Towards a revision of the theory of capital

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1. Introduction.

Capital theory, the controversial starting point of the political economy of capitalism, is a wide, complex and intellectually compelling subject, characterized by a high level of abstraction and by a plurality of logical dimensions. Its task is to explain the nature of capital, the fundamental connections of value and capital theories and the role performed by capital in production, valuation and the social distribution of income. It is a difficult and entangled topic, which needs to be developed at a twofold level of abstraction: both at the fundamental level of theoretical search about the inner nature of the economic process, that at which Smith, Ricardo, Marx, Böhm-Bawerk, Hayek and Sraffa were mainly interested, and at the more empirical level of asset valuation and profit measurement by accountants and bookkeepers.

The present state of the theory of capital, however, is rather disappointing. The basic problem of measuring heterogeneous capital goods in value terms has not been satisfactorily solved. And the time value of money, the fact that money can earn an interest or a profit, and therefore the future value of a money sum of invested capital is different from its present value tends to be underrated.

'Time is money', it is valuable and perishable. It takes time to do anything. Moreover, calendar or historical time, differently from logical time, is irreversible. Once past, calendar time is unrecoverable. Wasted time is calendar time that could be used to get an income and has been lost.

However, the functional links of the theory of capital with the theory of value, and with the theory of income distribution, are not yet sufficiently cleared. There is still some work to be done in this field of search.

The specific aims of this essay are three:

i) first, to provide an historical and critical introduction to the subject, going beyond the traditional distinction between the classical surplus approach, linked to the labour theory of value, and the neoclassical formulation based on the relationship between supply and demand;

ii) second, to distinguish two different historical situations: that of the primitive case of a state of pure nature, described by Locke and Smith, in which production is undertaken only for use, by human beings unassisted by capital goods owned by other people; and the more realistic and important case in which production is undertaken for profit, in an economic system characterized by the fundamental presence of capital goods;

iii) third, and last, to propose to calculate the monetary expression of the abstract labour-time represented by each commodity, without assuming Marx's alleged 'new-value equality' between the labour-value of the net social product and the total amount of living labour. We shall re-examine the meaning of a basic valuation parameter, the internal rate of return on invested capital, in order to include in it, on the cost side, the financial cost of invested capital and on the revenue side a risk premium.

A learned reader should easily recognize a Marxian connection in our theoretical vision. Our reference point will indeed be the position held by the 'elder' or 'senior' Marx − Marx *par excellence* − after the 'epistemological break' of the middle 1840s, that, according to the French philosopher Louis Althusser, signed the passage of Marx from ideology (Feuerbach's philosophy of

man) to science (historical materialism, an intellectual position closer to our contemporary sensibility of the cultural logic of capitalism) [1].

This essay is organized in three parts. The first one is an exercise in 'thinking about thinking'. It is a brief survey of the literature, has a critical and deconstructive character and provides a necessary historical framework to our analysis. It is a problematic description of the most important debates on the theory of capital and investment decisions that underlines the fundamental contrast present in the literature on the subject between a backward-looking analytical perspective and a forward looking one.

The second part of the essay is more analytical. It includes the outline of a theory of value and capital suited to account properly for the user cost of invested capital. That is for the real rental price of capital. The basic question afforded is: what determines the cost-of-production of commodities? To answer this fundamental question, we shall use a budgeting parameter that will include both the real cost of producing and the financial cost of investing (a notional charge). The opportunity cost of financial capital will be expressed as a percentage rate and will be augmented by the depreciation allowances of fixed capital and by the cost of managing and maintaining inventories. This procedure meets common sense and has important theoretical and practical effects.

The third part of this essay is specifically concerned with a revision of Marx's theories of value and capital. In the course of it, the Marxian notion of constant capital will be reconsidered. It will be argued that only a part of the value of real capital invested in material means of production – the portion of it which is entirely consumed during the production process – can be regarded as a constant flow of capital destined to be transferred unaltered in the value of output, as assumed by Marx. The residual part of real capital is not constant. It is valorising capital.

Our analytical treatment of the problem will thus confirm the need to abandon the pure labour theory of value, initially held by Marx ('the young Marx') and to turn to the different view expressed by the 'second' Marx, the author of *Grundrisse* and *Das Kapital*, after his alleged and contested 'epistemological break' [2].

Part I: THE HISTORICAL BACKGROUND OF THE PROBLEM

2. Some lessons from the past.

Let us start our exercise on thinking about thinking by recalling William Petty's real cost-of-production vision of the problem in terms of a labour-and-land theory of value ("the loaf of bread" theory), in surplus took the form of rent. But it was only with Adam Smith that the 'toil and trouble' of the labour time required to produce something was recognized as the real measure of value ("the real price" of commodities). Smith's 'labour-embodied' theory of value was intended to be effective only in the "early and rude state of society which preceded both the accumulation of capital and the appropriation of land". That is in a primitive state of nature, in which there was no capital and labour-embodied and labour-commanded coincided.

For a modern economy in which labour is divided, commodities are created to be exchanged and production is undertaken for profit, Smith had a different theory: a labour-commanded theory of value, centred on exchange, in which labour continued to be the basic element in the determination of value, but the relevance of its productive role was somewhat reduced.

[1] See JAMESON, F. (1984), *Postmodernism, or the Cultural Logic of Late Capitalism*, "New Left Review ", no. 146, pp. 53-92, and Verso, London, 1991. On the epistemological break, see BALIBAR, E. (1978), *From Bachelard to Althusser: The Concept of "Epistemological Break"*, "Economy and Society", vol. 7, pp. 207-37.

[2] This is the controversial interpretation advanced by the French philosopher Louis Althusser, the theoretician of an 'aleatory materialism' of contingency and possibility, and refused by other western critical Marxists, as Lukács, Sartre, Korsch, Adorno, Marcuse, Schaff and Habermas, for whom Marx's theoretical conception was from its first to its last formulation an unchanged positive form of philosophical humanism.

Smith held also another theory, an 'adding up' theory of the normal or natural price, that was intended to hold in a modern type of society, in which wages, profits and rents enter as independently determined primary price components (the classical 'trinitarian' formula). Commodities prices, determined by adding up these distinct elements, reckoned at their normal rates, were not necessarily proportional to labour costs.

A theory of value should answer two distinct problems: the search of a reliable measure of value, which is a purely technical problem, and the search of the origin or substance of value, which is a philosophical problem. Initially the classical economists regarded these two aspects as strictly connected and oriented themselves towards a single answer to both of them, provided by the labour theory of value. An important historical task was left by Smith to Ricardo, that of underlining the possible existence of different causes of changes in the relative values of commodities. Ricardo accomplished this task, but pointed out that the value of a commodity "depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour" (*Principles*, ch. 1). He generalized Smith's labour-embodied theory of value, by extending it to a capitalist society, and introduced in it important qualifications and innovations. He did not include a rent in the price of commodities. The price, for Ricardo, was equal to the unit cost-of-production, plus the profit on capital.

What neither Smith nor Ricardo were able to do was to reconcile the labour theory of value with a consistent theory of money. Ricardo held a rigid version of the quantity theory.

Then came Marx and further progress was made in the theory of value and capital. Marx's theory of value was not a simple elaboration and extension of the Ricardian theory. It was a unified theory of value and money, which contained several significant innovations:
- *i*) the introduction of the notion of abstract labour, or socially necessary labour-time, and the construction of an ontology of abstract labour;
- *ii*) the distinction between labour, the source and measure of value, and labour-power, the labourer's ability to work, a particular kind of commodity;
- *iii*) the reduction of different qualities of labour to a common homogeneous unit of measure;
- *iv*) the idea of capital as a relational concept, a social relational one;
- *v*) the establishment of a quantitative equivalence between social labour-time and money, that opened the way to the development of a monetary theory of value [3];
- *vi*) the distinction between absolute or intrinsic value ('value') and the relative value (or 'exchange value') of a commodity;
- *vii*) the singling out of unpaid labour-power as the only source of surplus value and profit.

Marx looked at money as the necessary form of appearance of value and capital. Capital was for Marx the result of a production process by which labour "*becomes value in process… and as such capital*" [4].

In one of his last writings, the draft of his *Critique of the Gotha Programme* (1875), Marx recognized that living labour could not be regarded as the only source of new or net value [5]. The 'second' Marx had no longer in mind a labour theory of value, but a wider cost-of-production theory, that considered both labour and capital as sources of value. He acknowledged that commodities prices – natural prices and market prices – could not be proportional to the quantities

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[3] The analysis of the demand for money as an asset – a demand for real cash balances made as a store of value and a source of liquidity services – is a special topic in the theory of capital. The demand for money as an asset is directly related to the income and price levels and inversely related to the opportunity cost of holding wealth in the form of money, rather than in that of bonds or equities, and can systematically affect the time structure of production.

