

A theory of capital as value in progress

Di Duccio Cavalieri

Index of contents:

1. On the present state of capital theory.
2. Capital as a source of value.
3. The role of money in capital theory
4. Three basic questions on the theory of value.
5. Capital in equilibrium and disequilibrium.
6. From the labour theory of value to the law of value.

1. On the present state of capital theory.

The theory of capital is an intellectual adventure in a difficult area of search, dealing with the theoretical foundations of political economy and characterized by a high level of abstraction. It is part of the general theory of value, the part of it which deals with the inter-temporal aspects of resource allocation. Its relevance is unquestionable, because labour and capital shape every aspect of human activity, but its exact frontiers are not well defined and its present state is controversial.

However the functional links of the theory of capital with the theory of value are not sufficiently cleared. Value and capital express social relations, but in a capitalist system they take the misleading appearance of material relations between things. Value is a basic concept. It may be conceived either as an intrinsic and general property of commodities, or as a subjective form of appearance. Capital is value in progress, valorising value. We shall examine the issue of the functional links between value and capital and consider the problems which arise in this context and their policy implications.

Let us start our analysis by the 'surplus approach' to value and distribution, a theoretical framework where social product and real wages are treated as exogenous variables historically determined. The surplus emerges as a residual, the excess of output over the means of production and subsistence, and can be expressed in physical terms, or in money terms, at market prices or at factor costs.

A problem which arises in this context concerns the treatment of the opportunity-cost of invested capital, a virtual or implicit cost that expresses the minimum level of return required by an investor and must not be less than the return on the best alternative foregone. In this context normal profit should be distinguished from quasi-rent. For an economist, normal profit is an implicit cost. It is the difference between revenue and cost and expresses the minimum level of

profit required by a firm to be competitive. Economists distinguish normal profit, which is as revenue minus all expenses, both explicit and implicit, from quasi-rent, or producer surplus, the difference between revenue and variable or direct cost. The latter denotes the part of revenue which exceeds the opportunity-cost of capital in the short-run, when sunk costs have already been incurred and are no longer reckoned by producers. It is the payment made to a scarce fixed factor of production, net of depreciation allowances, over and above the cost required to keep the factor in its current use. In the long-period, when all factors become variable, quasi-rents tend to disappear. Thus the total payment made to a factor of production for an economist is the sum of three distinct elements: the fixed cost; the variable cost, inclusive of a normal profit, and a pure or extra profit, which may include a risk element.

The professional accountant practice is different, because profit is not defined as the difference between revenue and cost, but as that between revenue and explicit expenses. As such, it encompasses two components: normal profit, which includes the implicit cost associated with lost investment opportunities and the compensation for the services of capital, and pure or extra profit, which is a residual surplus. In the empirical valuation of chartered accountants, where assets and liabilities are reckoned at a given point in time, following institutional rules and local habits, the opportunity-cost of capital is not considered. The profitability of investments thus is higher for bookkeepers and lower for economists.

Capital may be conceived either as real capital, a tangible stock of heterogeneous instrumental goods which generate an income in form of profit, or as financial capital, that is as a revolving fund of uncommitted, abstract productive power, suitable to be expressed in homogeneous units of value. Various concepts of capital are present in the economic literature. Let us recall some of them.

A first one is the classical notion of real or physical capital, a tangible collection of heterogeneous instrumental goods, consisting in produced means of production and intermediate products used in production. A second one is the neoclassical notion of capital as a quantifiable factor of production, distinct from the original factors labour and land, present in the production function approach and rewarded by interest, a specific category of income. A third notion is that of 'financial capital', a liquid fund of uncommitted purchasing power, measured in money units, though not necessarily held in form of money.^[1] A fourth notion is the Austrian one of 'capital as time' (in the sense that can be expressed in terms of time), in which capital was regarded as a revolving fund of stored-up services of the 'original factors' labour and land, with a complex physical, value and time dimension, and attention was focused on the vertical dimension, or time structure, of the production process.^[2] A fifth one is that of capital as valorising value, which underlines the specific role performed by capital as the dynamic driving force in a capitalistic system. A sixth concept is the Marxian one of a social relation of dominion, specific of a capitalistic economy. A seventh one is that of cognitive capital, a concept that denotes knowledge, information and cognitive skills. In the present essay we shall not consider all of them in detail.

