	2446.5	1551.4	208.4	4206.3
4	2509.6	1612.2	221.1	4342.9
5	2572.9	1612.8	229.5	4415.2
6	2745.0	1604.2	239.4	4588.6
7	3063.4	1655.1	262.5	4981.0
8	3093.8	1613.0	272.0	4978.8
9	3084.7	1582.0	281.2	4947.9
1940	3294.8	1596.1	297.5	5188.4
1941	3829.3	1718.5	333.2	5881.0
2	4292.6	1926.3	382.8	6601.7
3	4329.5	2066.1	420.9	6816.5
4	4364.4	2131.1	453.9	6949.4
5	4649.0	2173.5	487.2	7309.7
6	5605.8	2390.4	544.3	8540.5
7	7295.9	2772.7	634.6	10683.2
8	8922.9	3061.3	695.7	12679.9
9	9714.4	3146.6	730.8	13591.8
1950	10587.2	3299.5	786.9	14673.6
1	12155.7	3668.0	900.8	16724.5
2	13087.5	3913.2	988.5	17989.2
3	13806.1	4139.0	1075.7	19019.8
4	14411.3	4382.8	1172.6	19966.7
5	14989.1	4627.1	1276.4	20890.6
6	16253.6	4984.9	1401.2	22639.7
7	17939.2	5449.7	1536.8	24925.7
8	18829.8	5858.0	1633.3	26321.1
9	19156.9	6176.8	1705.6	27039.3
1960	19935.5	6540.3	1787.4	28263.2

Table B–IV.: Corporate gross surplus-value (pre-tax), 1900–1960 (millions of current dollars)

Year	(a) Corp. book profit	(b) Officers' salaries	(c) Net interest	(d) Net rent	(e) Capital charges	(f) Inventory valuation adjustment	(g) Gross surplus-value
1900	1188	425	512	289	486	35	2935
1	1370	446	528	283	515	−68	3074
2	2026	490	545	316	556	−246	3687
3	1997	536	561	325	608	172	4199
4	1663	544	577	334	647	−116	3649
5	1924	497	594	352	699	14	4080
6	2282	543	611	388	760	−200	4384
7	2321	659	629	424	831	−76	4788
8	1860	737	646	424	875	47	4589

Table B–IV.: (continued) Corporate gross surplus-value (pre-tax), 1900–1960 (millions of current dollars)

Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)
9	2402	678	663	478	945	−430	4736
1910	2639	723	676	478	993	266	5775
1	2303	850	690	478	1039	86	5446
2	2764	864	703	469	1105	−344	5561
3	2930	904	716	469	1180	27	6226
4	2137	1016	729	460	1223	194	5759
5	3532	949	752	469	1290	−401	6591
6	7082	967	775	587	1727	−2218	8920
7	7491	1616	798	866	2051	−2569	10253
8	4705	1833	821	938	2572	−1442	9427
9	6696	1712	844	957	2237	−1365	11081
1920	4435	2051	1117	948	2629	2812	13992
1	−133	1866	1271	695	2553	4355	10807
2	4314	1991	1220	830	2845	−633	10377
3	5749	2136	1295	966	2988	−114	13020
4	4848	2162	1341	975	3043	116	12485
5	6712	2262	1344	984	3139	−261	14180
6	6134	2362	1501	993	3500	1276	15766
7	3402	2463	1880	993	3396	597	12731
8	7013	2564	1530	1065	3675	46	15893
1929	7153	2680	1522	1128	3980	472	16935
1930	2346	2517	1649	1363	4000	3260	15135
1	−820	2177	1753	1351	3872	2414	10747
2	−2480	1719	1802	708	3660	1047	6456
3	393	1638	1742	366	3411	−2143	5407
4	1820	1800	1632	551	3318	−825	8296
5	2472	1951	1656	554	3361	−227	9767
6	4393	2289	1693	511	3409	−738	11557
7	4556	2376	1679	508	3633	−31	12721
8	2905	2140	1434	628	3412	963	11482
9	4598	2239	1429	649	3518	−714	11719
1940	5965	2479	1459	634	3627	−200	12964
1	8773	2987	1329	671	4022	−2471	15311
2	8731	3226	1343	741	4394	−1204	17231
3	9493	3274	1266	847	4689	−773	18796
4	9154	3268	1150	965	5197	−287	19447
5	7213	3560	1104	1027	6257	−564	18597
6	12056	4507	973	1155	4639	−5263	18067
7	16596	5318	−344	1305	5780	−5899	22756
8	18170	5906	1329	1441	7083	−2152	31777
9	9773	5867	1402	1458	7811	1856	28167
1950	20043	6612	−657	1599	8702	−4965	31334
1	16829	7053	1703	1730	10073	−1199	36189
2	14332	7133	1951	1807	11483	981	37687
3	14967	7364	2083	1977	13141	−997	38535
4	13644	7550	2276	2077	14898	−318	40127
5	19476	8636	2404	2307	17318	−1735	48405
6	19733	9281	2717	2518	18883	−2693	50439
7	18317	9948	3204	2824	20374	−1539	53128
8	15030	10375	3667	3104	21080	−255	53001
9	18114	11209	3891	3267	22556	−465	58572
1960	18856	12044	4115	3439	23912	−192	62174

