

## NEO-RICARDIAN ECONOMICS

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This article deals with the revival of the classical theory of value and distribution, championed by Piero Sraffa. The general rate of profits and relative prices are shown to be determined exclusively in terms of the given system of production and real wages (or the share of wages). Prices generally depend on income distribution. So does the cost-minimizing technique. The ‘quantity of capital’ cannot be ascertained independently of prices and thus the rate of profits. Techniques cannot generally be ordered monotonically with the rate of profits. Marginalist ideas regarding input proportions and input prices therefore cannot generally be sustained.

The term ‘neo-Ricardian economics’, as it is understood today, can mean several things. It was coined in the aftermath of the publication of *The Works and Correspondence of David Ricardo*, edited by Piero Sraffa with the collaboration of Maurice H. Dobb (Ricardo, 1951–73), and the publication of Sraffa’s *Production of Commodities by Means of Commodities* (Sraffa, 1960). One meaning of the term simply refers to these facts and interprets Sraffa’s work in the way Sraffa himself saw it: as a return to the ‘standpoint of the old classical economists from Adam Smith to Ricardo, [which] has been submerged and forgotten since the advent of the “marginal” method’ (Sraffa, 1960, p. v; see Smith, 1776, and Ricardo, 1951–73). However, the term was first used by Marxist economists to distinguish Sraffa’s approach to the theory of value and distribution, which explained relative prices and income distribution strictly in material terms (that is, quantities of commodities and labour), from the Marxist one, which starts from labour values (see Rowthorn, 1974). In some contributions Sraffa’s analysis is described in a derogatory manner as a ‘peanut theory of profits’ and rejected together with marginalist (or ‘neoclassical’) theory as a variant of ‘vulgar economics’, dealing with ‘appearances’ only, whereas Marxist theory is taken to investigate ‘the real relations of production in bourgeois society’ (Marx, 1867, p. 85n). Neoclassical economists in turn occasionally (see, for example, Hahn, 1982) applied the term to the analysis of those critics who, in the so-called Cambridge controversies on the theory of capital, had attacked marginalism, especially its long-period version, showing it to be logically flawed (see Kurz and Salvadori, 1995, ch. 14). Because of the nationalities of the critics – especially Joan Robinson, Nicholas Kaldor, Piero Sraffa, Pierangelo Garegnani and Luigi Pasinetti – they also spoke of an ‘Anglo-Italian school’.

Such an unfortunate diversity of meanings may reflect a misunderstanding both of Sraffa’s achievement and of the relation of his analysis to that of Marxist and marginalist economics respectively. What Sraffa in fact provides is a reformulation of the *classical* approach to the problem of value and distribution that sheds the weaknesses of its earlier formulations and builds upon their strengths. Put briefly, profits and all property incomes

(such as interest and land rents) are explained in terms of the *social surplus* left over after the necessary means of production and the wages in the support of workers have been deducted from the gross outputs produced during a year. As Ricardo had stressed: ‘Profits come out of the surplus produce’ (*Works*, vol. 2, pp. 130–1; cf. vol. 1, p. 95). Therefore, instead of ‘neo-Ricardian economics’ it would be more appropriate to speak of that part of classical economics that deals with value and distribution. As is well known, this part was designed to constitute the foundation of all other economic analysis, including the investigation of capital accumulation and technical progress, of development and growth, of social transformation and structural change, and of taxation and public debt. The pivotal role of the theory of value and distribution in the classical authors can be inferred from the fact that it is typically developed at the beginning of their major works. By rectifying this part, Sraffa revived interest in classical economics. In addition to this constructive task Sraffa also pursued a critical task: the propositions of his book were explicitly ‘designed to serve as the basis for a critique of [the marginal theory of value and distribution]’ (1960, p. vi).

In the following we first summarize the achievements of Sraffa and his followers with respect to the constructive task. We then turn to the criticism of marginalist theory. In conclusion, we point out some of the problems that are currently being tackled by scholars working in the classical tradition.

## **Reformulating the classical theory of value and distribution**

The concern of the classical economists, especially Smith and Ricardo, was the laws governing the emerging capitalist economy, characterized by the stratification of society into three classes: workers, landowners, and the rising class of capitalists; wage labour as the dominant form of the appropriation of other people’s capacity to work; an increasingly sophisticated division of labour within and between firms; the coordination of economic activity through a system of interdependent markets in which transactions were mediated through money; and significant technical, organizational and institutional change. In short, they were concerned with an economic system incessantly in motion. How to analyse such a system? The ingenious device of the classical authors to see through the complexities of the modern economy consisted in distinguishing between the ‘actual’ values of the relevant variables – the distributive rates and prices – and their ‘normal’ values. The former were taken to reflect all kinds of influences, many of an accidental or temporary nature, about which no general propositions were possible, whereas the latter were conceived of as expressing the persistent, non-accidental and non-temporary factors governing the economic system, which could be systematically studied.