We shall focus our attention on two specific problems of capital theory that appear of particular interest: those of capital budgeting, which concerns the process of investment appraisal, and of the determination of an optimal capital stock for the system as a whole. Their treatment

presents a basic difficulty, as it implies adding to a physically heterogeneous benchmark stock of wealth consisting in accumulated capital goods measured at a point in time, which has no time dimension, an investment flow which has a specific time dimension.^[3] Solving this problem is the specific task of dimensional analysis, which deals with the conversion of different units of measure.^[4]

2. Capital as a source of value.

In the course of the present analysis the logical necessity to abandon the pure labour theory of value will be confirmed. It will be argued that only part of the value of the capital invested in production is transferred in output.

Let us consider further on the relationships between capital, value, money and labour. Capital is a collection of tangible real resources consisting in machinery and production equipment; whereas value is worth, the objective or subjective worth of something. Capital and labour are two distinct factors of production, which must be combined to produce an output. Nothing can be produced with unassisted labour or unassisted capital. The proportions in which labour and capital are combined in production are important. because different proportions imply different profit rates.

The nature of the functional relation between capital and labour is controversial. This was a central subject in the discussion on the classical 'separation approach', which implied a distinct determination of quantities and prices. That is a prior determination of the real wage rate, the level and composition of the social product and the technical conditions of production – the analytical 'core' of the theory – and a later determination of the relative prices of commodities and of the social distribution of income.

The idea of a separation approach had been initially held by Ricardo in his *Principles*, in the framework of a corn model, in which capital and output were homogeneous quantities, wages were paid in kind and the rate of profit was the ratio of two physical magnitudes. But it became untenable when wages began to be paid in money, that could then be used to buy alternative bundles of consumption goods. It was therefore abandoned in the third edition of Ricardo's *Principles*, in the analytical framework of a multi-sector economy, after criticisms raised by Malthus.

The refutation of the separation approach removes a serious obstacle to a correct analysis of capital theory. It opens the way to an integrated stock-and-flow dynamic approach to the subject, which underlies the structural interdependence of commodities prices and quantities and the links between the real and the financial sectors of the economy.

To avoid incurring in a circular reasoning, the separation approach involves a prior determination of the real wage, the level and composition of social product and the technical

conditions of production, that must be established independently of the relative prices of commodities, the profit rate and the social distribution of income. But this interpretation is methodologically and historically questionable. Its central concept, the alleged 'core' of the system, is a black box where nothing is explained, because the analytical core of the system is arbitrarily isolated from the extra-core elements which regulate accumulation, growth and the distribution of income.

After Ricardo's withdrawal, the separation approach fell rapidly out. It was not retained by Marshall and Walras. But it did not disappear entirely. In a different form it was re-proposed by Sraffa.[\[5\]](#)

3. The role of money in capital theory.

Let us now consider the role performed by money in capital theory, as a form of value, an expression of social labour-time and an element of formal mediation between values and prices. Labour and money are two strictly intertwined elements. Money, the universal equivalent, is not a factor of production in technical sense, as labour, but its initial availability is a necessary condition for production activity. Money is a logical requirement, because production must be financed. Firms must dispose of a money fund to be able to buy or hire what is needed for their production activity. The provision of this fund of money implies for a firm the bearing of a financial cost, in addition to the real costs incurred in production.