Table B–V.: Unincorporated business gross surplus-value (pre-tax), 1900–1960 (millions of current dollars)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Year	Gross income	Charged depreciation	Net interest	Net rent	Inventory valuation adjustment	Less: Propietary wage equivalent	Gross surplus-value
1900	1676	390	61	302	34	1118	1345
1	1737	394	66	312	−61	1240	1208
2	1810	398	72	325	−220	1264	1121
3	1881	406	70	340	151	1375	1473
4	1915	412	76	349	−95	1348	1309
5	2015	412	81	360	14	1460	1422
6	2097	449	86	372	−152	1670	1182
7	2176	447	90	393	−56	1647	1403
8	2106	463	87	396	38	1516	1574
9	2388	473	92	411	−291	1713	1360
1910	2431	497	87	420	173	1826	1782
1	2391	518	97	417	59	1842	1640
2	2346	534	98	397	−207	1951	1217
3	2617	575	108	455	17	2083	1689
4	2647	605	109	486	111	2061	1897
5	2678	623	117	493	−208	2075	1628
6	2959	660	127	534	−1119	2461	700
7	3317	729	114	598	−1251	2854	653
8	3826	812	108	691	−659	3716	1062
9	4500	897	123	817	−585	4338	1414
1920	5195	995	156	955	1165	5121	3345
1	4687	1086	175	789	1815	4133	4419
2	4718	1143	220	755	−244	4368	2224
3	4932	1230	228	771	−42	5188	1931
4	5248	1338	224	806	41	5121	2536
5	5459	1446	233	799	−89	5363	2515
6	5598	1563	239	825	419	5679	2965
7	5638	1657	256	822	187	5720	2840
1928	5821	1754	374	833	14	5766	2930
9	6052	1847	260	873	142	6084	3090
1930	4427	1925	306	840	755	5888	2365
1	3028	1927	306	777	611	5319	1330
2	1628	1864	286	538	295	4515	96
3	2256	1762	298	451	-525	4021	221
4	3118	1669	259	526	-54	4271	1247
5	3748	1596	192	540	-50	4510	1516
6	4814	1571	219	533	-120	4818	2199
7	5193	1614	194	515	-29	5177	2310
8	4762	1636	212	590	221	5147	2274
9	5553	1646	241	614	-166	5394	2494
1940	6507	1693	246	513	-45	5577	3337
1	9318	1760	255	538	-615	6195	5061
2	11833	1778	215	557	-367	7047	6969
3	14208	1722	173	566	-156	7174	9339
4	15116	1669	156	596	-69	7634	9834
5	15967	1653	144	662	-106	8391	9929

Table B–V.: (continued) Unincorporated business gross surplus-value (pre-tax), 1900–1960 (millions of current dollars)

Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)
6	19151	1379	140	852	-1705	10589	9228
7	17455	1971	172	992	-1471	12788	6331
8	18094	2332	193	1109	-410	13978	7340
9	16889	2819	236	1131	463	14302	7236
1950	19081	2999	272	1197	-1094	15123	7332
1	20390	3304	317	1291	-327	16249	8726
2	20464	3598	343	1317	201	17854	8069
3	20903	3772	378	1370	-168	18835	7420
4	20768	3885	386	1428	-49	19302	7116
5	22486	3925	424	1609	-198	20473	7773
6	24210	4381	517	1755	-502	22061	8300
7	24255	4881	611	1925	-300	23153	8219
8	23500	5010	592	2143	-56	23729	7460
9	25052	5083	686	2166	-140	25515	7332
1960	24240	5149	721	2287	-19	26413	5965

Table B–VI.: Pre-tax, gross, and net surplus-value, 1900–1960

	Pre-tax gross surplus			Tax rate					
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Year	Corp.	Non-corp.	Total	Eff. fed. inc.	*total* fed. ratio	Eff. tax rate	Gross surplus-value	Capital con-sumption	Net surplus value
1900	2935	1345	4280	—	—	.0322	4142	1087	3055
1	3074	1208	4282	—	—	.0367	4125	1132	2993
2	3687	1121	4808	—	—	.0347	4641	1197	3444
3	4199	1473	5672	—	—	.0314	5494	1318	4176
4	3649	1309	4958	—	—	.0369	4775	1322	3453
5	4080	1422	5502	—	—	.0347	5311	1362	3949
6	4384	1182	5566	—	—	.0347	5373	1484	3889
7	4788	1403	6191	—	—	.0331	5986	1657	4329
8	4589	1574	6163	—	—	.0349	5948	1620	4328
9	4736	1360	6096	—	—	.0369	5871	1657	4214
1910	5775	1782	7557	—	—	.0316	7318	1806	5512
11	5446	1640	7086	—	—	.0346	6841	1855	4986
12	5561	1217	6778	—	—	.0370	6527	2042	4485
13	6226	1689	7915	—	—	.0331	7653	2089	5564
14	5759	1897	7656	—	—	.0354	7385	2183	5202
15	6591	1628	8219	—	—	.0342	7938	2250	5688
16	8920	700	9620	—	—	.0305	9327	2535	6792
17	10253	653	10906	.051	1.67	.0853	9976	3222	6754
18	9427	1062	10489	.080	1.65	.1317	9108	4095	5013
19	11081	1414	12495	.055	1.64	.0900	11371	4940	6431
1920	13992	3345	17337	.035	1.80	.0629	16246	5826	10420
21	10807	4419	15226	.035	2.17	.0760	14069	5196	8873
22	10377	2224	12601	.050	1.78	.0889	11481	4842	6639
23	13020	1931	14951	.030	2.51	.0754	13823	5066	8757
24	12485	2536	15021	.032	2.55	.0816	13795	5259	8536
25	14180	2515	16695	.027	2.65	.0716	15499	5592	9907
26	15766	2965	18731	.024	2.70	.0648	17518	5834	11684