[4] 'Value in process' is a highly expressive Marxian locution. It refers to the 'metamorphoses of capital' in the three stages of Marx's 'circuit of capital-value': those in which the capitalist acts as a buyer, a producer and a seller of commodities. We prefer to speak of 'value in progress', because the process is remunerative (see Cavalieri, 2013).

[5] "*Labour is not the source of all wealth. Nature is just as much the source of use-values (and it is surely of such that material wealth consists!) as labour, which itself is only the manifestation of a force of nature, human labour power*" (Marx, *Critique of the Gotha Programme*, 1875, chapter 1). The source of wealth for Marx was labour together with its 'material conditions' and natural resources (the classical triad).

of embodied labour [6]. He thus admitted that the labour theory of value was significant only in some special cases: those of an equal organic composition of capital in all sectors of production and of a zero rate of profit. And he obviously knew that his theory of value was subject also to another serious objection, since it could not explain how the prices of scarce and non-reproducible commodities were determined.

Two distinct and opposite analytical tendencies have then characterized the developments of the 'objective' theories of value, based on the cost of production, the cost of labour and capital services. One of them, suggested by Dmitriev and applied by Bortkiewicz and others, including Sraffa, was that of a 'reduction of prices to dated quantities of labour-time', properly weighted, through a sort of regression *ad infinitum* in human history. The process of backwardation had to be truncated at a certain point of time, to avoid the remnant of a small residual that could not be eliminated.

The other analytical approach, suggested by Torrens in his refutation of Ricardo's labour theory of value, was the reverse one. It was aimed not at 'humanizing' but at 'reifying' the subject, by substituting in the system of price equations human labour with the physical quantities of wage-goods consumed by workers and their families. It too was subject to the objection of implying an infinite historical regression. These two different approaches to the problem gave rise to the contraposition of a vertically integrated version of the labour theory of value, of classical and Marxian derivation, to a horizontally integrated version of the theory of value, of neo-Ricardian and Sraffian type, that regarded physical capital as an autonomous source of value, in an almost fetishistic perspective [7]. The contrast between these two kinds of cost-of-production theories of value has subsequently informed a large part of the literature of objective or intrinsic nature on the subject.

3. The neoclassical subjective perspective.

So far, we have made some reflections on the classical and the Marxian traditions in capital theory. Let us now look at the marginalist side of the literature, where in the search for an optimizing behaviour consistent with a general criterion of rationality attention was focused on utility and scarcity, rather than on real cost elements.

The hegemony of the classical school began to decrease in the third decade of the 19th century, due to the opposition of the leading class to the Ricardian conflictual vision of the distributive process. There was a revival of the Smithian idea of a natural order suited to reconcile contrasting economic interests and a shift of analytical interest from the supply to the demand side. More attention was paid to the time element and to time preference. Ricardo began to be regarded on a new light, as a forerunner of marginalism. Since then his spiritual heritage has been the object of a dispute, which is still going on, between opposite schools of thought.

Jevons was the first author who measured the quantity of capital in terms of time. He wished to build a theory of capital on subjective lines, based on Senior's concept of 'abstinence', the sacrifice implied by postponing current consumption. But he did not disregard completely the supply side [8]. At that time, in the U.S.A., J.B. Clark was looking at capital as a generic self-reproducing fund of non-allocated purchasing power and abstract productive capacity, suited to be expressed in money terms. His suggestive conception of capital was that of a permanent and continuously changing physical entity, similar to a river, or to a waterfall, made up of an infinitely large number of passing

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[6] "The possibility… 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" (Marx, *Capital*, vol. I, p. 102).

[7] In my opinion, Sraffa was not a neo-Ricardian theorist. Neo-Ricardians were some of the members of the Russian-German school of mathematical economics active at the beginning of last century. On value, Sraffa was very distant from Ricardo. And equally distant from Marx. He used to refer to commodity-values, not to labour-values.

[8] Jevons thought that since cost-of-production determines supply, which determines marginal utility, which determines demand, supply and demand were both relevant in the determination of values. He did not realize that this was circular reasoning.

drops of water. Frank Knight, an exponent of the Chicago School, developed a productivity theory of capital entirely independent of subjective time-preference. Both of them regarded capital as a fluid fund of free or uncommitted financial resources, which is a meaningless concept when it is applied to the economy as a whole. Another leading American neoclassical scholar, Irving Fisher, did not distinguish capital from other forms of wealth, as land and natural resources. He called capital any stock of wealth that produced an income flow over time. For him the relevant distinction was that between a stock of capital and a flow of income.

An attempt to reconcile in a theoretical synthesis the supply and demand sides of the theory of value was made in England by Alfred Marshall, who however did not hold a coherently organized theory of capital. His theoretical construction was designed to serve two main purposes: the integration of the theory of income distribution with the general theory of value and the closing of the gap between the economist conception of capital as a specific factor of production earning a particular type of income and the business practice conception of capital as a generic income-earning power which consisted in money or could be represented in terms of money. Marshall's intention was to lay the foundations of a comprehensive theory of production, value and distribution, built along partial-equilibrium lines. A theory where long-period normal prices would be explained on a the cost-of-production basis, whereas market prices were determined by the opposing forces of supply and demand. But he used different notions of capital, that he did not connect together in a consistent way. He regarded capital as a stock of productive wealth, a fund of advances to workers, a specific agent of production and a generic source of income, distinct from labour and land.

An equally general but more coherent notion of capital was held by Leon Walras. He called capital any resource suited to be used as an input in production, including labour ('personal capital') and land ('natural capital') and did not consider capital a single entity, but a vector of heterogeneous capital goods, whose prices obeyed the rule of cost-of-production. He distinguished capital goods from the flows of their services, whose prices were determined by supply and demand. There was therefore a significant shift of emphasis from capital goods to the services they provided (the true productive inputs). The prices of capital goods were regarded equal to the capitalized net income of their capital services, and did not change during the productive processes.

So conceived, the Walrasian theory of capital was innovative in some important analytical aspects. It showed that the treatment of an economy's capital endowment in the framework a general inter-temporal equilibrium model, involving a continuous set of temporary equilibria, did not require aggregation. But it did not offer an explanation of the origin of value. In Walras's general equilibrium theory everything depended on everything else. His theory, that correctly rejected the idea of capital as a single homogeneous magnitude, was not compatible with the application of the principle of factor substitution to each specific kind of capital good and with the assumption of a long-run tendency towards a uniform rate of return on capital goods, characterizing a 'normal' state of the economy. Moreover, in the Walrasian model with capital accumulation a serious difficulty was due to presence of newly produced and qualitatively different capital goods that implied a plurality of different net rates of returns (as many as the number of distinct types of capital goods), and this was not consistent with the assumption of a system in equilibrium.

There were therefore good reasons to go beyond the traditional contraposition in the theory of capital of a neoclassical approach implying perfect substitutability in production between labour and capital, and a classical approach, implying fixed coefficients.

4. Alternative approaches to the theory of capital.

An alternative to the neoclassical approach was provided by Austrian capital theorists interested in the relation between capital and time. Menger, the founder of the 'old' Austrian school, had a subjectivist theory of value. He reversed the direction of value imputation of classical political

economists, centred on labour, by pointing out the importance of intermediate goods ('goods of higher order') ordered in a pyramidal capital structure.

Böhm-Bawerk, another leading member of the old-Austrian school, had a systematic formal approach to the theory of capital. He rejected Clark's idea of capital as a fund of values. The 'dichotomy objection' which he raised to Clark's conception based on the working of the principle of synchronization of production and consumption in analogical models that oversimplify reality (as Knight's self-perpetuating 'Crusonia plant'), was that capital goods have a capital value, but are not capital value. Böhm-Bawerk and Wieser, who defined the concept of opportunity cost, did not refuse entirely the classical cost-of-production theory of value. They were perfectly aware of the role performed by the cost of production in the determination of commodities prices. But they believed in the operation of the market principle of supply and demand and of that of diminishing marginal utility. They argued that an interest must be paid to capital because production is not instantaneous, but takes time and needs to be financed in the meanwhile; and that this occurs quite independently of who owns the capital. Hence interest, the price of credit capital, has to be paid also in a socialist country.