The integration of money in the theory of capital requires a knowledge of the channels that link the finance sector to the real economy. The most important of them are the financial market and the bank lending channel. What has to be established to operate the integration is the causal direction of the relationship between the financial and the real sector of the economy. Does causality run from the financial sector to the real one, or is the behaviour of the financial sector ultimately determined by the needs of the real sector? Which is the driving force at work? We are inclined to believe in the existence of a bidirectional and asymmetrical causal nexus and to attribute to the supply of money a mixed nature, partly exogenous and partly endogenous. The exogenous component is that of fiat money, the legal tender issued by the monetary authority, or entered in the money circuit in an open economy as a result of the acquisition and conversion of foreign currency. The endogenous component is that of credit money, issued by commercial banks on demand, in form of bank loans or overdraft facilities.

The determination of the prevalence of the endogenous or the exogenous component in the nominal supply of money is still an open problem in the literature, because the nominal supply has a controversial nature, differently from the real supply of money, which has an endogenous nature. Some post-Keynesian authors working in the banking school tradition consider the supply of money infinitely interest-elastic at the current level of the interest rate established by the monetary authority, and represent it by a horizontal line in the rate of interest-quantity of money space. They are therefore called the 'horizontalists'. They focus the attention on money

flows, disregard the possibility of using money as a liquid store of wealth and downgrade the central bank to the role of a compliant lender of last resort.

The horizontalists are opposed by the 'verticalists', the heirs of the old view of money of the currency school, who believe in the quantity theory of money and in the logical priority of bank deposits over bank loans. They consider the supply of credit money of exogenous nature, as determined by the monetary base and the money multiplier. And they hypothesize a vertical money supply schedule, matched by a downward-sloping schedule of the demand for money, and assume that these two curves intersect at the market interest rate.

An intermediate position is held by two groups of non-fundamentalist post-Keynesians. One of them is that of the 'structuralists', who consider the supply of money as represented by a financial risk. The other group is that of the 'neo-chartalists', who emphasize the role of a peculiar type of pay-token having legal tender. They deny that the expansion of credit money can go on indefinitely over time and maintain that money supply and demand as two strictly connected variables that the commercial banks liquidity preference may affect negatively their responsiveness to the demand for credit.

Needless to say, the initial availability of a fund of money is a necessary pre-requisite of any productive activity by firms. Money is needed to buy the services of productive factors and this implies an indirect cost that has to be added to the direct cost of production.

4. Three basic questions on the theory of value.

A theory of value should answer three fundamental questions concerning the search for the origin, the substance and the measure of value. Smith had an answer to all of them. He identified the source of any form of value in human labour and suggested to measure value by the sacrifice (the 'toil and trouble') labour implied.

To explain the relation between value and price, Smith held different theories. One of them was a 'labour-embodied' theory of price, for the early and rude state of society which preceded the accumulation of capital and the appropriation of land. A second one was a 'labour-commanded' theory of price, which was assumed to hold later – after a phase of competition, characterized by the working of an 'invisible hand' – in a capitalist society where commodities were produced for profit. A further theory was an 'adding-up' theory of normal prices of commodities, in which wages, profits and rents entered as separate components.

There was, therefore, in Smith a plurality of definitions and explanations of value, that were not satisfactorily reconciled in a cost-of-production theory of price determination. This was a distinct merit of Ricardo, who did not share the fundamentally optimistic vision of Smith.[\[6\]](#)

Ricardo's theoretical position has been the object of contrasting interpretations. Two of them

are particularly interesting. One is the 'neo-Ricardian' interpretation of the Russian-German school, which implies a logic of separation and causal ordering, with independent and sequential determination of quantities, prices and the distribution of income. The other one is the so-called 'new view' of the Ricardian system, of Samuel Hollander and John Hicks, that implies an opposite logic of integration, by which Ricardo could be considered a forerunner of the neoclassical paradigm of general economic equilibrium.