The method of analysis adopted by the classical economists is known as the method of ‘long-period positions’ of the economy. Any such position is the situation towards which the system is taken to gravitate as the result of the self-seeking actions of agents, thereby putting into sharp relief the fundamental forces at work. In conditions of free competition the resulting long-period position is characterized by a *uniform rate of profits* (subject perhaps to persistent inter-industry differentials reflecting different levels of risk and of agreeableness of the business; see Kurz and Salvadori, 1995, ch. 11) and uniform rates of remuneration for

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each particular kind of primary input. Competitive conditions were taken to engender *cost-minimizing behaviour* of profit-seeking producers.

Alfred Marshall (1920) had interpreted the classical economists as essentially early and somewhat crude demand and supply theorists, with the demand side in its infancy. It was this interpretation and the underlying continuity thesis in economics that Sraffa challenged. As he showed, the classical economists' approach to the theory of value and distribution was fundamentally different from the later marginalist one, and explained profits in terms of basically two data: (a) the system of production in use and (b) a given real wage rate (or, alternatively, a given share of wages). Profits (and rents) were thus conceived of as a *residual* income. Whereas in marginalist theory wages and profits are treated symmetrically, in classical theory they are treated *asymmetrically*. On a still deeper methodological level the divide between the classical and the later marginalist authors could hardly be more pronounced. While the classical authors took the economic system to exist independently of the single agent and actually exert a considerable influence upon the latter depending upon the role ascribed to him as worker, capitalist or landowner, the marginalist authors advocated one version or another of 'methodological individualism', which takes a set of assumedly optimizing agents who exist independently of the system as a whole and who shape the system rather than the other way round.

Let us now examine more closely the scope, content and analytical structure of classical theory. The classical economists proceeded essentially in two steps. In the first step they isolated the kinds of factors that were seen to determine income distribution and the prices supporting that distribution in specified conditions, that is, *in a given place and time*. The theory of value and distribution was designed to identify *in abstracto* the dominant factors at work and to analyse their interaction. In the second step they turned to an investigation of the causes which *over time* affected systematically the factors at work from within the economic system. This was the realm of the classical analysis of capital accumulation, technical change, economic growth and socio-economic development.

It is another characteristic feature of the classical approach to profits, rents and relative prices that these are explained essentially in terms of magnitudes that can, in principle, be observed, measured or calculated. The *objectivist* orientation of classical economics has received its perhaps strongest expression in a famous proclamation by William Petty, who was arguably its founding father. Keen to assume what he called the "physician's" outlook', Petty in his *Political Arithmetick*, published in 1690, stressed that he was to express himself exclusively 'in Terms of *Number, Weight or Measure*' (Petty, 1986, p. 244). And James Mill noted significantly that '*The agents of production are the commodities themselves ... . They are the food of the labourer, the tools and the machinery with which he works, and the raw materials which he works upon*' (Mill, 1826, p. 165, emphasis added) According to Sraffa the classical authors advocated essentially a concept of *physical real cost*. Man cannot create matter, man can only change its form and move it. Production involves destruction, and the real cost of a commodity consists in the commodities destroyed in the course of its production. This concept differs markedly from the later marginalist concepts, with their emphasis on 'psychic cost', reflected in such notions as 'utility' and 'disutility'.

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In line with what may be called their ‘thermodynamic’ view, the classical authors saw production as a *circular flow*. This idea can be traced back to William Petty and Richard Cantillon, and was most effectively expressed by François Quesnay (1759) in the *Tableau économique*: commodities are produced by means of commodities. This is in stark contrast with the view of production as a one-way avenue leading from the services of original factors of production via some intermediate products to consumption goods, as was entertained by the ‘Austrian’ economists.