A distinguished exponent of the Swedish school of economics, Wicksell, went even farther. He pursued the objective of measuring capital by a single magnitude further on, by expressing quality differences between capital goods as quantitative differences, reckoned in terms of lengths of time. He noticed that the fact that capital had to be calculated in value units extraneous to itself was a disturbing theoretical anomaly that caused important consequences [9]. Together with his disciples Åkerman and Lindahl, he succeeded in extending the Austrian theory from circulating to fixed capital.

The second generation of Austrian capital theorists, active in the interwar period, devised a theory of business cycles in which the key role was that of the rate of interest, regarded as a regulator of the level of bank liquidity. A leading contributor was Ludwig von Mises, an eminent radical apriorist who reasoned in deductive terms in the Mengerian tradition, held a pure time-preference theory of interest and refused the neoclassical methodology and the Clarkian-Knightian conception of capital as a self-perpetuating fund of values. He regarded time-preference as a fundamental category of human action and looked at the market process as characterized by a dynamically competitive entrepreneurial behaviour.

An essential component of the 'new' Austrian theoretical construction was Friedrich von Hayek's 'pure' theory of capital. Hayek stressed the importance of the role of knowledge and of its growth during of the market process and developed some of the basic ideas of Böhm-Bawerk: that the market process takes time; that production takes place in vertical linear sequences, through the application of stored-up services of the original factors labour and land; and that the length of the time interval which elapses between an input flow and the corresponding output flow affects the amount of the product. The fundamental Austrian conception of a vertical time structure of production was retained, but the controversial notion of an average period of production, suited to be applied to simple point-input point-output productive situations, though not to more complex flow-input flow-output cases, was abandoned. Hayek's purpose was to construct a theory of capital fully integrated with the theory of money, to provide a rational basis for a monetary explanation of business cycles. But he did not achieve this result [10].

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[9] The anomaly originates a 'Wicksell effect', by which any change in the rate of interest (profit) or in the supply of capital goods causes a change in the valuation of a stock of capital, by altering the units in which the stock is measured, so that in competitive equilibrium the rate of interest (profit) is no longer equal to the marginal product of capital.

[10] Later on, three distinct conceptions emerged among the 'Austrian-American' capital theorists of the third generation: those of Ludwig Lachmann, a German radical subjectivist who proposed the concept of capital structure and promoted an important turn in the study of capital in disequilibrium; of Israel Kirzner, who underlined the fundamental role of individual actions and of entrepreneurs expectations; and of Murray Rothbard, a right-wing 'anarcho-capitalist', who applied Austrian capital theory to macroeconomic monetary analysis, integrating the time-preference interest theory with a study of the time structure of production.

At the end of the 1930s, Austrian and Swedish authors had succeeded in rejecting the neoclassical attempt to treat capital as a single and homogeneous fund of values. The debate was then re-oriented towards the notion of instantaneous equilibrium and this opened the way to the development of neo-Walrasian capital theories.

In England two economists, Robertson, a Marshallian scholar, and Hicks, a neo-Walrasian, were also working, independently of each other, on the temporary equilibrium of the economic system. Robertson, who held a 'loanable funds' theory of interest, centred on voluntary savings in free or circulating capital, used a step-by-step period analysis, implying a time-lag between the reception and the spending of income. He applied this type of analysis to the study of industrial fluctuations, which he explained as the result of a shortage of saving relative to investment, rather than as caused by an excessive expansion of bank credit [11]. Hicks's approach to the same problem was more eclectic. He analysed the market process in a temporary equilibrium framework and in a forward-looking pseudo-dynamic perspective, in which every variable was dated. Later on, Hicks admitted that the result of his approach was not fully satisfactory and that the temporary equilibrium method was unfit for a dynamic analysis. He then focused on the study of growth equilibrium, with a methodological position that allowed to make use of both flex-price (neoclassical) and fix-price (Keynesian assumptions), and finally he proposed a 'neo-Austrian' reformulation of the theory of capital, in which time was the crucial variable. Input flows were transformed, with time-lags, into corresponding output flows [12].

The Austrian capital theory was neither the expression of a united school of thought (there were different opinions on capital among the Austrians), nor that of an exclusively national school. It was a subjectivist and forward-looking conception that pointed out the importance of the relation between time and productivity. Much attention was devoted to the multi-stage capital structure of the economy, characterized by capital goods of various orders. They focused on the analysis of entrepreneurs expectations and deserve appreciation for having made clear that the 'quantity of capital' is a meaningless concept. But the Austrian theory of capital did not assert itself sufficiently, because it did not afford properly the problems concerning changes in the capital structure in a disequilibrium context and because the Austrians were not sufficiently interested in the links of capital accumulation with income distribution and undervalued the role of money in capital theory. Their contributions to the study of the vertical structure of capital and to the critique of the tendency of neoclassical theory to reduce individual decisions to a mechanical application of an optimizing procedure must however be underlined. They achieved the important result of discarding the mechanistic optimizing conception of neoclassical economics and rediscovered the creative role of entrepreneurship in a context of dynamic competition. After them, the entrepreneur can no longer be regarded as the mechanical executor of a pre-ordered scheme.

5. On Keynes's capital theory.

Keynes was scarcely interested both in the theory of value, that he regarded as a pedagogical tool devoid of practical relevance, and in the theory of capital. But he did not dismiss entirely capital theory. His theoretical system in this field was, basically, an expectations-augmented extension of Marshall's theory founded on the principle of factor substitution, which implies the availability of

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[11] Robertson's doctrine of 'forced saving' and 'induced lacking' was the origin of a famous controversy with Keynes on the determinants of the rate of interest.

[12] The legitimacy of this name was criticised by Austrian authors. Other criticisms came from Edwin Burmeister, a neoclassical economist, who argued that the technology of Hicks's model was a special case of the more general von Neumann model: the case of vertical integration. Hicks's answered that the Austrian approach was a more general one and that the von Neumann approach implied steady-state conditions and sector disintegration.

alternative methods of production and diminishing marginal productivities of single factors [13]. But with a significant difference. Keynes's attention did not focus on the yields of past investments, but on the expected returns of new investments (the marginal efficiency of capital). His purpose was to provide a general theory of asset holding.

In his *Treatise on Money* (1930), whose original draft was significantly titled *The Standard of Value*, Keynes adopted a cost-based monetary theory of value and took two standards of value: the purchasing power of money, reckoned in terms of homogenized labour units, which he named "labour-power standard", and the more general purchasing power of money reckoned in terms of a weighted average value of all commodities, which he called "commodity-power standard". In the *General Theory*, Keynes devoted a whole chapter (chapter 16) to an analysis of the nature of capital and cleared that he did not share the Austrian representation of capital as time and that he regarded labour as the basic productive factor [14]. He also observed that the marginal efficiency of capital depends primarily on the scarcity of capital, but there were no intrinsic reasons for it, and that if the supply of capital goods was kept sufficiently abundant, capital yields would decrease in the long period up to the point where the marginal efficiency of capital would be zero. At that point investment would no longer be profitable from a private point of view and the demand for capital assets would cease and cause the "euthanasia of the rentier" and the end of "the cumulative oppressive power of the capitalist to exploit the scarcity-value of capital" (*G.T.,* p. 376).

Keynes made use of an investment demand schedule of Marshallian type, inversely related to the interest rate, sufficiently elastic and largely independent of savings. But in his theory there was no systematic link between the market for capital goods and that for financial liabilities. What was missing in his analysis of investment was an integrated balance-sheet approach. Special attention was paid by Keynes to the demand for short-term finance in form of overdraft bank facilities covering the period between the planning and the execution of an investment. He thought that under stationary conditions, investors would usually be in the position to meet their payment obligations for the purchase of capital goods, without the need of additional financial resources. Producers of capital goods would thus be able to repay their previous bank loans, using the sums received from the buyers. This would provide the availability of a revolving fund of short-term finance. In a growing economy there would however be a need of 'extra-finance', that should be met by the firms by issuing new securities in the bond market and/or by borrowing again from the bank system.

In the Keynesian theoretical system the macroeconomic equilibrium condition left open the problem of how to finance new investment. On the supply side, the crucial elements in this connection we re the liquidity position of the banking system and the willingness of financial intermediaries to lend at the ruling interest rates. On the demand side, Keynes's 'finance motive for holding money' played an important role and was at the center of his capital theory approach to the demand for money [15]. This approach stressed the importance of bank credit and dealt in particular with the demand for short-term finance which had to be satisfied during the time interval between

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[13] The principle of factor substitution, which should govern the choice of the capital intensity in production, has a limited theoretical validity. It is subject to failure when the amount of a factor of production cannot be determined independently of the price system.