In his search of an invariable measure of value, Ricardo addressed his attention to the real world, but could not identify in it a commodity of this type. Therefore he did not take a definitive distance from the labour theory of value, whose logical insufficiency he had perceived. He ultimately held an incomplete cost-of-production theory of value.[\[7\]](#)

5. Capital in equilibrium and in disequilibrium. An integrated approach.

The conventional representation of an economy in stationary equilibrium takes place in an imaginary steady-state framework where all expectations are fulfilled and all individual plans are compatible and are realized. Under such unrealistic conditions, the theory of capital is much simplified.

Real economies, however, are not in stationary equilibrium. A disequilibrium approach is thus needed. It implies an integration of the theory of capital with the theory of investment, that is a stock-and-flow approach to the problem, in which various methodological difficulties are present. They are due to several causes: the heterogeneous nature of capital goods, the fact that their production takes time and that capital goods last for a limited and uncertain period, the low interest elasticity of their demand and the different time dimension of stocks and flows. The demand and supply functions of real capital have a stock dimension, whereas the demand function for investment and the supply function of new capital goods have a flow dimension and do not adjust instantaneously in the presence of excess demand or supply, as would be required for equilibrium.

Let us also notice that the demand curve for capital goods cannot be identified with the savings function, because savings may be partly hoarded. Likewise, the supply of capital goods cannot be identified with the investment function, because investments may be financed by dishoarding and bank credit. Together, supply and demand of capital goods determine the prices of such goods; though not the rate of interest, which is a monetary phenomenon.

The marginal efficiency of investment determines the demand function for investment, whereas the marginal efficiency of capital determines the demand function for a stock of capital goods. Thus the marginal efficiency of investment is the flow-version of the marginal efficiency of capital.[\[8\]](#) It is obtained by dividing the marginal productivity of capital by the cost of production of the capital goods, and ranks the investment projects according to their expected yields.

In long-run equilibrium, the marginal efficiency of investment must equal both the rate of interest and the marginal efficiency of capital. Investment will take place up to the level at which equality between the marginal efficiency of investment and the rate of interest is attained. The function of the marginal efficiency of capital will be matched by a 'stock-augmented' supply curve of capital goods, an increasing function of the rate of return which represents the stock of capital goods at a given point of time (the inherited stock, plus net current production)[\[9\]](#) and has different meanings in neoclassical and Keynesian models[\[10\]](#).

The comparative-static model provides a useful starting point for the analysis of capital theory in a more dynamic context. Let us begin this analysis by distinguishing the main analytical functions relevant in the theory of capital and investment, according to the side of the market and to their stock or flow nature. The stock relations will be the demand for financial capital (that is for investible funds), the supply of financial capital, the demand for a stock of capital goods (Keynes's marginal efficiency of capital), and the supply of a stock of capital goods. The corresponding flow relations will be the demand for additional units of financial capital, the supply of additional units of financial capital, the demand for an additional flow of capital goods, and the supply of additional units of capital goods.

We are now in the condition to describe the effects of an adjustment process implying net investment and a reshaping of the capital structure. It is a process during which old capital goods are discarded and new capital goods enter the scene. In neoclassical models this adjustment process will determine the growth of the capital stock required to restore equilibrium.[\[11\]](#) The traditional theory says that the structure of capital is optimal when the weighted average cost of capital is minimized and the market value of capital assets is maximized. Once the desired optimal size of the capital stock is specified, the flow of investment is determined, but the speed of the adjustment process is not.

In a Keynesian model, where investment is an autonomous macroeconomic variable which reflects the 'animal spirits' of entrepreneurs, the demand for investment is a function of effective demand, of the marginal efficiency of capital and of the conditions of the money market. At each level of the interest rate there will be an optimal amount of capital desired by the entrepreneurs. If the stock of capital held by the entrepreneurs at that point falls short of the optimal amount, there will be net investment, which will cause an upward shift of the schedule of the investment rate of return. This, in turn, will react on the marginal efficiency of investment and will decrease the level of investment. In neoclassical models the adjustment process will continue until a stationary equilibrium position will be achieved. Any change in the demand of funds for investment will affect the supply of investible funds, via the level of income. Investment will be made up to the point at which the present value of the expected future revenues will equal at the margin the opportunity cost of capital.