Why then did the classical economists fail to elaborate a consistent theory of value and distribution on the basis of the twin concepts of (a) physical real costs and (b) a circular flow of production? According to Sraffa (see Kurz and Salvadori, 2005) a main, if not *the* main, reason consisted in a mismatch between highly sophisticated analytical concepts on the one hand and inadequate tools available to the classical authors to deal with them on the other. More specifically, the tool needed in order to bring to fruition an analysis based on these twin concepts was simultaneous equations: knowledge of how to solve them and how to discover what their properties are. This indispensable tool (alas!) was not at their disposal. They therefore tried to solve the problems they encountered in a roundabout way, typically by first identifying an ‘ultimate standard of value’ by means of which *heterogeneous* commodities could be rendered *homogeneous*. Several authors, including Smith, Ricardo and Marx, had then reached the conclusion that ‘labour’ was the standard they sought and had therefore arrived in one way or another at some version of the labour theory of value. This preserved the objectivist character of the theory by taking as data, or known quantities, only measurable things, such as amounts of commodities actually produced and amounts actually used up, including the means of subsistence in the support of workers. This was understandable in view of the unresolved tension between concepts and tools. However, with production as a circular flow, even labour values cannot be known independently of solving a system of simultaneous equations. Hence the route via labour values was not really a way out of the impasse in which the classical authors found themselves: it rather landed them right in that impasse again. Commodities were produced by means of commodities and there was no way to circumnavigate the simultaneous equations approach.

What made it so difficult, if not impossible, for the classical authors to see that the theory of value and distribution could be firmly grounded in the concept of physical real cost? Given their primitive tools of analysis, they did not see that the information about the system of production in use and the quantities of the means of subsistence in support of workers was all that was needed in order to determine *directly* the system of necessary prices and the rate of profits. Sraffa understood this as early as November 1927, as we can see from his hitherto unpublished papers kept at Trinity College Library, Cambridge (UK), with respect to what he called his ‘first’ (without a surplus) and ‘second’ (with a surplus) ‘equations’.

We may start with James Mill’s aforementioned case with three kinds of commodities, tools (*t*), raw materials (*m*), and the food of the labourer (*f*). Production in the three industries may then be depicted by the following system of quantities

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$$\begin{aligned}
 T_t \oplus M_t \oplus F_t &\rightarrow T \\
 T_m \oplus M_m \oplus F_m &\rightarrow M \\
 T_f \oplus M_f \oplus F_f &\rightarrow F
 \end{aligned}
 \tag{1}$$

where  $T_i$ ,  $M_i$  and  $F_i$  designate the inputs of the three commodities (employed as means of production *and* means of subsistence) in industry  $i$  ( $i = t, m, f$ ), and  $T$ ,  $M$  and  $F$  total outputs in the three industries; the symbol  $\oplus$  indicates that all inputs on the LHS of  $\rightarrow$ , representing production are required to generate the output on its RHS. Invoking classical concepts, Sraffa called these relations ‘the methods of production and productive consumption’ (1960, p. 3). In the hypothetical case in which the economy is just viable, that is, able to reproduce itself without any surplus (or deficiency), we have  $T = \sum_i T_i$ ,  $M = \sum_i M_i$ , and  $F = \sum_i F_i$ .

From this schema of reproduction and reproductive consumption we may directly derive the corresponding system of ‘absolute’ or ‘natural’ values, which expresses the idea of physical real cost-based values in an unadulterated way. Denoting the value of one unit of commodity  $i$  by  $p_i$  ( $i = t, m, f$ ), we have

$$\begin{aligned}
 T_t p_t + M_t p_m + F_t p_f &= T p_t \\
 T_m p_t + M_m p_m + F_m p_f &= M p_m \\
 T_f p_t + M_f p_m + F_f p_f &= F p_f
 \end{aligned}
 \tag{2}$$

These linear equations are homogeneous and therefore only relative prices can be determined. Further, only two of the three equations are independent of one another. This is enough to determine the two relative prices. Alternatively, it is possible to fix a standard of value whose price is *ex definitione* equal to unity. This provides an additional (non-homogeneous) equation without adding a further unknown, and allows one to solve for the remaining dependent variables.

A numerical example illustrates the important finding that the given socio-technical relations rigidly fix relative values:

	<i>Values</i>
$2p_t + 15p_m + 20p_f = 17p_t$	$p_t = 3p_m$
$5p_t + 7p_m + 4p_f = 28p_m$	$p_m = p_f$
$10p_t + 6p_m + 11p_f = 35p_f$	$p_f = p_t$

These values depend exclusively on necessities of production. They are the only ones that allow the initial distribution of resources to be restored. Apparently, the value of one commodity may be ‘reduced’ to a certain amount of another commodity needed directly or indirectly in the production of the former. For example, one might reduce one unit of commodity  $t$  to an amount needed of commodity  $m$ . Hence one might say that each of the three commodities could serve as a ‘common measure’ and that, for example, commodities  $t$

and  $f$  exchange for one another in the proportion 1:2 because commodity  $t$  ‘contains’ or ‘embodies’ twice as much of commodity  $m$  as commodity  $f$ .