Table B–VI.: (continued) Pre-tax, gross, and net surplus-value, 1900–1960

Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
1927	12731	2840	15571	0.028	2.58	0.0721	14448	5901	8547
8	15893	2930	18823	0.004	2.26	0.0769	17376	5975	11401
9	16935	3090	20025	0.029	2.44	0.0718	18587	6221	12366
1930	15135	2365	17500	0.019	4.09	0.0778	16138	6130	10008
1	10747	1330	12077	0.017	6.15	0.1046	10814	5403	5411
2	6456	96	6552	0.039	4.50	0.1743	5410	4584	826
3	5407	221	5628	0.055	3.85	0.2118	4463	4206	230
4	8296	1247	9543	0.047	3.18	0.1496	8115	4343	3773
5	9767	1516	11283	0.044	3.00	0.1318	9796	4415	5381
6	11557	2199	13756	0.067	2.24	0.1501	11691	4589	7102
7	12721	2310	15031	0.054	2.38	0.1287	13096	4981	8115
8	11482	2274	13756	0.039	3.13	0.1219	12079	4979	7100
9	11719	2494	14213	0.054	2.69	0.1453	12148	4948	7200
1940	12964	3337	16301	0.066	2.06	0.1359	14085	5188	8897
1	15311	5061	20372	0.130	1.42	0.1852	16600	5881	10719
2	17231	6969	24200	0.171	1.20	0.2046	19248	6602	12646
3	18796	9339	28135	0.234	1.10	0.2581	20874	6817	14057
4	19447	9834	29281	0.187	1.12	0.2098	23138	6949	16189
5	18597	9929	28526	0.197	1.12	0.2214	22209	7310	14899
6	18067	9228	27295	0.207	1.14	0.2358	20860	8541	12319
7	22756	6331	29087	0.154	1.15	0.1770	23938	10683	13255
8	31777	7340	39117	0.101	1.20	0.1213	34372	12680	21692
9	28167	7236	35403	0.078	1.22	0.0954	32027	13592	18435
1950	31334	7332	38666	0.116	1.18	0.1371	33363	14674	18689
1	36189	8726	44915	0.129	1.15	0.1485	38244	16725	21519
2	37687	8069	45756	0.122	1.14	0.1392	39388	17989	21399
3	38535	7420	45955	0.115	1.14	0.1315	39912	19020	20892
4	40127	7116	47243	0.109	1.18	0.1286	41167	19967	21200
5	48405	7773	56178	0.103	1.18	0.1213	49365	20891	28474
6	50439	8300	58739	0.127	1.19	0.1507	49885	22640	27245
7	53128	8219	61347	0.123	1.19	0.1469	52338	24926	27412
8	53001	7460	60461	0.122	1.20	0.1466	51597	26321	25276
9	58572	7332	65904	0.111	1.20	0.1333	57118	27039	30079
1960	62174	5965	68139	0.111	1.23	0.1362	58860	28263	35097

Table B–VII.: Gross and net variable capital, 1900–1928 (millions of current dollars)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
year	Mfg.	Mining	Const.	Transpt. & pub. util.	serv.	Agr. Serv. etc.	Gross variable-capital	Net variable-capital
1900	2142	293	413	1048	397	36	4329	4328
1	2350	344	502	1122	398	35	4751	4750
2	2639	310	554	1185	403	40	5131	5130
3	2816	466	560	1276	411	41	5570	5569
4	2610	437	603	1344	410	48	5439	5458
5	3062	485	692	1410	420	48	6117	6116
6	3271	512	772	1545	423	54	6577	6576
7	3470	652	704	1562	438	54	6880	6879
8	2796	482	559	1532	442	56	5867	5866

Table B–VII.: (continued) Gross and net variable capital, 1900–1928 (millions of current dollars)

Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
9	3444	552	733	1582	528	54	6893	6892
1910	3898	609	718	1715	528	54	7522	7521
1	3811	617	693	1792	517	56	7486	7485
2	4239	667	769	1915	485	57	8132	8131
3	4529	736	823	1998	547	58	8691	8690
4	4153	630	604	1993	573	57	8010	8009
5	4495	636	604	2048	573	58	8414	8413
6	6082	805	670	2342	612	62	10573	10572
7	7483	998	629	2781	675	77	12643	12640
8	9418	1248	670	3794	770	90	15990	15986
9	10626	1288	997	4371	899	111	18292	18288
1920	12494	1669	1400	5750	1238	132	22683	22679
1	8201	1328	1000	4538	1183	85	16335	16332
2	8730	1193	1203	4383	1243	82	16834	16830
3	11151	1723	1843	4963	1387	90	21157	21153
4	10422	1455	1879	4832	1447	90	20125	20121
5	10948	1352	1900	4918	1526	91	20735	20731
6	11458	1580	2213	5138	1671	98	22158	22154
7	11461	1421	2098	5097	1846	95	22018	22013
8	11779	1256	2120	5090	1844	94	22183	22178

Table B–VII.: (continued) Gross and net variable capital, 1929–1960

year	(a)	(b)	(c)	(d_1) Transpt.	(d_2) Pub. util.	(e)	(f)	(g)
1929	12512	1277	2095	3929	1263	1987	93	23156
1930	10201	1069	1667	3365	1223	1861	85	19471
1	7718	779	1147	2741	1091	1627	79	15182
2	5445	535	636	2064	924	1335	63	11002
3	5714	553	480	1961	847	1216	58	10829
4	7498	780	636	2252	957	1422	59	13604
5	8477	835	748	2413	1009	1515	70	15067
6	9928	1004	1124	2776	1119	1695	69	17715
7	12127	1205	1229	3149	1282	1909	95	20996
8	9162	954	1051	2614	1202	1775	79	16837
9	10237	956	1262	2731	1184	1766	79	18215
1940	11943	1097	1415	2943	1266	1892	81	20637
1	17243	1348	2510	3553	1426	2170	93	28343
2	25268	1578	4169	4513	1535	2469	123	39655
3	34269	1789	3524	5710	1658	2915	135	50000
4	35673	1944	2541	6476	1748	3223	158	51763
5	31061	1882	2555	6677	1911	3448	166	47700
6	29036	2038	3751	7138	2428	4278	190	48859
7	34160	2476	5036	7687	2842	4748	214	57163
8	36760	2838	6070	8056	3237	4993	243	62197
9	33851	2461	5817	7505	3343	4950	235	58162
1950	39241	2706	6752	8044	3582	5236	253	65814
1	46681	3071	8477	9214	3951	5686	389	77369
2	49793	3056	9164	9489	4276	5977	313	82068
3	54969	3102	9490	9825	4636	6291	328	88640

