Money, Interest and Profit in the Theory of Distribution: A Sraffian Approach[*][†]

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Abstract

The main objective of this study is to find the meaning of the so often highlighted phrase

> *"[The rate of profits] is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest."*

(Sraffa, 1960, 44, p. 33)

This paper systematically collects evidence on possible interpretations of Sraffa's hint, by examining all factors that might be significant: his historical background, his theoretical forefathers, his contemporaries, his intellectual development. When examining already existing research, I conclude that the models of Massimo Pivetti (1991) and Carlo Panico (1988a) are not able to deliver an interpretation of Sraffa's actual intention. They constitute merely the authors' own elaborations and therefore present two models which are incompatible with Sraffa's original system, which was constructed in classical tradition of not endogenising elements outside the core. I found that Sraffa acknowledged the significance of a monetary economy and critically viewed Keynes's development of the concept of own rates of interest, which orginally was his suggestion. The peculiar missing definition of the price by which the amount of cotton returned as interest should be priced (Keynes, 1936, Chapter 17, pp. 222-3) and the argument between Keynes and Sraffa on this topic lead to the conclusion that by the money rates of interest Sraffa might have meant commodity own rates of interest measured in money terms. The proposition stands and falls with the assumption that, in the dispute over the price that should be used to calculate the own rates of interest, Sraffa preferred the spot price because it leads to an expression in monetary terms.

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JEL classifications: *B12, B24, B51, D33, E49*

"Aber wenn wir im allgemeinen in der Aufstellung unserer Grundsätze strenger sind als in ihrer Betätigung..."

(Fontane, 1878, p. 233)

1 Introduction

One might describe Piero Sraffa as "one of the greatest economists and deepest thinkers of the twentieth century" (Kurz, 2012, p. 1535-6) or "one of the most remarkably clear minds of the twentieth century" (Pasinetti, 2012b, p. 1304). Most definitely, he ranks among the greatest in the guild of economists. Even though his biggest achievement, in my personal opinion, which will stay unquestionable for generations to come, are his years of editorial work that produced the most complete edition of *The Works and Correspondences of David Ricardo*.

Sraffa's main own publication is a small slender volume, a condensate of economic theory, which entailed a lot of turmoil and discussion: *Production of Commodities by Means of Commodities* (1960). Maurice Dobb called this "an epoch-making book" and probably rightly so. "It is no wonder that this book took a long time to write." - was Joan Robinson's reaction (Robinson, 1961, p. 53). The book models mathematically a whole economic system as a circular model in classical tradition. But compared to the classical practice, he chooses a different closure to the system - the rate of profits, which has to be determined exogenously.

The main objective of this study is to find the meaning of the so often highlighted phrase:

> "[The rate of profits] is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest."

(Sraffa, 1960, 44, p. 33)

However, following Lewis the intention here should not be to derive a separate model from this small clue.

> **"But it is not enough to make sense. We want to find the sense the author intended.** 'Brilliant' explanations of a passage often show that a clever, insufficiently informed man has found one more mare's nest. The wiser reader, far from boasting an ingenuity which will find sense in what looks like nonsense, will not accept even the most slightly strained meaning until he is quite sure that the history of the word does not permit something far simpler."

(Lewis, 1960, p. 6, emphasis added)

Additionally, we should take into account that Kurz (2012, p. 1536) feels that there have been numerous misinterpretations in recent papers. Interpreting Sraffa might be an extremely difficult task, especially due to the fact that a person's opinion on specific topics might evolve over time and the information at hand might not be sufficient to find an answer. Thus, when discussing such a specific question, the main task presents to find the sense Sraffa intended. Kurz (2012, p. 1540), seizing on Popper's principle of falsification (Popper, 1959, p. 10), suggests — after finding support for a working hypothesis — to search the material for evidence that might contradict the hypothesis. I will try to take

into account all the information at my disposal to minimize the risk of misinterpretation, however it cannot be eliminated.

Analyses in the history of economic thought differ in some aspects only insignificantly from interpretations in literary studies. For the comprehension of an author it is not only required to understand the words he has written and published. His historical background, the society he was born into, his contemporaries, his dialogue partners and his friends, his intellectual development and all the accounts capturing his progress — all this is equally important. The context of a work might even be the only way to its comprehension.

Considering the arguments of the Frankfurt School, we cannot - most importantly - discuss this topic without having a clear picture about the views of Sraffa's theoretical forefathers. Thus, I will discuss the classical economists' and Marx's positions on distribution, the rate of profit and the rate of interest before making any attempts to define the meaning of the phrase.

Interestingly enough but not surprisingly, Sraffa himself dealt with the problem of interpretation himself while editing the *The Works and Correspondence of David Ricardo*. Kurz (2012, p. 1538) mentions Sraffa's annotations in his copy of Antonio Gramsci's Prison Notebooks written between 1929 and 1936, whom he supported during the latter's stay in prison:

> *"It is necessary, first of all, to reconstruct the process of intellectual development of the thinker in question in order to identify those elements which were to become stable and 'permanent'—in other words those which were taken up as the thinker's own thought, distinct from and superior to the 'material' which he had studied earlier and which served as a stimulus to him. It is only the former elements which are essential aspects of the process of development."*

(Gramsci, 1971, p. 714)

This excerpt is part of a passage highlighted by Sraffa. To comprehend the intellectual development will be the hardest part in this undertaking. Kurz (2012, p. 1538) points out that Sraffa's views changed considerably over time.

Sraffa published very little during his lifetime, while leaving behind a tremendous amount of notes. Sraffa himself described his notes and papers as an "iceberg", the tip of which is his published work (see Kurz, 2012, p. 1539). *Production of Commodities by Means of Commodities* can be seen as a condensate of a lifetime study. However, it does not touch on any monetary subjects.