There is no need even to talk about labour values at this stage of the argument. The same applies to the next stage, which refers to a system with a surplus and given commodity (or real) wages advanced at the beginning of the production period. In conditions of free competition the surplus will be distributed in terms of a *uniform* rate of profits on the ‘capitals’ advanced in the different industries.

We start again from the system of quantities consumed productively and produced (1), but now we assume that  $T \geq \sum_i T_i$ ,  $M \geq \sum_i M_i$ , and  $F \geq \sum_i F_i$ , where at least with regard to one commodity the strict inequality sign holds. In conditions of free competition ‘normal’ prices, or ‘prices of production’, have to satisfy the following system of price equations:

$$\begin{aligned} (T_t p_t + M_t p_m + F_t p_f)(1+r) &= T p_t \\ (T_m p_t + M_m p_m + F_m p_f)(1+r) &= M p_m \\ (T_f p_t + M_f p_m + F_f p_f)(1+r) &= F p_f \end{aligned} \quad (3)$$

The case of a uniform rate of physical surplus across all commodities contemplated by David Ricardo and Robert Torrens

$$\frac{T - \sum_i T_i}{\sum_i T_i} = \frac{M - \sum_i M_i}{\sum_i M_i} = \frac{F - \sum_i F_i}{\sum_i F_i} = r \quad (4)$$

denotes a very special constellation: in it the general rate of profits,  $r$ , equals the uniform material rate of produce. *Here we see the rate of profits in the commodities themselves, as having nothing to do with their values.* In this case only two of the eqs. (3) are linearly independent so that eq. (4) determines the rate of profits, and eqs. (3), following the same procedure used for eqs. (2), determine relative prices. In general, the rates of physical surplus will be different for different commodities. Unequal rates of commodity surplus do not, however, by themselves imply unequal rates of profit across industries.

In this case there are three numbers, each of which substituted for  $r$  in eqs. (3) makes them linearly dependent on one another with respect to prices. It is possible to show that, when the highest real number among such numbers is substituted for  $r$ , the corresponding relative prices are positive, whereas when any of the other numbers is substituted for  $r$  some relative prices are negative. Since a negative relative price has no economic meaning in the present context, we can assert that there is a single solution which is relevant from an economic point of view. Fixing a standard of value provides a fourth equation and no extra unknown, so that the system of equations can be solved.

The important point to note here is the following. With the real wage rate given and paid at the beginning of the periodical production cycle, the problem of the determination of the rate of profits consists in distributing the surplus product in proportion to the capital advanced in each industry. Obviously,

such a proportion between two aggregates of heterogeneous goods (in other words, the rate of profits) cannot be determined before we know the prices of the goods. On the other hand, we cannot defer the allotment of the surplus till after the prices are known, for ... the prices cannot be determined before knowing the rate of profits. *The result is that the distribution of the surplus must be determined through the same mechanism and at the same time as are the prices of commodities.* (Sraffa, 1960, p. 6; emphasis added)

This passage shows that the idea which underlies Marx's so-called 'transformation' of labour values into prices of production (see Marx, 1894, part 2) cannot generally be sustained. Marx had proceeded in two steps; Ladislaus von Bortkiewicz (1906–7, essay 2, p. 38) aptly dubbed his approach 'successivist' (as opposed to 'simultaneous'). In a first step Marx had assumed that the general rate of profits is determined independently of, and prior to, the determination of prices as the ratio between the labour value of the social surplus and that of social capital, consisting of 'constant capital' (means of production) and 'variable capital' (wages or means of subsistence). In a second step he had then used this rate to calculate prices.