In a two-sector neoclassical model with distinct production functions for consumption and capital goods, capital can be treated as a malleable and homogeneous asset, suited to be used with various techniques in each of the two sectors.[\[12\]](#) In 'neoclassical synthesis' models the neoclassical and the Keynesian capital theories are integrated. Savings are regarded as a direct function both of the level of income and of the rate of interest. The demand for investment is inversely related to the rate of interest, but directly related to the current level of income. And

there are a whole family of investment demand schedules and a whole family of supply of investible funds schedules, each of them associated to a particular level of income.

6. From the labour theory of value to the law of value.

Let us now come back to Marx and explain to which extent we shall depart from him. Here we must distinguish between the young and the elder Marx. Following the classical surplus approach, the young Marx conceived the economic surplus in real terms, as the excess of social product over what was required to replace the means of production and the means of subsistence used during the productive process. Profits, interests and rents were paid out of the surplus, so defined[\[13\]](#).

It was not the same for the elder Marx, who considered the labour theory of value fully significant only in a pre-capitalist economy, the 'early and rude' Smithian primitive society in which commodities were produced by means of labour and rudimentary tools. In more developed societies, the labour theory of value could not hold, and was substituted by different theory, a real cost of production one. Marx had realized that the labour theory of value could only be applied in the pre-capitalist economy that preceded the accumulation of stock and the appropriation of land. A system in which labour was the sole source of value, the entire product of labour went to workers and commodities exchanged at prices proportional to their values.

But in spite of Marx's unequivocal assertion that prices out of equilibrium ceased to reflect the quantities of labour-time embodied in commodities (unless in unrealistic special cases, characterized by an equal organic composition of capital in all sectors or by a zero profit rate), the pure labour theory of value was not abandoned.

There was however a problem. If the labour theory of value could no longer be used to explain the origin of profit from wage labour exploitation, other justifications had to be found to legitimate Marx's idea that profits were the result of labour exploitation and to validate his appeal to class struggle.

This was gradually realized by Marx. In the third volume of *Capital*, edited by Engels, he substituted the pure theory of labour with a more generic conception, that of a 'law of value' (*Wertgesetz*), which regulated the determination of relative prices[\[14\]](#). There Marx rejected the labour theory of value of classical lineage that he had previously endorsed. In chapter IX, he acknowledged that profits are distributed by competition in proportion to the prices of constant and variable capitals, and not in proportion to their values. He pointed out that "there is always the possibility of an error if the cost-price of a commodity in any particular sphere is identified with the value of the means of production consumed by it", before concluding that "our present analysis does not necessitates a closer examination of this point. It remains true, nevertheless, that the cost-price of a commodity is always smaller than its value". Marx recognized that in the presence of different organic compositions of capital in production,

and with a positive rate of profit, commodities prices are not proportional to labour values. They simply tend to gravitate around them. And he turned to a cost-of-production theory of value, in which both labour and capital were treated as directly productive agents.

There was therefore in Marx, in the middle 1840s, when he matured the leading thread of his economic thought, a fundamental change of theoretical perspective, an 'epistemological break', pointed out by Louis Althusser, that signed his passage from ideology to science. That is from his former Hegelian metaphysical position to historical materialism.

*retired full professor of political economy, University of Florence

Bibliographical references:

BLISS C. (1975), *Capital Theory and the Distribution of Income*, North-Holland, Amsterdam;
idem (2005), *The Theory of Capital: A Personal Overview*, Introduction, in C. Bliss, A.J. Cohen and G.C. Harcourt, eds., *Capital Theory*, Elgar, Cheltenham, 3 vols., vol. I, pp. xi-xxvi.