[14] " I sympathize, therefore, with the pre-classical doctrine that everything is produced by labour, aided by what used to be called art and is now called technique, by natural resources which are free or cost a rent according to their scarcity or abundance, and by the results of past labour, embodied in assets, which also command a price, according to their scarcity or abundance (Keynes, *G.T.*, p. 213).

[15] Keynes's demand for money was the result of two distinct components: a passive one, the liquidity preference schedule, and an active one, the demand for money made for the finance motive, a further component that he introduced in 1937 to answer some criticisms made by Ohlin. Keynes's intention was to build a bridge between two different analytical approaches to the demand for money: that of the demand for cash and that of the demand for loanable funds. He argued that at any given rate of interest the entrepreneurs' demand for finance made to cover the time lag between the planning and the execution of investment decisions depends on the current volume of investment and that the corresponding supply of new finance comes out of existing cash balances and of credit creation and consists of the funds made available by dishoarding and current returns on actual investments, of equity issues and bank loans.

the planning and the execution of an investment. It was a demand for temporary money loans from the banking system, not a demand for real capital. When the investment was completed, the short-term financial arrangements that had been made were expected to be substituted by longer-term ones, with institutionally accredited investment underwriters [16]. There is a need to distinguish between a genuine investment-demand function – that for an addition to the existing stock of capital goods – and a pseudo investment-demand function, the neoclassical demand for investible funds, which is a demand for finance.

The Keynesian demand for money was the sum of a passive component, the liquidity preference schedule, that is a demand for cash, and an active component, the demand for investible funds made for the finance motive. The rate of interest was independent of the marginal efficiency of capital, being determined by the demand and supply of money, two stock-variables in the money market, and not by the real forces of savings and investment, two flow-variables in the commodity market. Keynes's purpose was to build a bridge between the different components of the demand for money, the theoretical development that made possible to prove the logical equivalence of the classical, neoclassical and Keynesian theories of interest, and to show that, under general equilibrium conditions, the rate of interest is simultaneously determined by a threefold-margin of choice between present and future consumption, real and financial investment, money and bonds.

In Keynesian capital models there is always a choice between two distinct ways of allocating saving out of current income: either by accumulating saving in the single capital good or by holding it in the form of money balances. In these models the equality between savings and investment is not an identity, as in neoclassical models, but an equilibrium condition. Saving is a function of the level of income. Therefore the position of the saving function varies with the level of income. For each level of capital endowment a curve of the demand for financial funds and an investible funds supply curve can be drawn.

In 'post-Keynesian' theories – a generic label which includes several distinct branches – capital accumulation depends in the short-run on investment decisions based on uncertain entrepreneurs expectations (not on the amount of savings), the rate of profit is determined by the rate of growth of the economy and the principle of effective demand sets the level of activity and the size of social output. In the long-run, the classical theory of capital continues to hold. An element which distinguishes post-Keynesian from Sraffian capital models is the different importance that in the presence of uncertain expectations these models assign to the analysis of the short-period tendencies of the economy. Keynes and the post-Keynesians considered a monetary economy where the nominal wage rate was given and money prices were determined. Sraffa and the Sraffians, on the contrary, analyzed a simpler non-monetary world, where either the real wage rate or the general rate of profit was exogenously given. Once the system was locked, the relative prices of commodities were determined.

As Keynes, Sraffa thought that a theory of absolute value was superfluous if one could explain the relative prices of commodities. But whereas Keynes was not particularly concerned with the value problem and limited himself to a reception of the Marshallian theory of relative prices, Sraffa proposed an explanation of relative prices of production. He showed that if in the frame of the classical surplus approach one assumes the simplifying hypothesis of constant returns to scale, or an equivalent hypothesis that could avoid to consider the unit cost of production as a function of the quantity produced, commodities relative prices could be determined in quantitative terms without

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[16] In a stationary economy, investors will be in the position to meet their contractual payment obligations for the purchase of the capital goods, without the need of additional financial resources. Capital goods producers will be able to repay their previous bank loans, by using the sums received from buyers, and the repaid bank loans will provide the revolving fund of short-term finance, which will be used over and over again. But in a growing economy net investment must be financed by additional means of payment. There will thus be the need of an 'extra-finance', provided by dishoarding and credit expansion. Keynes pointed out "that *all* demand for liquid funds compete on equal basis for the available supply, whereas the conception of a separate pool of 'funds available for investment' suggests that the rate of interest is determined by the interaction of investment demand with a segregated supply of funds earmarked for the special purpose irrespective of other demands and other releases of funds" (Keynes, *G.T.*, p. 284).

the necessity to pass through the labour theory of value [17]. To do this, however, Sraffa was forced to assume unrealistically that when income distribution and commodities relative prices changed, the people's expenditure customs and the production techniques did not change. In his theoretical system, in which all qualitative aspects concerning value-forms were ignored, relative prices of production and the social distribution of income between wages and profits were simultaneously determined, when one of the distributive variables was given exogenously. But the source of profit was not explained.

6. The Cambridge debates.

In the early 1950s a fundamental criticism was addressed to the macroeconomic versions of the neoclassical conception of capital by Joan Robinson. In a provocative article she described the aggregate production function as a powerful instrument of economic miseducation opened to severe logical objections, as it could not be specified in what physical or technical units capital was reckoned. Robinson posed two basic questions – what is the meaning of 'the quantity of capital' and what determines the rate of profit – and argued that there is no physical quantity of capital, no marginal product of capital and the social distribution of income between wages and profits is not determined by the marginal productivities of factors [18]. Her article shook the backwater of capital theory , but did not achieve entirely its objectives. Times were not yet sufficiently mature to discard the mainstream neoclassical version of the theory of capital. One conclusion could however be drawn: that neoclassical growth models had to assume an unrealistic hypothesis: either the presence of homogeneous capital and labour or that of a single and malleable composite capital good.

The debate on capital theory was resumed in the 1960s, under the name of 'Cambridge controversy', after the appearance of Sraffa's famous book on production of commodities by means of commodities. In the course of this new phase of the debate it was definitively shown that the capital intensity of production is not a monotonic function of the rate of profit, that different capital goods cannot be aggregated into a single magnitude and that in the presence of heterogeneous capital goods 'Wicksell effects' can arise involving changes in the methods of production and in the value of the capital stock, associated with changes in the rate of interest incompatible with those assumed by the neoclassical theory [19]. The debate confirmed that the amount of capital had to be reckoned in value terms, but independently of the price system. It could not be ascertained in quantity terms. It was also established that no measure of capital intensity is independent of the rate of interest. The logical possibility of insurgence of paradoxical phenomena, such as 'reswitching of techniques' and 'capital-value reversing', was proved [20].

Three distinct conceptions of value were present in the debate: the classical and Marxian notion of labour value, the neo-Ricardian and Sraffian concept of commodity value (which together

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[17] Sraffa's refusal of the labour theory of value is clearly expressed in his notebooks, where he says that "It is a purely mystical conception that attributes to labour a special gift of determining value" (SP, D3/9:89) and that "Smith and Ricardo and Marx indeed began to corrupt the old idea of cost – from food to labour" (SP, D3/12/4:2.i.a.).

[18] Leading 'neo-neoclassical' authors made use of capital theory 'parables' implying an unrealistic one-commodity world or a single homogeneous and malleable capital good, no joint products and full substitutability of labour and capital, to show that an increase in capital intensity would lead to a lower marginal product of capital and a lower level of the rate of interest. To preserve the inverse relation in demand theory between the price of any factor service and the quantity of the factor used in equilibrium, they erroneously maintained that the social distribution of income between capitalists and wage earners was determined by the technical parameters of the aggregate production function and that the labour/output ratio was a monotonically increasing function of the rate of interest.

[19] Joan Robinson did not take an active part to the discussion, in that phase of the debate. She was interested in the working of capitalism in historical time, did not share Sraffa's emphasis on the long-period positions of the economy and regarded his approach to the theory of capital as too narrow in scope (half a general equilibrium system, centered only on the supply side of the economy).

[20] Reswitching of techniques means that a method of production may be preferable at different rates of profit and not between them. Capital reversing takes place when the value of capital and the rate of profit move in the same direction.

formed the 'Anglo-Italian' side, who won the debate), and the neoclassical conception. But the winners did not succeed in providing an alternative to the neoclassical theory. They showed that the distribution of income is not governed by the opposing market forces of supply and demand and that there is no stable inverse relationship between the amount of produced means of production and their remuneration. Factor substitution between capital and labour moves in the wrong direction, when income effects are larger than substitution effects [21].