So far we have assumed that real wages are given in kind at some level of subsistence. The classical economists, however, saw clearly that wages may rise above mere sustenance of labourers, which makes necessary a new wage concept. This case had made Ricardo adopt a *share* concept of wages and establish the inverse relationship between the share of wages in the product and the rate of profits: 'The greater the *portion of the result of labour* that is given to the labourer, the smaller must be the *rate of profits*, and vice versa' (*Works*, vol. 8, p. 194; emphasis added). The concept of 'proportional wages', as Sraffa called it, was then adopted by Marx in terms of a given rate of surplus value. Sraffa also adopted the concept, albeit with two important changes. First, when workers participate in the sharing out of the surplus product, the original classical idea of wages being entirely paid out of social capital can no longer be sustained. After some deliberation Sraffa decided to treat wages as a whole as paid out of the product. Second, he did not express the share of wages in terms of labour but as the ratio of total wages to the net product expressed in terms of normal prices,  $w$ . These changes necessitated reformulating the price equations by taking explicitly into account the amounts of labour expended in the different industries,  $L_i$  ( $i = t, m, f$ ), because wages are taken to be paid in proportion to these amounts, and by defining these amounts as fractions of the total annual labour of society, that is,  $L_t + L_m + L_f = 1$ . In addition, it is assumed, following the classical economists, that differences in the quality of labour have been previously reduced to equivalent differences in quantity, so that each unit of labour receives the same wage rate (see Kurz and Salvadori, 1995, ch. 11). We may now formulate the corresponding system of production equations again for the case of the three kinds of commodities mentioned by Mill, where now the quantities represented by  $T_i$ ,  $M_i$  and  $F_i$  refer exclusively to the inputs of the three commodities employed as means of production. We get (on the assumption that wages are paid *post factum*)

$$\begin{aligned}
 (T_t p_t + M_t p_m + F_t p_f)(1+r) + L_t w &= T p_t \\
 (T_m p_t + M_m p_m + F_m p_f)(1+r) + L_m w &= M p_m \\
 (T_f p_t + M_f p_m + F_f p_f)(1+r) + L_f w &= F p_f
 \end{aligned} \tag{5.1}$$

With the net product taken as standard of value, we have in addition that

$$(T - \sum_i T_i) p_t + (M - \sum_i M_i) p_m + (F - \sum_i F_i) p_f = 1.$$

Taking one of the distributive variables, the share of wages  $w$  (or the rate of profits  $r$ ) as given, allows one to determine the remaining variables:  $r$  (or  $w$ ) and the prices of commodities.

Using this approach, Sraffa was able to show that, whereas the wage rate as a function of the rate of profits is necessarily decreasing (but does not need to be so if commodities are produced jointly), any relative price as a function of the rate of profits typically does not follow a simple rule: the function can alternately be increasing or decreasing, and can pass through unity a number of times (but such a number is constrained by the overall number of commodities involved). This fact is important also because the problem of the choice of technique from among several alternatives can be studied by following substantially the same argument. Suppose, for instance, that commodity  $t$  can be produced also with process

$$T'_t \oplus M'_t \oplus F'_t \oplus L'_t \rightarrow T'$$

Then we can add to system (5.1) the equation

$$(T'_t p_t + M'_t p_m + F'_t p_f)(1+r) + L'_t w = T' p'_t \tag{5.2}$$

with the further unknown  $p'_t$ . The study of the ratio  $p'_t/p_t$  allows one to say when it is profitable to use the old process and when the new one: if  $p'_t/p_t$  is smaller than 1, the new process will be chosen by cost-minimizing producers; if it is larger than 1, the old process will be retained, whereas the two processes can coexist in case  $p'_t/p_t = 1$ . Obviously, if the new process is chosen and has replaced the old one, and if it is assumed that the rate of profits is unchanged, then eqs. (5.1) give way to the following equations, serving as the new system

$$\begin{aligned}
 (T'_t p'_t + M'_t p'_m + F'_t p'_f)(1+r) + L'_t w' &= T' p'_t \\
 (T_m p'_t + M_m p'_m + F_m p'_f)(1+r) + L_m w' &= M p'_m \\
 (T_f p'_t + M_f p'_m + F_f p'_f)(1+r) + L_f w' &= F p'_f
 \end{aligned} \tag{6.1}$$

In this new system prices and the wage are different ( $p'_j \neq p_j$  and  $w' \neq w$ ), but they are not so when  $p'_t/p_t = 1$  in system (5). If we now evaluate the old process in terms of the prices and wage of the new system by combining system (6.1) and the equation

$$(T_t p'_t + M_t p'_m + F_t p'_f)(1+r) + L_t w' = T p_t \tag{6.2}$$

we can calculate again the ratio  $p'_t/p_t$ , and the property that prices and the wage in the two systems coincide when  $p'_t/p_t = 1$  is enough to prove that  $p'_t/p_t$  is larger (lower) than 1 for a

given  $r$  in system (6) if and only if it is so in system (5). Hence the comparison between the new process and the old one can be indifferently done at the prices of either the old system or the new system.