CAVALIERI, D. (1963), *Sulla relazione tra il saggio di rendimento oltre il costo e l'efficienza marginale del capitale*, "Giornale degli economisti e annali di economia", March-April, pp. 247-73; idem (2004), *On Some Equilibrium and Disequilibrium Theories of Endogenous Money: A Structuralist View*, "History of Economic Ideas", vol. 12, n. 3, pp. 49-81; idem (2009), *Sull'inseparabilità delle strutture sintattiche nell'analisi classica del valore e della distribuzione*, "Studi economici", vol. 64, no. 97, pp. 5-46; (2010), *Valore e costo reale di produzione. Un riesame del problema, dopo la "New Value Controversy"*, "Studi Economici", vol. 65, no. 102, pp. 5-47.

COHEN, A. J. and HARCOURT, G.C. (2003), *Whatever Happened to the Cambridge Capital Theory Controversies?*, "Journal of Economic Perspectives", vol. 17, no. 1, pp. 199-214.

FOLEY, D. K. (2000), *Recent Developments in the Labour Theory of Value*, "Review of Radical Political Economics", vol. 32, no. 1, pp. 1-39.

GAREGNANI, P. (1970), *Heterogeneous Capital, the Production Function and the Theory of Distribution*, "Review of Economic Studies", vol. 37, pp. 407-3; idem (1984), *Value and Distri*; idem (1990), *Quantity of Capital*, from *The New Palgrave Dictionary of Economics Series: Capital Theory*, J. Eatwell, M. Milgate and P. Newman eds., Macmillan, London, pp. 1-78.

HICKS, J.R. (1939), *Value and Capital*, Clarendon Press, Oxford, 2nd ed. 1946; idem (1973), *Capital and Time: A Neo-Austrian Theory*, Clarendon Press, Oxford.

KEYNES, J.M. (1973-83), *Collected Writings*, ed. by D. Moggridge, Macmillan, London, and Cambridge Univ. Press, Cambridge.

KLIMAN, A. (2007), *Reclaiming Marx's Capital: A Refutation of the Myth of Inconsistency*, Rowman and Littlefield, Lanham.

LERNER, A. (1936-37), *Capital, Investment and Interest*, "Proceedings of the Manchester Statistical Society", Report of Group Meetings, pp. 26-31, repr. in Lerner, *Essays in Economic Analysis*, Macmillan, London, 1953, pp. 347-53; idem (1965), *On Some Recent Developments in Capital Theory*, "American Economic Review", Papers and Proceedings, May, pp. 284-95.

MARX, K. (1867-1894), *Das Kapital: Kritik der politischen ?konomie*, voll. 3, tr. *Capital*, Lawrence and Wishart, London, 1969-74, and *MECV*.

PASINETTI, L.L. *et alii* (1966), *Paradoxes in Capital Theory: A Symposium*, "Quarterly Journal of Economics", vol. 80, no. 4, November, pp. 503-83, with *A Summing Up* by P.A. Samuelson, pp. 568-83.

SRAFFA, P. (1960), *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*, Cambridge Univ. Press, Cambridge.

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

Keywords: capital, labour, value, time, money.

[1] Examples of this type of capital are Marshall's 'free or floating capital', Menger's 'Dispositionskapital' and Böhm-Bawek's 'subsistence fund'. The notion of capital as a fund of purchasing power was developed by J.B. Clark, G. Cassel and F.H. Knight.

[2] The importance of the time dimension of capital had already been recognized by Ricardo, who correctly attributed to an inadequate treatment of the time element in production most of the difficulties faced in his theory of value, where the presence of durable capital goods was an obstacle to prove the proportionality of normal prices and labour values.

[3] On the difficulties in measuring capital, see DIEWERT, W.E. (1980), *Aggregation Problems in the Measurement of Capital*, in D. Usher, ed., *The Measurement of Capital*, Univ. of Chicago Press, Chicago, pp. 433-528. Various methods for measuring capital are known, but all of them are open to criticisms. The value of capital can be computed at the historical cost of capital assets, suitably revaluated; at their present replacement cost, reckoned at current prices; or at the discounted value of their expected future incomes. The classical surplus approach, centred on the supply side, is open to criticisms for its neglect of demand conditions, consumer preferences and the function of money as a store of value; the neoclassical approach for its reduction of the functional distribution of income to a purely technical determination, unaffected by class conflicts.