The ultimate implications and the empirical relevance of the last Cambridge debate have been subject to controversial interpretations. Neoclassical parables had to be abandoned, but paradoxical behaviours were regarded by neoclassical authors as simple empirical anomalies: logical 'curiosa', or 'local puzzles', confined to a subset of price systems with constant interest rates and posing an intriguing logical problem. The economic reasons for paradoxical capital behaviours were cleared. They were ultimately connected to the treatment of capital as an input in an aggregate production function and to the complex character of the relation between the rate of interest and the capital intensity of production.

There was an attempt to archive the whole debate as an ideological controversy that had caused much ado for nothing. Aggregate production functions and the related neoclassical supply curves continued to be used. And it was not definitively ascertained whether or not the neo-Walrasian disaggregated treatment of heterogeneous capital goods in physical terms, which did not require uniform rates of return, was unaffected by the Cambridge criticisms. This situation opened a new and confusing controversial phase in the debate on capital theory, a phase which is still going on. In the course of such phase, it was shown that the neo-Walrasian versions of general equilibrium theory, those of the Arrow-Debreu type which apply the principle of substitution to each single kind of capital goods, was also meeting some problems, by ignoring the fundamental question of the aggregation of different capital goods. As a consequence, the notion of long-run equilibrium, implying a uniform rate of profit, had to be discarded and reswitching had to be recognized as a possible cause of instability of inter-temporal equilibrium.

The overall impression that one can draw from these controversies is that much has been deconstructed but little has been reconstructed in the theory of capital. The debates on capital theory have not cleared definitively some crucial points concerning the foundations of the theory of capital. Including the most simple and fundamental question, that concerning the nature of capital and the way of measuring it. It is therefore time to look in other directions. Starting from the most basic question: what is capital? A collection of heterogeneous capital goods? A permanent fund of abstract productive power? A social relation of production? Or something else? And how can capital stocks and flows be measured (the valuation problem)? By which price indices? Should the money value of a capital asset be taken as equal to the discounted expected value of its future net cash flows?

The really basic question in capital theory is how capital is created and valorised. Smith, Ricardo and Sraffa did not afford this fundamental problem directly. Marx did it. He was the first one to pose the question of the origin of profit. He answered that the source of value is abstract labour-time and that capital is valorised through the creation of 'surplus-value', the result of capitalist exploitation of living labour.

To prove the existence of labour exploitation, Marx used to compare two quantities of labour-value: the quantity of labour-power sold by the worker to the capitalist and the labour-value of the wage goods the worker was able to get as a reward. The labour theory of value could perform this task, as it allowed to reduce anything to a quantity of labour. With the abandonment of this theory, the existence of labour exploitation could no longer be proved with Marx's method [22].

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[21] The Cambridge debate was followed by a discussion between Solow and Pasinetti on the relevance of Irving Fisher's rate of return on capital as an efficiency measure.

[22] From a theoretical point of view, some other possibilities are available to recover the Marxian notions of surplus-value and exploitation. Surplus-value can be reinterpreted on neo-Sraffian lines as the difference between two distinct values of the real wage: the greatest theoretical value compatible with the existing technology (the value which

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Sraffa derived commodities production prices and the equilibrium rate of profit of the system from the physical quantities of commodities used as inputs, without the necessity to pass through labour values. But he did not provide an explanation of the origin of profit. The way seemed therefore open for a revival of the neoclassical explanations of profit and interest, based on the productivity of capital and/or on abstinence from consumption.

Part II: SOME ANALYTICAL DEVELOPMENTS

7. After the last Cambridge capital controversy.

This state of things came again under discussion in the 1980s, when a *New Interpretation* (NI) of the Marxian labour theory of value was advanced by Marxist scholars. In their approach to the problem, which focused on the monetary expression of labour-time, money was a direct expression of abstract labour and had the important task of providing a formal mediation between values and prices. All was reckoned in money terms, in a labour-commanding value perspective which privileged the phase of circulation over that of production, following the lines proposed by the 'Rubin school'. Since labour values and money prices did no longer pertain to two dimensionally different levels of analysis, no problem of transformation of values into prices could arise. The attention could be focused on the money-form of value. The money wage rate was taken as given. Marx's law of value held for the system as a whole, though not for single sectors of production.

At the aggregate level, the integration of the theory of value with the theory of money was achieved, through the redefinition of two important concepts: the labour-value of money and the money-value of labour-power [23]. This involved two distinct steps. First, the labour-value of money had to be determined in the framework of an income approach to the problem, as the ratio between the total amount of direct labour employed in production and the money value of the net product of the system. Then the value of labour-power was expressed in money terms, by calculating the share of money wages in the net product, or by multiplying the labour value of money by the money wage.

The relevance of this approach was however questioned. It was objected that it obscured the role of the means of production; that some problems could arise in the presence of technical changes in the productive system; and that it might not be immediately evident why money should be taken as a direct quantitative expression of value, in a world where commodities did not usually exchange at their values. The crucial objection moved to NI was however another one. If workers receive a money wage, consisting in a non-allocated purchasing power that they can spend as they like to buy bundles of goods of different composition, the Marxian law of labour value cannot be applied to labour-power, whose exchange value is not known in advance. Is this an insurmountable obstacle? On this point different opinions are possible, because labour-power is not a 'normal' commodity, produced for profit [24].

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corresponds to a zero rate of profit) and the actual real wage. The existence of surplus-value can also be deduced from the simple fact that production gives rise to a profit; or from the inverse relation which links the rate of profit to the real wage. One can also regard labour in a reified meaning, as a bundle of subsistence wage goods, and measure surplus-value in terms of objectified surplus-labour, that is as the difference between the quantity of commodity produced by a worker in a vertically integrated sector and the quantity of that commodity commanded by the money wage at production prices. As if the work would not rewarded by money but by a certain amount of the commodity produced and that quantity would then be exchanged at production prices with the bundle of physical wage goods that constitutes the material wage of the worker. All these possibilities imply the assumption of the productivity of labour as the only source of surplus-value. See on it, Cavalieri, 1995.

[23] The time-value of money is the ratio of the total value added, reckoned in terms of labour-time, to the total value added reckoned in terms of money. It is therefore the inverse of the money value of commodities.

[24] For neo-Marxist authors linked to the French 'regulation approach' labour-power is not a commodity.

The relevant point to be ascertained is whether the exchange-value of labour-power should be regarded as given by the money wage, which is directly observable, or by the real wage, which it is not. If the money wage is privileged, as happens in NI, then the value of labour-power corresponds to the share of money wages on the net output of the economy; the Marxian condition of equality between the sum of values and the sum of prices holds for the net product of the system; and the measure of value in terms of labour-commanded coincides with that in terms of labour-embodied. If, however, the correct is provided by the real wage, a complex intermediation process between values and prices is required for wage goods. The determination of the value of labour-power must first pass through that of a given basket of wage goods and only then through that of money wages. In NI there is no intermediation process. Labour-time is the substance of value and money the measure of value. The value of labour-power is the amount of living labour commanded by the money wage [25].

Two variants of NI must be mentioned. One of them is the *Simultaneous Single System Interpretation* (SSSI), suggested by a group of neo-Ricardian and Sraffian scholars. Within this approach all values are directly expressed in money terms, at prices of production, so that there is no need to transform values into prices. All capital, no matter whether variable or constant, is reckoned in money terms, at production prices. Input and output prices are simultaneously determined, together with the rate of profit. They are valued according to the labour-time required to obtain them by exchange, rather than to the labour-time needed to produce them [26].

Since the abstract labour-time equivalent of the real capital is expressed in this approach by the money price of the material means of production, divided by the monetary expression of labour-time, output price and output value are necessarily equal and the rate of profit reckoned in price terms is the same as the Marxian one, reckoned in value terms.

However, as NI, this simultaneist interpretation of Marx's theory of value is not consistent with his assertion that the surplus value of wage workers is the only source of capitalists profits. It implies the logical possibility of the existence of profit in the absence of surplus labour and of the existence of surplus labour in the absence of profit.

This is a remark that contrasts with Okishio's and Morishima's controversial 'Fundamental Marxian Theorem' (FMT), according to which in sufficiently general Leontief models, with homogeneous labour, exploitation is synonymous of positive profits and can be regarded as a purely technological phenomenon, an efficient use of labour. This should not surprise. FMT has a limited validity. It does not hold in more general linear models with alternative techniques, fixed capital and joint production, and in economies with a convex cone technology.