In the following a system involving a number of processes equal to the number of commodities involved, each producing a different commodity, is called a *technique*, and a technique which is chosen at a given income distribution is called a *cost-minimizing technique* at that income distribution. The fact that a relative price can pass through unity at several income distributions implies that a technique can be cost-minimizing at different values of the rate of profits, with other techniques being cost minimizing in the interval in between. This fact has been called *reswitching*; it played an important role in the criticism of neoclassical theory.

In the above it has for simplicity been assumed that there is only single production, that is, only circulating capital. While the circulating part of the capital goods advanced in production contributes entirely and exclusively to the output generated, that is, ‘disappears’ from the scene, so to speak, the fixed part of it contributes to a sequence of outputs over time, that is, after a single round of production its items are still there – older but still useful. For a discussion of joint production, fixed capital and scarce natural resources, see Kurz and Salvadori (1995).

## Critique of marginalist theory

The passage quoted above from Sraffa (1960, p. 6) contains the key to his critique of the long-period marginalist concept of capital. This concept hinges crucially on the possibility of defining the ‘quantity of capital’, whose relative scarcity and thus marginal productivity was taken to determine the rate of profits, independently of the rate of profits. However, according to the logic of Sraffa’s above argument the rate of profits and the quantity (that is, value) of social capital ( $\sum_i T_i p_t + \sum_i M_i p_m + \sum_i F_i p_f$ ) can only be determined simultaneously.

We may approach the issues under consideration by first discussing what are known as ‘Wicksell effects’. The term was introduced by Joan Robinson (1953, p. 95) during a debate in the theory of capital (see Kurz and Salvadori, 1995, ch. 14). We distinguish between *price Wicksell effects* and *real Wicksell effects* (henceforth PWE and RWE). A PWE relates to a change in relative prices corresponding to a change in income distribution, given the system of production in use. A RWE relates to a change in technique, with the fact taken into account that at the income distribution at which two techniques are both cost-minimizing (one being so at higher, the other at lower levels of the rate of profits) both techniques have the same prices. The ‘changes’ under consideration refer to comparisons of long-period equilibria.

Marginalist theory contends that both effects are invariably positive. A *positive* PWE means that with a rise (fall) in the rate of interest prices of consumption goods will tend to rise (fall) relative to those of capital goods. The reason given is that consumption goods are said to be produced more capital intensively than capital goods: consumption goods emerge at the end of the production process, whereas capital goods are intermediate products that gradually ‘mature’ towards the final product. The higher (lower) is the rate of interest the less (more) expensive are the intermediate products in terms of a standard consisting of a (basket of)

consumption good(s). At the macro level of a stationary economy (in which the net product contains only consumption goods) this implies that with a rise in the rate of interest the value of the net social product rises relatively to the value of the aggregate of capital goods employed. Clearly, seen from the marginalist perspective, a positive PWE with regard to the relative price of the two aggregates under consideration involves a negative relationship between the aggregate capital-to-net output ratio on the one hand and the interest rate on the other. Let  $K/Y = \mathbf{x}\mathbf{p}(r)/\mathbf{y}\mathbf{p}(r)$  ( $\mathbf{x}$  is the row vector of capital goods,  $\mathbf{y}$  the row vector of net outputs, and  $\mathbf{p}(r)$  the column vector of prices (in terms of the consumption vector) which depends on  $r$ ) designate the capital-output ratio, then the marginalist message is:

$$\frac{\partial(K/Y)}{\partial r} \leq 0$$

Since for a given system of production the amount of labour is constant irrespective of the level of the rate of interest, also the ratio of the value of the capital goods and the amount of labour employed, or capital-labour ratio,  $K/L$ , would tend to fall (rise) with a rise (fall) in the rate of interest,

$$\frac{\partial(K/L)}{\partial r} \leq 0 \quad (7)$$

This is the first claim marginalist authors put forward. The second is that RWEs are also positive. A *positive* RWE means that with a rise (fall) in the rate of interest cost-minimizing producers switch to methods of production that generally exhibit higher (lower) labour intensities, ‘substituting’ for the ‘factor of production’ that has become more expensive – ‘capital’ (labour) – the one that has become less expensive – labour (‘capital’). Hence (7) is said to apply also in this case. The assumed positivity of the RWE underlies the marginalist concept of a demand function for labour (capital) that is inversely related to the real wage rate (rate of interest).