Table B–VII.: (continued) Gross and net variable capital, 1929–1960

year	(a)	(b)	(c)	(d_1) Transpt.	(d_2) Pub. util.	(e)	(f)	(g)
4	50652	2773	9509	9105	4747	6408	339	83533
5	55885	2960	10227	9720	5065	6902	361	91120
6	59479	3271	11310	10344	5485	7414	400	97703
7	60930	3303	11487	10600	5650	7852	403	100225
8	56577	2829	11297	9964	5710	8028	403	94808
9	63138	2854	12259	10666	6039	8892	425	104273
1960	64703	2823	12546	10880	6301	9593	442	107288

Table B–VII.: (continued) Variable capital, 1929–1960

year	(g) Gross variable capital	Tax Rate: Eff. fed. inc.	Tax Rate: *Total* fed. ratio	Tax Rate: Eff. tax rate	Total tax paid	(h) Net variable capital
1929	23156	0.01	2.09	0.0002	5	23151
1930	19471	0.01	2.21	0.0002	4	19467
1	15182	0.01	3.06	0.0003	5	15177
2	11002	0.05	4.40	0.0022	24	10978
3	10829	0.04	3.09	0.0012	13	10816
4	13604	0.03	2.68	0.0008	11	13593
5	15067	0.04	2.28	0.0009	14	15053
6	17715	0.05	2.00	0.0010	18	17697
7	20996	0.06	1.70	0.0010	21	20975
8	16837	0.12	1.75	0.0021	35	16802
9	18215	0.10	1.98	0.0020	36	18179
1940	20637	0.23	1.91	0.0044	91	20546
1	28343	1.26	1.63	0.0206	583	27760
2	39655	3.58	1.28	0.0459	1819	37836
3	50000	6.64	1.08	0.0717	3587	46413
4	51763	6.58	1.08	0.0711	3678	48085
5	47700	6.37	1.08	0.0686	3272	44428
6	48859	5.25	1.09	0.0573	2799	46060
7	57163	5.99	1.09	0.0654	3741	53422
8	62197	4.49	1.11	0.0500	3107	59090
9	58162	4.37	1.15	0.0504	2930	55232
1950	65814	5.03	1.14	0.0576	3790	62024
1	77369	6.49	1.11	0.0721	5582	71787
2	82068	7.29	1.10	0.0804	6595	75473
3	88640	7.51	1.11	0.0831	7362	81278
4	83533	6.75	1.13	0.0763	6370	77163
5	91120	6.95	1.13	0.0788	7182	83938
6	97703	7.73	1.14	0.0879	8587	89116
7	100225	7.76	1.14	0.0886	8880	91345
8	94808	7.55	1.16	0.0872	8270	86538
9	104273	8.21	1.16	0.0952	8823	94350
1960	107288	7.85	1.17	0.0916	9829	97459

C. Tables supplementary to chapter VII

Note: Sources for these tables are described in the section of chapter VI on "Sources and methods".

Table C–I.: Man-hours of productive labour, 1900–1960 (millions of man-hours)

year	(a) Agr. etc.	(b) Mfg.	(c) Transpt.	(d) Pub. util.	(e) Serv.	(f) Mining	(g) Const.	(h) Total
1900	181	13513	5523	501	1622	1377	1848	24565
1901	188	14167	5780	578	1773	1500	1972	25958
1902	197	15506	6141	595	1805	1534	2330	28108
1903	201	15961	6448	642	1894	1713	2398	29257
1904	205	14576	6559	675	1923	1701	2106	27745
1905	207	16584	6787	739	2007	1873	2102	30299
1906	219	17359	7256	811	2156	1898	2154	31853
1907	221	18156	7401	856	2193	2108	2085	33020
1908	207	15375	7056	891	2113	1885	2100	29627
1909	220	17492	7065	938	2286	2131	2182	32314
1910	222	18397	7489	990	2364	2253	2251	33966
1911	224	18168	7686	1039	2431	2321	2210	34079
1912	236	18945	7881	1077	2457	2393	2325	35314
1913	242	18943	8023	1080	2523	2533	2187	35531
1914	240	17834	7614	1077	2522	2206	1896	33389
1915	238	18481	7158	1082	2489	2191	1759	33398
1916	252	22377	7590	1176	2632	2449	1824	38300
1917	246	23768	7847	1253	2598	2581	1755	40048
1918	234	23470	8062	1272	2560	2522	1682	39802
1919	242	21413	7311	1290	2648	2177	1752	36833
1920	258	22066	7964	1354	2787	2397	1531	38357
1921	223	15345	6415	1364	2813	1830	1875	29865
1922	245	17267	6547	1434	2981	1790	2271	32535
1923	269	20539	7226	1611	3204	2397	2370	37606
1924	254	18227	6692	1684	3296	2200	2556	34909
1925	265	19244	6693	1732	3434	2123	2856	36347
1926	261	19966	6834	1798	3646	2282	3107	37894
1927	253	19719	6671	1871	3715	2147	3209	37585
1928	254	19716	6473	1994	3889	1992	3180	37498
1929	262	20765	6461	2175	3995	2087	2836	38581
1930	242	17351	5634	2148	3795	1745	2440	33355
1931	235	13997	4633	1908	3457	1349	2025	27604
1932	208	11204	3781	1582	3104	1043	1416	22338
1933	214	12593	3757	1509	3124	1167	1080	23444
1934	206	13273	3935	1427	3384	1239	1134	24598
1935	215	14773	3968	1428	3563	1241	1259	26447
1936	207	17216	4348	1551	3938	1489	1757	30506
1937	254	18612	4582	1646	4121	1590	1752	32557
1938	204	13910	3725	1476	3698	1186	1579	25778
1939	186	16011	3959	1477	3700	1265	1847	28445
1940	183	17606	4140	1532	3898	1403	1972	30734
1941	188	23239	4757	1676	4281	1597	2916	38654
1942	208	29107	5320	1708	4586	1729	3704	46362
1943	204	35092	6092	1728	4813	1757	2890	52576
1944	222	34206	6407	1702	4763	1827	2097	51224
1945	215	28825	6412	1713	4710	1656	2091	45622
1946	227	25554	6032	1958	5013	1644	3137	43565
1947	235	16699	5942	2041	4734	1733	3670	45054
1948	240	26346	5703	2229	4750	1755	4055	45078
1949	233	23511	5059	2180	4617	1474	3798	40872
1950	238	25332	4928	2183	4627	1549	4105	42962
1951	247	27443	5221	2265	4718	1571	4646	46111
1952	257	27617	5074	2273	4726	1497	4774	46218
1953	254	28897	5061	2344	4812	1414	4590	47372