Another variant of NI is the *Temporal Single System Interpretation* (TSSI), or *Marxian Disequilibrium Approach*, proposed by 'new orthodox' Marxists, in which emphasis is put on the possibility of continuous structural changes, rather than on the structure of capital itself. The variables of the problem are reckoned in money terms, in temporal sequence. Commodities prices can change during the production processes, if the techniques of production change. This approach to the problem assumes that inputs are purchased at a given moment and outputs are sold later. In the meanwhile prices can change. Therefore there is no reason to think that commodities should have the same prices when they are considered as inputs or as outputs. Equilibrium is possible, but is not supposed to be the norm. Time is not conceived as an autonomous source of value, but as a relevant dimension for the determination of values. The assumption that production techniques are subject to continuous changes during a production process seems however excessive. It does not

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[25] Another serious objection raised to the NI interpretation is the absence in it of a specific theory of determination of the exchange-value of money. This value is simply defined as the monetary expression of living labour-time (MELT), that is as the ratio of the net domestic product of the economy, reckoned at current market prices, to the total living labour employed in production. This ratio can be determined only *ex post*, when the relative price of money in terms of all commodities is known.

[26] A stationary equilibrium of the economy is assumed. This explains the name *Equilibrium Marxism* given to this approach by some critics.

reflect common experience.

The basic idea underlying all value-form reinterpretations of Marx's labour theory of value is that values and prices are easily convertible in each other and form a single system of interdependent variables, rather than two separate systems pertaining to logically distinct and subsequent stages of the analysis [27]. Value is reckoned as the sum of two quantities of abstract labour-time: the amount directly required to produce a commodity and that equivalent to the money value of the other inputs.

All single-systems interpretations imply Marx's controversial 'net value' or 'new value equality' between the labour value of the net product of the system and the total amount of living labour used to produce gross output. This is an *a priori* synthetic proposition, that would hold in an imaginary primitive economic system with no capital goods, but which does not hold in the real world and should thus be refused. Marx said very clearly that the law of value does not hold in the mechanized and automated modern industry, in which the worker becomes a mere appendix of the machine. He was conscious of the historical change which had established a real submission of labour to capital. He knew that the logic which informed the working of a capitalist economy had undergone a radical historical change and that the value of a commodity was determined by the entire social labour time, past and present, which entered its process of production.

The young Marx was initially a supporter of the labour theory of value, but then gradually realized that it was quantitatively inconsistent and discriminating against fixed capital [28]. He initially considered the case of exchange of equivalents, in which products exchange at their values, and argued that the means of production could not transfer to the product more than their value. Real capital was therefore unsuited to generate surplus value. It could only reproduce the part of its value that was lost for depreciation. But later on, considering the case of exchange of non-equivalents, Marx acknowledged that the rates of profit in the various industries tend to equalize by the working of competition.

Profit was therefore regarded by Marx as a surplus, appropriated by capitalists. Abstract labour-time was still viewed by Marx as the measure of value and labour-power was still regarded as the source of profit, but living labour had lost its peculiar exclusive role in the explanation of prices. In a famous passage of *Grundrisse*, Marx argued that real capital had an active role in production. "*As long as the means of labour remains a means of labour in the proper sense of the term, such as it is directly, historically, adopted by capital and included in its realization process, it undergoes a merely formal modification... But, once adopted into the production process of capital, the means of labour passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery..., set in motion by an automaton, a moving power that moves itself... In no way does the machine appear as the individual worker's means of labour. ... Rather, it is the machine which possesses skill and strength in place of the worker... The worker's activity, reduced to a mere abstraction of activity, is determined and regulated on all sides by the movement of the machinery, and not the opposite*" (*Grundrisse*, 1857-58, chapter on capital, 'Fragment on Machines', notebook VI, par. 584-86).

Later on, in the first volume of *Capital* (1867) Marx wrote: "*On a closer examination of the working-machine proper, we find in it, as a general rule, though often, no doubt, under very altered forms, the apparatus and tools used by the handicraftsman or manufacturing workman: with this difference, that instead of being human implements, they are the implements of a mechanism... The machine proper is therefore a mechanism that, after being set in motion, performs with its tools the same operations that were formerly done by the workman with similar tools*" (*Capital*, I, 368). And "*In manufacturing the organization of social labour is purely* subjective; *it is a combination of detail labourers; in its machinery system modern industry has a productive organism that is purely*

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[27] We are referring to Bortkiewicz's 'dual system' interpretation of Marx's production schemes, retained by Sweezy, Dobb and other Marxist theorists and further developed in its formal aspects by Seton and Morishima.

[28] Marx remarked that "It also has to be postulated (which was not done above) that the use-value of the machine is significantly greater than its value" (*Grundrisse*, English ed., p. 383). See also Keen, 1993.

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objective, *in which the labourer becomes a mere appendage to an already existing material condition of production*" (*Capital*, I, 382). Almost a decade later, as already mentioned, in his *Critique of the Gotha Programme*, Marx confirmed that "*labour is not the source of all wealth*".

This proves that Marx had changed his views on the role of machinery in production and had recognized that machines are directly productive. He regarded them as the objectified power of social knowledge, the product of 'General Intellect', a typical real abstraction, an entangled mix of intellectual ability, creativity, technology and history. Abstract knowledge, objectified in industrial machinery, had become a productive force in its own right.

Since then, new important phenomena – exchange globalization, capital financialization, increased financial fragility – have further transformed the world economic system. So that there is today an even more impelling need to update the theory of capital.

9. Towards a revisionl of the theory of capital.

Let us now proceed further on and suggest some guidelines for an alternative analysis of capital theory, one in which the time value of money will be properly considered, and begin by recalling that Marx included real capital into the 'productive forces', though he did not regard real capital as suited to produce a net output.

We shall focus the attention on Marx's concept of 'constant capital', defined as "*that part of capital… which is represented by the means of production, by the raw material, auxiliary material and the instruments of labour*", and that "*does not, in the process of production, undergo any quantitative alteration of value*". For Marx, constant capital consisted partly in fixed capital (plants, machinery and tools) and partly in circulating capital (raw and auxiliary materials). He assumed that both of them were destined to transfer their value to output. Fixed capital did it gradually, circulating capital instantaneously.

Marx's constant capital cannot create new value or increase itself in value. It simply conserves its value and transfers it in the product. It "*enters unchanged into the production process and emerges from it unchanged*". It was regarded by Marx as a constant flow that maintains the value of the stock of material means of production, reckoned at their current replacement costs [29]. This choice has been contested in the literature [30].

We shall divide the value of Marx's constant capital in two parts. One part of it, that which refers to raw and auxiliary materials and to the depreciation quotas of fixed capital, all of which are used and entirely consumed during the production process, can be assumed to be transferred unaltered in the value of the product. It is a capital flow that keeps the capital stock constant in money terms and does not imply a net investment. The remaining part of Marx's constant capital – which consists of plants, machinery and tools – is a variable stock of capital, subject to gradual depreciation, that can however be balanced by a parallel reinvestment of the amortization quotas.

We shall therefore distinguish the flow of capital, which leaves the value of the social product unaltered from the stock of capital, which is not constant.

This theoretical position is different from Marx's conception of value, expressed by his famous formula $P = C + V + S$, where P is the social product, C is constant capital, V is variable capital and S is surplus-value.

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[29] "*It is true that the value of this constant part can fall or rise, depending on whether the commodities of which it is composed have to be reproduced at lesser or greater cost. This change of value, however, never alters the fact that in the process of production, into which it enters as a condition of production, it is a postulated value which must reappear in the value of the product. Therefore, this change of value of the constant capital can here be ignored*" (Marx, *Theories of Surplus Value*, vol. I, p. 109, MECW, vol. 30, p. 413).

[30] In her *Open Letter from a Keynesian to a Marxist*, Joan Robinson criticized Marx's position. She wrote that Marx seems to have mistaken the stock for the flow. A change in the value of the stock should result in a change in the value of the transferred flow. This point has been the object of a rather inconclusive debate between Fred Moseley, Alan Freeman and Andrew Kliman.

The value of capital should be expressed in money terms, as the sum of the money value of Marx's constant capital and of his variable capital: $K = K_c + K_v$. This makes possible to express in money terms also the rate of profit, as $r = S/K$. The rate of surplus-value, by which Marx measures the degree of capitalist exploitation of wage labour, will be $s' = S'/K_v$, where S' is surplus-value in money terms.

Using Marx's terminology, let us now call "monetary expression of value" (MEV) the money equivalent of abstract labour-value, that is the average unit cost of producing commodities, reckoned *ex post* at market prices, in money terms, for the economy as a whole. This is a valuation parameter that expresses the relation between abstract labour (the substance of value) and money (the value form) [31].