Careful scrutiny of the marginalist argument has shown that it cannot generally be sustained: there is no presumption that PWEs and RWEs are invariably positive. In fact there is no presumption that techniques can be ordered monotonically with the rate of interest (Sraffa, 1960). Reswitching implies that, even if PWEs happen to be positive, RWEs cannot always be positive. As Mas-Colell (1989) stressed, the relationship between  $K/L$  and  $r$  can have almost any shape whatsoever. In the intervals in which  $K/L$  is an increasing function of  $r$  we say that there is *capital reversal*. It implies that, if the neoclassical approach to value and distribution is followed, the ‘demand for capital’ is not decreasing, and therefore the resulting equilibrium, provided there is one, is not stable. Hence the finding that PWEs and RWEs need not be positive challenges the received doctrine of the working of the economic system, as it is portrayed by conventional economic theory with its reference to the ‘forces’ of demand and supply (see Pasinetti, 1966; Garegnani, 1970; see also Harcourt, 1972; Kurz and Salvadori, 1995, ch. 14; 1998c).

## Current work in the classical tradition

In more recent times authors working in the classical tradition, as it was revived by Sraffa, have focused attention on a large number of problems. First, there has been a lively interest in generalizing the results provided by Sraffa on joint production, fixed capital, and land. Then the approach was extended to cover renewable and exhaustible resources and to allow for the more realistic case of costly disposal, which leads to the concept of negative prices of products that have to be disposed of. There is also a renewed interest in the problem of economic growth and development. Freed from the straightjacket of Say's Law, which can be said to be an implication of the finding that conventional equilibrium analysis cannot be sustained, there is no presumption that the economy will consistently follow a full-capacity path of economic expansion. Hence the problem of different degrees and modes of utilization of productive capacity and the role of effectual demand (Adam Smith) have to be analysed. This avenue has opened up avenues for cross-fertilization between classical economics on the one hand, and Keynesian economics, based on the principle of effective demand, and evolutionary economics, concerned with complex dynamics, on the other (see Coase, 1976; Nelson, 2005). This fact is also highlighted in comparisons with the so-called new growth theory, and allows one to better understand the latter's merits and demerits (see Kurz and Salvadori, 1998a, ch. 4; 1999).

In the 1960s and 1970s the long-period versions of marginalist theory revolving around the concept of a uniform rate of return on capital were called into question on logical grounds. While many marginalist authors accepted this criticism, some of them contended that intertemporal equilibrium theory, the 'highbrow version' of neoclassicism, was not affected by it (see especially Bliss, 1975; Hahn, 1982). This claim has more recently been subjected to close scrutiny (see Garegnani, 2000, Schefold, 2000, and the special issue of *Metroeconomica*, vol. 56(4), 2006). While the criticism of the long-period versions of marginalist theory is irrefutable, as authors from Paul Samuelson to Andreu Mas-Colell have admitted, surprisingly this has not prevented the economics profession at large from still using this theory. This is perhaps so because in more recent years the way of theorizing in large parts of mainstream economics has fundamentally changed. Whether this change is a response to the criticism need not concern us here. It suffices to draw the reader's attention to a statement by Paul Romer in one of his papers on endogenous growth in which he self-critically pointed out a slip in his earlier argument. The error he had committed, he wrote, 'may seem a trifling matter in an area of theory that depends on so many other short cuts. After all, if one is going to do violence to the complexity of economic activity by assuming that there is an aggregate production function, how much more harm can it do to be sloppy about the difference between rival and nonrival goods?' (Romer, 1994, pp. 15–16) Once economic theory has taken the road indicated, criticism becomes a barren instrument. Indeed, why should someone who seeks to provide 'microfoundations' in terms of a representative agent with an infinite time horizon find fault with the counter-factual but attractive assumption that there is only a single (capital) good?

**Heinz D. Kurz and Neri Salvadori**

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**See also capital theory; capital theory (paradoxes); classical distribution theories; classical growth models; classical growth models (history of thought); classical production theories; reswitching of technique; Ricardo, David; Smith, Adam; Sraffa, Piero; Sraffian economics; Sraffian economics (modern developments)**