Table C–I.: (continued) Man-hours of productive labour, 1900–1960 (millions of man-hours)

year	(a) Agr. etc.	(b) Mfg.	(c) Transpt.	(d) Pub. Util.	(e) Serv.	(f) Mining	(g) Const.	(h) Total
1954	247	25748	4593	2300	4672	1239	4442	43241
1955	255	27182	4779	2361	4837	1295	4651	45360
1956	265	27324	4800	2435	4973	1355	4947	46099
1957	262	26427	4653	2402	5002	1298	4752	44796
1958	244	23824	4156	2282	4914	1087	4548	41055
1959	253	25732	4238	2287	5187	1061	4748	43506
1960	259	25262	4189	2291	5424	1024	4595	43044

Table C–II.: Capital stock, capital consumption, and labor content of the current dollar, 1900–1960

	Capital stock (millions of labor-units)				(e)	(f)
year	(a) Fixed capital	(b) Inventories	(c) Total	(d) Capital consumption	Labor-content of $	Reciprocal of price-index
1900	71890.6	18253.0	90143.6	4392.4	3.41882	3.5461
1	72875.2	18394.4	91269.6	4442.1	3.42536	3.4722
2	74194.2	18704.6	92898.8	4551.2	3.34246	3.3991
3	75611.5	18253.5	93865.0	4676.5	3.06730	3.1990
4	76626.3	18464.4	95090.7	4748.0	3.17532	3.2637
5	77744.2	18125.8	95870.0	4842.4	3.07530	3.2637
6	79908.3	19922.1	99830.4	5025.4	3.08632	3.1378
7	82894.7	20991.1	103885.8	5268.4	2.97617	2.9665
8	84759.6	21384.1	106143.7	5412.2	2.96591	3.1378
9	85750.5	21761.8	107512.3	5489.7	2.96198	3.1378
1910	87061.7	20882.5	107944.2	5599.1	2.66627	2.9665
1	88183.2	22368.3	110541.5	5695.3	2.77637	2.9665
2	89794.5	23203.3	112997.8	5822.0	2.80639	2.7655
3	96062.4	22599.9	114662.3	6025.0	2.54274	2.8129
4	93501.7	23629.8	117131.5	6154.1	2.56874	2.7732
5	93917.9	23371.8	117289.7	6223.8	2.42320	2.7412
6	95419.0	26717.1	122136.1	6507.7	2.25176	2.5536
7	99065.6	33426.8	132492.4	6945.2	2.07787	2.1716
8	103633.4	37653.9	141287.3	7537.0	1.88647	1.8505
9	106484.1	36273.2	142757.3	7905.5	1.50843	1.6082
1920	107469.1	32700.3	140469.4	7984.4	1.19053	1.3885
1	107102.5	31520.1	138622.6	7887.8	1.24183	1.5774
2	106325.5	33246.2	139570.7	7754.1	1.42309	1.6620
3	107205.4	33392.3	140597.7	7868.8	1.30017	1.6324
4	108590.4	34224.8	142815.2	8017.3	1.26567	1.6279
5	109823.4	33885.0	143708.4	8181.6	1.22905	1.5866
6	111430.6	32837.2	144267.8	8321.4	1.16494	1.5741
7	113302.8	35339.5	148642.3	8446.6	1.26248	1.6036
8	114844.5	32041.0	146885.5	8530.5	1.16369	1.6234
9	116519.7	31623.7	148143.4	8712.3	1.13310	1.6234
1930	117690.7	31343.5	149034.2	8803.8	1.18407	1.6949
1	116618.5	30790.6	147409.1	8597.9	1.39286	1.9011
2	113733.0	33224.5	146957.5	8211.5	1.86414	2.1505
3	110421.8	33844.1	144265.9	7828.9	2.05041	2.2321
4	107346.5	26230.5	133577.0	7596.7	1.48262	2.1008
5	104686.3	25335.0	130021.3	7480.0	1.36533	2.0576

Table C–II.: (continued) Capital stock, capital consumption, and labor content of the current dollar, 1900–1960