If we denote by C_R the money cost of a unit of real capital, by C_L the money cost of a unit of direct labour, by C_K the money cost of a unit of all other input services, by C_F the money cost a unit of financial capital and by r the average opportunity cost of invested capital, MEV can be written as the sum the three components of the real cost for unit of production, $C_R + C_L + C_K$, plus the corresponding financial cost of capital, $r (C_R + C_L + C_K)$. Here r is the rate of return on invested capital (ROI), that is the ratio of the amount of money gained or lost to the amount of money invested. It is an indicator of the efficiency of investments and can be used to assess the desirability of investment projects, to choose between them, to price shares and to evaluate firms.

The weighted average cost of capital, in which all types of costs are proportionally weighted, must account for the interests and dividends that have to be paid to get the financial capital which is needed by an investment and is collected by borrowing or by issuing equities. Market values should be used as weights and a correction should be made to consider the time value of money [32].

In vector notation, we can write:

$$\text{MEV} = (px - m)/L = (px - m)/\ell x,$$

where p is a price index expressing the vector of commodities unit prices, $wL [I - (1 + r) A]^{-1}$, x is a quantity or volume index of the social product, px is the value of the social product, m is the money value of used up materials and operating costs of production, L is abstract labour-time and ℓ is the vector of labour coefficients.

We are thus in the presence of a proportionality factor that can be used to convert abstract labour values into money prices and to obtain a formal solution to the 'transformation problem'. The inverse of MEV can be used to convert abstract labour values into concrete money values. Neither of them is an invariable standard of value. But an invariable standard of value is a logical nonsense. Absolute value, independent of prices and income distribution, is a chimera. We can therefore limit ourselves to look for a practical proxy, reckoned as money value at current market prices.

Two alternative parameters are available for this purpose: MEV and MELT. Which one of these expressions of money value should we choose in measuring social value? The money value of commodities reckoned at their market prices, or the money value of the amount of abstract living labour time commanded by commodities at the current wage level [33]?

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[31] 'Monetary expression of value' is the English locution used by Marx in *Value, Price and Profit*, a pamphlet in which he pointed out that "price, taken by itself, is nothing but the *monetary expression of value*" and that "so far as it is the monetary expression of value, price has been called *natural price* by Adam Smith, *prix nécessaire* by the French physiocrats". In many passages of *Capital* (e.g., in the first chapter of volume III) Marx made use of MEV to pass from labour values to money values. This concept has been 'rediscovered' by some neo-Marxist scholars.

[32] Valuation models, such as CAPM and Arbitrage Pricing Theory, are available to estimate the weighted average cost of capital.

[33] A possible objection to the use of both MEV and MELT may be related to the fact that the cost of production of commodities is reckoned at market prices which are not independent of the distribution of income. But is this really a fundamental objection? Should not one let the market do the job of determining how the different types of labour and the different types of capital goods that produce abstract value should be weighted, when they are going to be expressed in money terms?

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Let us begin our answer by remarking that in capital budgeting for investment appraisal accounting rather than economic profits are generally used. And that accounting profits do not consider normal profit and advertising and R&D expenses as part of the cost of capital. They are therefore larger than economic profits, the driving force of market economies.

Economic profits are a measure of the income earned over and above the sum of total expenses, when we include in them the cost of financial capital. In other words, economic profit is the difference between the present value of the expected revenue of an investment and the cost of all the resources used and consumed to produce the revenue, including the opportunity cost of the capital invested. Normal profit is not accounted for as a profit component. It is treated as an opportunity cost.

Economic value added is a distinct concept, an accounting one. It provides a simpler performance parameter. It is a measure of net operating profits after tax, less a notional capital charge covering the cost of debt and equity finance [34].

In choosing an appropriate performance measure, economists normally look at economic profits; not at value added, i.e. at accounting profits.

Let us now come back to the comparison of MEV and MELT, where the situation is similar. MEV is a money measure of value reckoned at current market prices. MELT is a different price-index, the monetary expression of living labour time, measured by the ratio of net value added to the living labour employed:

$$\text{MELT} = (px - m) / \ell' x,$$

where net output is px minus m, the notional capital charge, and ℓ' is the vector of living labour coefficients. It includes in the cost side only the explicit cost items. It does not include the financial cost of capital, which is an implicit cost. It is not an expression of the money value of social labour time, but of the money value of living labour time used in production [35].

10. Redefining the internal rate of return and incorporating uncertainty in capital theory.

If we divide our price index MEV by the average unit cost of production of commodities ($C_R + C_L + C_K$), we get $(1 + r)^t$, an expression which includes the expected rate of social surplus reckoned per unit cost of output. Here r is an internal rate of return (IRR).

The internal rate of return, which measures the economic yield on an investment, is usually defined as the discount rate that, if it is applied instead of the market rate of interest to compute the present value of an investment, equalizes the discounted value of the difference between revenues and costs, and thus reduces to zero the net present value of the investment. An investment is advantageous if its internal rate of return is greater than the current rate of interest. In the presence of capital rationing, when several alternative investment projects not mutually exclusive are to be appraised, that one which maximizes the internal rate of return should be chosen.

The internal rate of return is the exponential parameter r in the following equation:

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[34] See on this distinction any handbook on capital budgeting or on cost-benefit analysis, e.g. Brealey, R. and Myers, S., *Principles of Corporate Finance*, McGraw-Hill, New York, 1996; Pratt, S.P. and Grabowsky, R., *Cost of Capital*, 4th ed., SPV, Beaverton, and Wiley, N.J., 2005; or Gallagher, T.J., *Financial Management*, Textbook Media Press, Prentice Hall, Upple Saddle River, N.J., 5th ed., 2008; or Kieso, D. E. and Weygandt, J.J., *Intermediate Accounting*, 9th ed., 1998, Wiley, New York.

[35] MELT is, however, an interesting parameter in itself. It is the inverse of the abstract living labour-time contained in a unit of money, hence a price index that allows to distinguish between the changes in price levels brought about by changes in labour productivity and those due to nominal changes in the unit of account. The problem is that it does not include on the cost side the financial cost of capital.

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$$\int_{O}^{T} [R(t) - E(t)] \, e \, exp - rt \, dt - K(\tau) = 0,$$

where t is continuous time, $R(t)$ is revenue, $E(t)$ is current cost, net of amortization quotas, $K(\tau)$ is the construction cost of the plant and the integration interval (O,T) denotes the expected plant lifetime.

The choice of the valuation parameter r which should be used as compounded discount rate is however subject to some serious technical criticisms [36]. One of them, of mathematical nature, is that a real-valued internal rate of return may not exist and that there can be multiple complex-valued internal rates of return, in the presence of alternating positive and negative cash flows, with more than one sign change. The use of this valuation metric thus implies on logical grounds an unrealistic assumption: that there will be no interim cash flows of the investment, or that all interim cash flows will be reinvested at the internal rate of return of the original project. Another critique is that on the cost side of this parameter an implicit cost, the financial cost of the invested capital, is not considered. A third criticism is that this rate does not appear to cover well market situations characterized by the presence of uncertainty.

In our opinion, the notional cost element of financial nature should be accounted for and included it in $E(t)$. This would change the nature of the internal rate of return, from its standard form r, to a different budgeting parameter, suited to be used to compare alternative investment not mutually exclusive of equal size and duration [37].

The internal rate of return which accounts for the financial cost of capital is known by engineering economists as 'modified internal rate of return', or MIRR (Lin, 1976). Let us denote this rate by the Greek letter ρ. MIRR is a hybrid metric that implies the use in accounting of two different rates, one to discount the net revenues of reinvestment and the other to compute the cumulated burden of financing.

MIRR is the geometric mean rate of the compounded value of the expected inflow of revenues (positive items) and of the discounted value of the expected outflow of expenses (the corresponding negative items). That is:

$$\rho = \sqrt[n]{\frac{(future \ value)}{-(present \ value)}} - 1,$$

where n is the number of periods (calendar days) in which the cash flows occur. Future value is equal to present value multiplied by $(1 + r)^{n}$. A result of the computation of MIRR is that investment yields look lower than those coming out from IRR.

The usual accounting rate of return is an average rate that accounts only for the explicit outlays implied by an investment. It does not account for the financial cost of capital [38]. Therefore it does not consider the time value of money. This is not correct.

We refuse to assume the independence of the internal rate of return from the financial cost of capital. In our opinion, the financial cost of capital should be accounted for in the computation of the discount rate. We thus conclude by underlining the need:

- to adopt in capital theory a correct economic methodology,
- to make use of a 'real internal rate of return on capital' (RIRR), a known capital budgeting metric, in which all cash flows are reckoned in constant prices (this is what makes this parameter different from the nominal internal rate of return), and

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[36] On this point, see another essay of the present writer: Cavalieri, 1964, pp. 66-72.