[4] On dimensional analysis, see HUNTLEY, H.E (1967), *Dimensional Analysis*, Dover Books, Mineola, New York, and DE JONG, F.J. and QUADE, W. (1967), *Dimensional Analysis for Economists*, North-Holland, Amsterdam.

[5] Sraffa made clear that the analytical separation to be considered was not concerned with the determination of quantities and prices, but with the relation of value with the social distribution of income. See his 'price-equations method', where the real wage and the social product are given, when the relative prices of commodities and the profit rate, inversely related to the real wage, are determined.

[6] Ricardo was conscious of Smith's inconsistencies. He refused the notion of labour commanded and the adding-up theory of price and regarded profit as a residual income. In his opinion the value of a commodity depended "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" (Ricardo, *Principles*, I, 11).

[7] See G. J. Stigler, *Ricardo and the 93% Labor Theory of Value*, "American Economic Review", vol. 47, no. 3, June 1958, pp. 357-67.

[8] It is wrong to assert that "the marginal productivity of capital is the marginal efficiency of investment when the rate of net investment is zero", as was done by Lerner (1944, p. 334). The correct relationship between the marginal productivity of capital and the marginal efficiency of investment was shown by Lerner in another paper (1965), in which he introduced a further variable, the marginal productivity of investing, defined as the flow of extra capital produced per unit of time by diverting resources at the margin from consumption to investment.

[9] As a norm, the supply curve of capital goods should be a monotonically increasing function of the amount of capital, in accordance with the usual shape of a marginal cost curve. But in the presence of a reservation demand curve, the influence of demand in the determination of the price of capital goods can prevail over that of the flow-supply to such an extent that the stock-supply schedule can be nearly constant up to the level of output which corresponds to the given capacity of the capital goods industry.

[10] In a neoclassical framework the supply curve of capital shows the supply of savings, a real variable, and together with the entrepreneurs demand for capital, determines the equilibrium level of the rate of interest. In the Keynesian theory, where savings are a residuum and depend on the level of income, at any exogenously given rate of interest there are as many supply functions of capital as possible levels of income. Equilibrium in the capital goods market is brought about by changes in prices, rather than by changes in the rate of interest, separately determined in the money market. Together the investment rate of return and the supply curve of capital determine the equilibrium stock of capital and the equilibrium output of capital goods. In equilibrium two conditions must be satisfied: the rate of return on capital must be high enough to induce firms to hold their endowment of capital goods, and the current supply of capital goods must be such to make the marginal cost of production equal to the market price of a unit of real capital. For each stock of capital goods, a different market price and a different rate of return are associated in equilibrium with each rate of output of capital goods and with each rate of investment.

[11] Once the desired optimal size of the capital stock is specified, the investment flow is determined.

[12] That is either with 'putty' capital models, implying smooth factor substitutability both ex ante and ex post, or with 'clay' capital models, implying fixed and irreversible factor proportions and non-malleable and heterogeneous capital, that once has been installed becomes unsuited to be later utilized with a different technique. These models provide a variety of different frameworks for an analysis of capital theory. In some of them, capital-labour substitution may be possible ex ante, though not ex post.

[13] Marx used to group together fixed capital and raw materials. Gross product was for Marx the sum of constant capital (c), variable capital (v) and surplus value (s). Net product was $v+s$ and the rate of profit was $s/(c+v)$.

[14] This was not a return to Adam Smith's controversial adding-up theory of price, criticised by Ricardo. In Marx's 'simple merchant society' technologically primitive capital goods existed and workers owned them; whereas in Smith's early and rude imaginary state of society capital

goods did not exist.