	Capital stock (millions of labor-units)					
	(a)	(b)	(c)	(d)	(e)	(f)
year	Fixed capital	Inventories	Total	Capital consumption	Labor-content of $	Reciprocal of price-index
6	103102.2	26367.7	129469.9	7583.5	1.29609	2.0367
7	102717.7	26877.9	129595.6	7793.5	1.18410	1.9646
8	101667.0	26125.3	127792.3	7790.7	1.16231	2.0080
9	99973.5	26170.1	126143.6	7696.2	1.19172	2.0325
1940	99445.7	26302.0	125747.7	7809.7	1.11298	2.0125
1	100151.8	29781.7	129933.5	8073.1	1.05336	1.8832
2	99431.0	31335.9	130766.9	7922.4	0.95096	1.6807
3	96489.2	30511.6	127000.8	7385.8	0.89114	1.5385
4	94014.0	28066.1	122080.1	7044.3	0.81811	1.4577
5	93291.4	27061.1	120352.5	7052.9	0.79048	1.4085
6	95715.2	31250.9	126966.1	7529.8	0.76352	1.3072
7	101226.9	35871.2	137098.1	8390.5	0.69085	1.1820
8	106693.8	34292.6	140986.4	9221.1	0.58098	1.1173
9	110167.6	34513.0	144680.6	9716.2	0.57975	1.1274
1950	112933.2	35175.0	148108.2	10045.9	0.55571	1.1124
1	116268.8	38410.5	154679.3	10528.8	0.51476	1.0417
2	119721.2	39949.6	159670.8	10861.1	0.49694	1.0204
3	123151.9	39545.8	162697.7	11081.0	0.48233	1.0101
4	126188.0	37868.8	164056.8	11256.0	0.46055	1.0000
5	128917.8	36230.9	165148.7	11423.8	0.42598	0.9960
6	132844.9	38713.0	171557.9	11825.7	0.41672	0.9794
7	137473.1	39086.0	176559.1	12303.9	0.39740	0.9515
8	140153.7	38092.9	178246.6	12421.3	0.38713	0.9320
9	141387.5	37119.1	178506.6	12350.5	0.36877	0.9217
1960	143239.6	37611.8	180851.4	12437.0	0.35492	0.9083

D. Tables supplementary to chapter VIII

Table D–I.: Productivity and wage indexes (1929 = 100)

year	(a) Labor net-productivity	(b) Hourly real wage	(c) Labor gross-productivity
1900	72.4	64.1	64.5
1901	70.8	65.2	63.4
1902	71.0	63.7	62.5
1903	72.8	62.5	62.9
1904	71.7	65.9	64.6
1905	74.1	67.6	65.9
1906	71.0	66.5	64.2
1907	69.6	63.4	62.2
1908	73.8	63.8	67.7
1909	73.9	68.7	68.3
1910	77.7	70.9	69.2
1911	74.6	66.9	67.4
1912	68.8	65.4	61.8
1913	77.2	70.6	69.6
1914	75.4	68.3	70.6
1915	79.0	70.9	73.4
1916	79.2	72.4	70.9
1917	72.9	70.4	70.4
1918	68.5	76.3	70.9
1919	74.4	82.0	75.1
1920	81.4	84.3	76.2
1921	87.5	87.4	87.0
1922	81.5	88.3	84.9
1923	87.6	94.3	85.9
1924	89.8	96.3	91.7
1925	90.1	92.9	90.9
1926	94.3	94.5	94.1
1927	88.7	96.4	91.7
1928	97.4	98.6	99.4
1929	100.0	100.0	100.0
1930	99.9	101.6	106.0
1931	95.3	107.3	118.6
1932	80.5	108.5	120.3
1933	76.0	105.7	110.9
1934	98.9	119.2	125.0
1935	105.2	120.2	125.6
1936	109.7	121.3	124.2
1937	115.8	129.9	126.3
1938	120.6	134.4	149.7
1939	119.0	133.4	147.0
1940	126.2	138.1	152.0
1941	124.8	138.8	147.3
1942	123.4	140.8	137.1

Table D–I.: (continued) Productivity and wage indexes, 1929 = 100

year	(a) Labor net-productivity	(b) Hourly real wage	(c) Labor gross-productivity
1943	120.5	139.4	131.0
1944	124.4	140.5	133.0
1945	124.4	140.8	140.2
1946	119.5	141.9	143.1
1947	119.4	143.9	143.4
1948	134.2	150.4	155.1
1949	135.7	156.4	165.5
1950	139.7	164.9	176.0
1951	141.2	166.5	177.7
1952	143.3	171.1	181.7
1953	146.2	177.9	186.6
1954	151.6	183.2	198.2
1955	173.2	189.2	210.7
1956	164.0	194.4	215.8
1957	167.1	199.2	227.5
1958	168.0	201.7	238.0
1959	174.4	205.2	244.7
1960	178.6	211.1	253.7

Table D–II.: Rates of increase of net-productivity and hourly real wages

Net productivity (% per annum)

from \ to	1929	1940	1960
1905	1.28	1.52	1.60
1929	—	2.12	1.87
1940	—	—	1.74

Hourly real wage (% per annum)

from \ to	1929	1940	1960
1905	1.63	2.04	2.07
1929	—	2.93	2.41
1940	—	—	2.12

b (elasticity of hourly real wage with respect to net-productivity)

from \ to	1929	1940	1960
1905	1.27	1.34	1.29
1929	—	1.39	1.29
1940	—	—	1.22

Source: Table D–I

Table D–III.: Capitalist sector gross product, 1900–1960 (millions of current dollars)