[37] If the investment projects are mutually exclusive, the internal rate of return ranking of the investment projects may be inconsistent with the present value ranking, which is based on the investment size, not on the investment yield.

[38] A notable exception is represented by Chinese financial accounting textbooks.

- to include in the computation of RIRR, on the cost side, an inflation-risk factor, consistently reckoned, in order to express the expected yield of the investment in terms of constant purchasing power. This should be done by subtracting from the internal rate of return the rate of inflation.

Part III: THEORETICAL, WELFARE AND POLICY IMPLICATIONS

11. On the importance of choosing proper accounting methods.

How much does the choice of appropriate accounting methods matter in the presence in the real world of market imperfections, such as externalities and transaction costs, that invalidate the explanatory power of the neoclassical efficient markets hypothesis? Has this choice any significant welfare and policy implication?

The economic implications for the theory of capital and investment of the management discretionary choice between different accounting methods should be clear. This choice – that concerns the leverage hypothesis about the total liabilities/total assets ratio, the method adopted for the depreciation of fixed assets and that used for the valuation of inventories – affects a firm financial performance .

The financial leverage hypothesis assumes that the higher a firm's debt/equity ratio the more likely is a choice by the managers of accounting methods that shift the reported earnings from the future to present time, to reduce the probability of default. Straight-line depreciation of fixed assets and FIFO inventory methods are often preferred in balance sheet reports not only because they are more simple and less expensive, but also because they increase the reported income of the firm; whereas accelerated depreciation and LIFO inventory methods which decrease the reported income are used in making income tax returns statements. Combinations of these basic methods are also possible.

Investment and financing decisions are not independent of each other. Their interaction should be obvious, but is not sufficiently recognized in the economic literature. The Modigliani-Miller neoclassical theorem that affirms the irrelevance of corporate capital structure in a perfect financial market, with no taxes, no transaction or adjustment costs, no difference between the cost of lending and borrowing and no information asymmetries, is still popular. But it is a purely theoretical result. Inductive work on corporate capital structure has not confirmed the empirical relevance of this approach to the problem. Firms seem to prefer to finance their investments by recurring as much as possible to internal sources.

The response of investments to changes in the weighted average cost of capital is a fundamental element to evaluate the effectiveness of investment policies. Demand elasticities have to be considered. The demand curve for capital exhibits an inverse relation between the user cost and the stock of capital. High demand elasticities tend to reduce capital formation and to enforce the transmission mechanism of economic policy. With an upward-sloping supply curve of capital, the capital stock of an open economy tends to exhibit a positive relation to the user cost.

The user cost elasticity of capital is the inverse of the elasticity of substitution between capital and labour in production, which measures the extent to which these two factors are substituted as their relative cost or relative productivity change. The empirical estimates of the user cost elasticity of capital are not conclusive at the aggregate level, but they do not appear to confirm the neoclassical theory [39] according to which the stock and the user cost of capital are determined by the opposing forces of market supply and demand and in equilibrium the marginal product of capital equals the marginal opportunity cost.

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[39] See, e.g., Eisner and Nadiri, 1968, and Chirinko, 1993.

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If capital is regarded as productive of net value, its reward should not necessarily be viewed as the result of labour exploitation. It may be regarded in part as a payment obtained by capitalists for their abstinence from consumption, or for the interests they pay for the use of other people's savings, and in part as the remuneration of an entrepreneurial risk.

Two further types of costs are generally associated with the external financing of investments: information costs and transaction costs. The information costs are incurred by firms to have access to relevant economic information. Transaction costs, due to financial markets imperfections, are usually associated to compensations paid to intermediaries for the negotiation and execution of contracts. Both these categories of costs are difficult to estimate in advance.

In this context, monetary policy is important, as it can condition and affect, positively or negatively, the financial decisions of the firms.

12. Concluding remarks.

Let us make some final remarks and mention some implications of our approach to capital theory as regards the interactions between the investment and the financing decisions of entrepreneurs. We have seen that the availability of a money fund is a necessary pre-requisite of productive activity and that all investment decisions by firms imply the burden of a financial cost for the provision of invested capital. Professional accountants look at this implicit cost as a minimal required return element, not as a cost. Normal profit loses in accounting practice its cost nature, to achieve the opposite one, that of a required earning element.

Economists call profit the difference between total revenue and total input cost. And they distinguish normal profits from quasi-rents. Professional accountants and bookkeepers do not. To calculate profits, they deduce from revenues only the explicit expenses that have been actually incurred by firms in their production activity, thus failing to recognize that the value of a foregone opportunity represents a cost for the investor.

This situation has important practical implications. It entails an inefficient allocation of social resources, with negative effects on capital accumulation and growth policies. The consequences of this state of things for a correct understanding of the theory of capital and for an improvement of fiscal, monetary and control policies should be evident.

The presence of strict logical links between the theory of value, the theory of capital and the theory of money is not surprising, if we consider that labour is the substance of value, capital is value in process and money is the generalized formal expression of value.

Of fundamental importance is the distinction between the economic rate of return and an accounting rate. The former one is a general expression of the money value of the social labour-time involved by all productive resources. It considers all explicit and implicit costs and returns of investments. The accounting rate is the ratio of the net income of an investment to the book value of assets. It does not consider the time-value of money, a central concept in capital theory. That is the fact that since money can earn an interest, a given quantity of money available now is worth more than the same amount of money available in the future. The accounting rate of return on invested capital (ROI), that does not include in the cost side the time value of money, can at best be regarded an empirical proxy of the economic rate of return used to discount the expected net income flows which will become available over the life of an investment and make them equal to the initial outlay of the investment.

In view of the reciprocal implication of labour and capital, that are not perfectly substitutes, both a pure labour theory of value and a pure capital theory of value are ultimately bound to appear inadequate. In this essay, we have drafted the outline of a cost-of-production theory of value capable to account for the productive contribution of the input services of both labour and capital. It is a theory consistent with Marx's view of the matter, exposed in 1857 in his famous *Grundrisse* 'fragment on machines'. It is also an interpretation compatible with Althusser's idea of Marx's epistemological break from his previous German idealism to dialectical materialism, a gradual

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process initiated in 1844-45 and probably culminated in the following decade [40]. We have reported textual evidence that in that period Marx dismissed the pure labour theory of value and substituted it with a more general theory which recognized both labour and capital as productive factors. A theory in which commodities were seen as the real source of value and surplus value [41].

In the period of more than one and half a century which followed, the structure of the world economy has further changed by a great deal. The relative importance of the accumulation of fixed capital has progressively decreased in comparison with that of financial investment. Exchange globalization and capital financialization are new phenomena that call for a substantial revision of neoclassical and neoliberal optimistic views on the alleged efficient mechanisms of resource allocation in managerial capitalism and on the stabilizing role of financial speculation. It is thus time to reconsider a substantial part of the traditional theory of capital and to update some old paradigms of economic policy.

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[40] Althusser actually proposed to distinguish in Marx's works his early writings, up to 1844, from those of the break (*Theses on Feuerbach* and *The German Ideology*, 1845), those of the transitional period (1845-57) and those of the later and mature period (after 1857). Althusser's subsequent self-criticism made in a dramatic and mentally confused period of his life, is hardly credible. See Althusser, L. (1976), *Essays in Self-Criticism*, New Left, London; also Callinicos, A. (1976), *Althusser's Marxism*, Pluto Press, London; Elliott, G. (1987), *Althusser. The Detour of Theory*, Verso, London; Negri, A. (1993), *Pur Althusser. Notes sur l'évolution de la pensée du dernier Althusser*, in « Futur Antérieur », *Sur Althusser. Passages*, L'Harmattan, Paris, pp. 73-96

[41] See Steve Keen, 1993.

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Abstract: *Towards a Revision of the Theory of Capital.*

This is a proposal to restate the theory of capital along critical Marxian lines aimed at providing a better integration of the theory of capital with the theory of money and finance. The time value of money must be properly accounted for. An analytical method is proposed to accomplish this task. The fundamental Marxian problem of the origin of profit is treated with reference to a specific price index, the monetary expression of labour value (MEV), which accounts for both explicit and implicit

cost components, including the financial cost of capital. MEV should not be confused with MELT, the 'New Interpretation' money expression of living labour time, which does not consider the opportunity-cost of capital and, following the erroneous net value equality, focuses on the money value of the living labour time commanded by commodities at a given wage rate, rather than on the money value of total abstract labour time embodied in commodities, inclusive of both living and past labour.

JEL Classification: B13, B22, B51, D46, E22, E41.