### **Bibliography**

- Bliss, C. 1975. *Capital Theory and the Distribution of Income*. Amsterdam: North-Holland.
- Bortkiewicz, L. Von. 1906–7. Wertrechnung und Preisrechnung im Marxschen System. *Archiv für Sozialwissenschaft und Sozialpolitik* 23 (1906), 1–50 (essay 1), 25 (1907), 10–51 (essay 2) and 445–88 (essay 3).
- Coase, R. 1976. Adam Smith's view of man. *Journal of Law and Economics* 19, 529–46.
- Garegnani, P. 1970. Heterogeneous capital, the production function and the theory of distribution. *Review of Economic Studies* 37, 407–36.
- Garegnani, P. 1987. Surplus approach to value and distribution. In *The New Palgrave: A Dictionary of Economics*, vol. 4, ed. J. Eatwell, M. Milgate and P. Newman. London: Macmillan.
- Garegnani, P. 2000. Savings, investment and the quantity of capital in general intertemporal equilibrium. In Kurz (2000).
- Hahn, F. 1982. The neo-Ricardians. *Cambridge Journal of Economics* 6, 353–74.
- Harcourt, G. 1972. *Some Cambridge Controversies in the Theory of Capital*. Cambridge: Cambridge University Press.
- Kurz, H., ed. 2000. *Critical Essays on Piero Sraffa's Legacy in Economics*. Cambridge: Cambridge University Press.
- Kurz, H. and Salvadori, N. 1995. *Theory of Production: A Long-period Analysis*. Cambridge: Cambridge University Press.
- Kurz, H. and Salvadori, N. 1998a. *Understanding 'Classical' Economics: Studies in Long-Period Theory*. London: Routledge.
- Kurz, H. and Salvadori, N., eds. 1998b. *The Elgar Companion to Classical Economics*, 2 vols. Cheltenham and Northampton, MA: Edward Elgar.
- Kurz, H. and Salvadori, N. 1998c. Reverse capital deepening and the numeraire: a note. *Review of Political Economy* 10, 415–26.
- Kurz, H. and Salvadori, N. 1999. Theories of 'endogenous' growth in historical perspective. In *Contemporary Economic Issues. Proceedings of the Eleventh World Congress of the International Economic Association, volume 4: Economic Behaviour and Design*, ed. M. Sertel. London: Macmillan.
- Kurz, H. and Salvadori, N. 2005. Representing the production and circulation of commodities in material terms: on Sraffa's objectivism. *Review of Political Economy* 17, 414–41.
- Marshall, A. 1920. *Principles of Economics*, 8th edn. London: Macmillan.
- Marx, K. 1867. *Capital*, vol. 1. Moscow: Progress Publishers, 1954.
- Marx, K. 1894. 1959. *Capital*, vol. 3. Moscow: Progress Publishers, 1959.

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Edited by Steven Durlauf and Lawrence Blume. Published by Palgrave Macmillan.  
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Forthcoming.

- Mas-Colell, A. 1989. Capital theory paradoxes: anything goes. In *Joan Robinson and Modern Economic Theory*, ed. R. Feiwel. London: Macmillan.
- Mill, J. 1826. *Elements of Political Economy*, 3rd edn, reprinted 1844. London: Baldwin, Cradock, and Joy.
- Nelson, R. 2005. *Technology, Institutions, and Economic Growth*. Cambridge, MA, and London: Harvard University Press.
- Petty, W. 1986. *The Economic Writings of Sir William Petty*. New York: Kelley.
- Quesnay, F. 1759. *Quesnay's Tableau Economique*, ed. M. Kuczynski and R. Meek. London: Macmillan, 1972.
- Pasinetti, L. 1966. Changes in the rate of profit and switches of techniques. *Quarterly Journal of Economics* 80, 503–17.
- Ricardo, D. 1951–73. *The Works and Correspondence of David Ricardo*, 11 vols, ed. P. Sraffa with the collaboration of M. Dobb. Cambridge: Cambridge University Press. (In the text referred to as *Works*, volume number.)
- Robinson, J. 1953. The production function and the theory of capital. *Review of Economic Studies* 21, 81–106.
- Romer, P. 1994. The origins of endogenous growth. *Journal of Economic Perspectives* 8(1), 3–22.
- Rowthorn, R. 1974. Neo-classicism, neo-Ricardianism and Marxism. *New Left Review* 86, 63–87.
- Schefold, B. 2000. Paradoxes of capital and counter-intuitive changes of distribution in an intertemporal equilibrium model. In Kurz (2000).
- Smith, A. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Oxford: Oxford University Press, 1976.
- Sraffa, P. 1960. *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*. Cambridge: Cambridge University Press.

*Index terms*

endogenous growth

actual vs. normal values

Austrian economics

Cantillon, W.

capital accumulation

capital theory

circular flow of production

classical distribution theories

classical economics

cost-minimizing behaviour

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division of labour  
economic growth  
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Torrens, R.

uniform rate of profits

Wicksell effects

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