year	(a) Aggregate employee compensation	(b) Other Gross surplus-value	(c) Proprietor wage-equivalent	(d) Corp. tax liability	(e) Real-estate tax	(f) Sub-total	(g) Indirect business taxes	(h) Gross product
1900	6665	3855	1118		591	12229	783	13012
1901	7239	3836	1240		601	12916	886	13802
1902	7867	4318	1264		641	14090	760	15050
1903	8504	5136	1375		665	15680	1079	16759
1904	8526	4414	1348		683	14971	1033	16004
1905	9529	5005	1460		712	16706	1127	17833
1906	10407	5023	1670		760	17860	1126	18986
1907	10974	5532	1647		817	18970	1207	20177
1908	9651	5426	1516		820	17413	1198	18611
1909	11230	5418	1713	22	889	19272	1230	20502
1910	12087	6834	1826	36	898	21681	1382	23063
1911	12170	6236	1842	30	895	21173	1384	22557
1912	12827	5914	1951	37	866	21595	1385	22980
1913	13940	7111	2083	45	924	24103	1509	25612
1914	13447	6640	2061	40	946	23244	1512	24756
1915	14095	7270	2075	59	962	24461	1582	26043
1916	16909	8653	2461	180	1121	29324	1651	30975
1917	20072	9290	2854	2286	1464	35960	1870	37830
1918	24552	8656	3716	3397	1629	41950	2478	44428
1919	28101	10783	4338	2298	1772	47292	2824	50116
1920	34112	15286	5121	1671	1903	58093	3258	61351
1921	26172	13360	4133	696	1484	45845	2761	48606
1922	27511	10610	4368	761	1585	44835	3592	48427
1923	33242	12815	5188	934	1737	53916	3744	57660
1924	32729	12859	5121	860	1781	53350	3920	57270
1925	33813	14433	5363	1101	1783	56493	4153	60616
1926	36314	16369	5679	1192	1818	65372	4639	66011
1927	36189	13108	5720	1056	1815	57888	4750	62638
1928	36606	16259	5766	1081	1898	61610	5272	66882
1929	38785	17245	6084	1082	766	64062	5168	69230
1930	34830	14859	5888	688	778	57043	5416	62459
1931	28569	9900	5319	415	800	45003	5179	50182
1932	21220	4833	4515	316	537	31421	4968	36389
1933	19972	3990	4021	462	397	28842	5080	33922
1934	23497	7743	4271	643	488	36642	5988	42628
1935	25820	9332	4510	820	491	40973	6044	47017
1936	29532	11467	4818	1204	527	47548	6636	54184
1937	34321	12655	5177	1303	574	54030	6957	60987
1938	30812	11616	5147	870	474	48919	7058	55977
1939	33721	11974	5394	1286	432	52807	7108	59915
1940	37207	13822	5577	2613	731	59950	7676	67626
1941	47596	17385	6195	7252	712	79140	8901	88041
1942	61253	20974	7047	10977	690	100941	9239	110180
1943	74004	24861	7147	13570	687	120296	10112	130408
1944	78200	26013	7634	12386	682	124915	11188	136103
1945	76235	24966	8391	9957	591	120140	12138	132278
1946	83407	22788	10589	8309	655	125748	13175	138923
1947	97058	23769	12788	10504	738	144857	14391	159248
1948	107026	33211	13978	11414	805	166434	15895	182329
1949	104323	29536	14803	9130	877	158168	16531	174719
1950	115109	32054	15123	16357	850	179493	18499	197992
1951	133106	37862	16249	20650	923	208790	20312	229102
1952	142410	38623	17854	17439	1036	217362	22315	239677
1953	154194	38591	18835	18023	1097	230740	24193	254933

Table D–III.: (continued) Capitalist sector gross product, 1900–1960 (millions of current dollars)

year	(a) Aggregate employee compensation	(b) Other gross surplus-value	(c) Proprietor wage-equivalent	(d) Corp. tax liability	(e) Real-estate tax	(f) Sub-total	(g) Indirect business taxes	(h) Gross product
1954	151497	39693	19302	14867	1138	226497	23126	249623
1955	164059	47542	20473	19636	1312	253022	26489	279511
1956	178102	49458	22061	18963	1291	269875	28946	295821
1957	186745	51399	23153	18301	1592	281190	30854	312044
1958	183173	50086	23729	15513	1665	274166	31182	305348
1959	200110	54695	25515	19973	2041	302334	34123	336457
1960	209545	56095	26413	18662	2151	312866	37370	350236

Sources:

- Columns *a* through *e*: See chapter VI, section "Sources and methods".
- Column *g*: For 1929–1960, based on *U. S. Income and Output*, table I-12; for 1900–1928, based on Kendrick, *Productivity Trends in the U. S.*, table A-II-B.

Chart D–1.: Expanded (gross of taxes) and actual (net of taxes) rates of profit and surplus-value, 1900–1960 (labor-unit base)

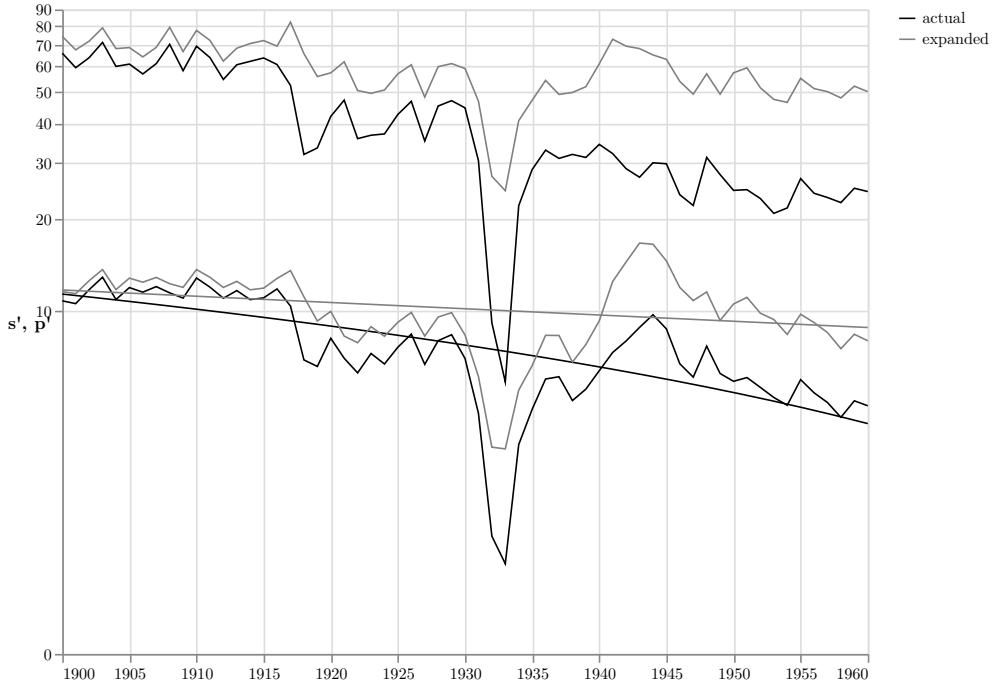


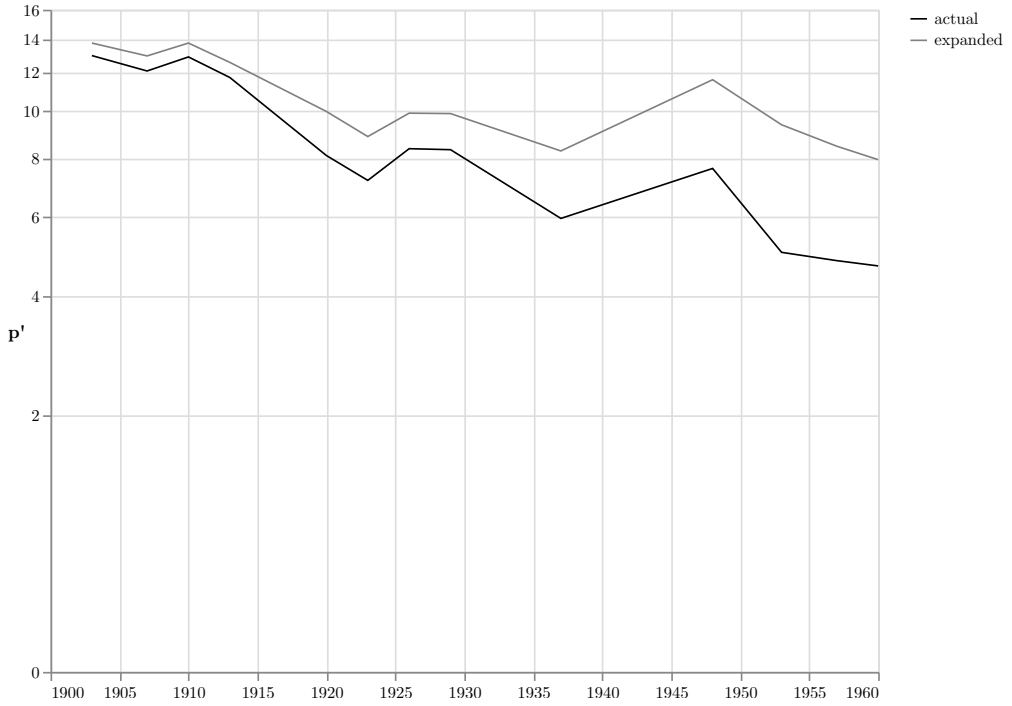
Table D–IV.: Expanded (gross of taxes) rates of profit and surplus-value, 1900–1960 (millions of labor-units)

year	(a) s'	(b) p'	(c) Expanded surplus-value	(d) Expansion of surplus-value
1900	74.40	11.63	10489	721
1901	67.60	11.45	10461	773
1902	71.90	12.63	11749	788
1903	79.00	13.74	12902	727
1904	68.20	11.81	11237	823
1905	68.70	12.88	12332	841
1906	64.30	12.49	12455	898
1907	68.80	12.95	13472	925
1908	79.30	12.35	13095	866
1909	66.80	12.01	12926	1026
1910	77.60	13.74	14843	930
1911	72.30	12.96	14313	1015
1912	62.40	12.00	13561	1066
1913	68.40	12.57	14426	991
1914	70.70	11.79	13823	1007
1915	72.20	11.94	13994	982
1916	69.40	12.85	15703	1209
1917	82.30	13.63	18062	4278
1918	65.80	11.18	15801	6156
1919	55.90	9.28	13223	3976
1920	57.40	10.00	14000	2643
1921	62.10	8.25	11438	1854
1922	50.60	7.83	10932	2348
1923	49.60	8.88	12485	2381
1924	50.80	8.24	11764	2321
1925	57.00	9.19	13194	2326
1926	60.80	9.92	14324	2238
1927	48.30	8.25	12253	2459
1928	60.00	9.57	14062	2372
1929	61.30	9.90	14661	2312
1930	59.20	8.32	12408	2103
1931	46.90	5.97	8806	2341
1932	27.30	3.25	4780	2906
1933	24.60	3.20	4618	3351

Table D–IV.: (continued) Expanded (gross of taxes) rates of profit and surplus-value, 1900–1960 (millions of labor-units)

year	(a)	(b)	(c)	(d)
1934	40.80	5.34	7133	2688
1935	47.20	6.52	8489	2594
1936	54.40	8.30	10738	3169
1937	49.20	8.29	10744	3023
1938	49.90	6.71	8584	2335
1939	52.00	7.72	9728	2947
1940	61.20	9.29	11579	3812
1941	72.90	12.56	16312	6899
1942	69.40	14.54	19008	8626
1943	68.20	16.74	21293	10077
1944	65.20	16.60	20233	8348
1945	63.20	14.66	17656	7153
1946	54.00	12.00	15291	6894
1947	49.30	10.86	14868	6721
1948	57.00	11.60	16363	5615
1949	49.30	9.32	13488	4637
1950	57.40	10.58	15681	7187
1951	59.50	11.13	17199	8041
1952	51.60	9.86	15714	7002
1953	47.50	9.39	15254	7084
1954	46.50	8.36	13707	6003
1955	55.20	9.78	16148	6543
1956	51.30	9.17	15720	6757
1957	50.20	8.48	14962	6467
1958	48.00	7.47	13302	5748
1959	52.20	8.37	14923	6210
1960	50.20	7.95	14377	5923

Chart D–2.: Expanded (gross of taxes) and actual (net of taxes) rates of profit, peacetime peak years, 1903–1960 (labor-unit base)



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