The principal question can be split into three sub-questions, asking first of all (i) what is a money rate of interest, secondly (ii) by what he differentiates the particular rates of interest and thirdly (iii) how does the rate of profit depend on the money rates of interest in particular. The answer to the question are build upon each other. The first question in itself is not easy to answer, therefore it is difficult to understand why other authors jump straight forward to the third. Or even more drastically: they develop their own model of how the rate of profit is influenced by the rate of interest, without dealing with Sraffa's original intention, producing basically an extension of the original model. While this extension, however, then lacks any assessment criteria.

So the purpose of this study will not be to cover all possible ways in which the rate of profits can be considered as the exogenous variable, but to explore the connection which Sraffa might have deemed to exist between the two magnitudes.

The questions asked are, on the one hand, very specific ones such that the number of works that attending to them is limited. On the other hand, the suggestion of fixing the rate of profit via the money rates of interest as the exogenous distributive variable is a mere, not further elaborated, hint and the room for interpretation is wide. The authors following this suggestion in general try to explore interactions between real and monetary economy in the classical price system. Carlo Panico (1988a) and Massimo Pivetti (1991) approach the problem under assumption of a modern fiat money regime and explore the transmission channels through which the rate of profits is determined by the money rate of interest. But the discussion of these models requires a sound foundation.

I will approach the problem systematically. The remaining part of chapter 1 discusses the relevance of the subject. Chapter 2 explores Sraffa's classical roots and lays out the different positions of Smith, Ricardo and Marx. Chapter 3 describes Sraffa's basic model and lays the basis for further discussions. And Chapter 4 is the heart of the study. It discusses already existing approaches, studies Sraffa's opinion on money, the own rates of interest and his critical position towards Keynes, and tries to give the vague hint an interpretation. Chapter 5 concludes.

1.1 Income distribution and the relevance of the chosen approach

Questions of income distribution and distributive justice have been discussed by philosophers and economists since antiquity. Plato, for instance, demands in his Laws (*Νόμοι*), written in the 4th century B.C., that no citizen shall have more than the fourfold of another:

> *"Let the limit of poverty be the value of the lot; ... This the legislator gives as a measure, and he will permit a man to acquire double or triple, or as much as four times the amount of this. But if a person have yet greater riches, ... if he give back the surplus to the state, and to the Gods who are the patrons of the state, he shall suffer no penalty or loss of reputation; ..."*

> (Plato, 1892, Vol.5, p.745)

Ever since distribution has been a central concern of economic theory. Ricardo expressed this in the preface to his main work which has become famous:

> *"To determine the laws which regulate this distribution, is the principal problem in Political Economy."*

> (Ricardo, 1817, p. 5)

The most prominent motivation behind the continuing studies is the desire of a just allocation of income, in particular in distribution policy to decrease the differences in income and wealth (Werner, 1979, p .50). Thus, this topic often incorporates political discussions and questions practical realisation. However, before drawing any conclusions for economic policy, one must first know exactly how the system functions. Deductive reasoning requires the correctness of the premises. Else it will lead to false conclusions. This study will solely discuss theoretical matters and make no policy suggestions.

Distribution models do not only have to determine which income has to be distributed, but also based on which characteristics economic agents have to be subdivided. There are two different dimensions from which income distribution is usually approached. The

functional distribution of income divides national income by the factors of production, i.e. labour, land and capital, and thus emphasises the different sources of income - wages, profits and rents. Traditionally used in classical political economy, it was employed to explain the determinants of income distribution among social classes.

The other measure, the personal distribution of income, examines the income distribution among individuals or rather households. Here different income sources are accounted for and split by economic unit. It is often associated with capturing inequality.

In today's modern economic studies, personal income distribution is more often explored than functional income distribution. This might be linked to the fact that classical ideas were predominantly born in the 18th and 19th century, mirroring its society. In times of the classical economists factors of production coincided with the classes in society. Nowadays, this is not the case anymore. Today's society is often seen as being classless. Income classes, which are to be burdened or promoted, have different sources of income. For example, in addition to wage households or individuals may derive income from interest.

Thus, one might think this approach to be outdated and lack explanatory power nowadays. However, I must object this supposition strictly. It is not only useful in determining relative prices if following Sraffa's revival of the classical approach to distribution. Functional distribution does not reveal instantaneously the relation distribution policy. It distinguishes between different types, i.e wage and income upon investments. Income upon investments in today's society is not only the profit of companies, it is also the income on private investments in the capital market and the income of self-employed people. However, this fact might, on the contrary, justify this approach. The rate of profit in functional income distribution becomes also a measure of income from wealth and therefore provides an even better measure for distributive justice than personal income distribution can. It might give a more profound insight into the process of redistribution. Furthermore, as Bontrup (2008, p. 244) argues, everything revolves around the rate of profit in capitalism. The whole system depends on it. Even the government cannot escape its influence. Tax incomes depend on the willingness to accumulate. And only the functional distribution addresses this issue.

Recent papers, which were published as a result of the workshop on "New Perspectives on Sraffa's Work", held at Queens' College, Cambridge, in July 2010 in a special issue of the Cambridge Journal of Economics in November 2012, demonstrate vividly the relevance of a Sraffian perspective. These applied economics papers deal with topical economic questions: the role of the financial sector in economic development and the implications of its 'unproductive' labour (Barba and de Vivo, 2012), the current economic crisis (Pasinetti, 2012a), how the size of the financial sector influences distribution shares (Panico et al., 2012) or the relationship between the customary standard of life and real wages and economic development (Wilkinson, 2012).

1.2 The relevance of the rate of profit for distribution

The rate of profit is one of the variables of distribution. According to Sraffa, the rate of profit is the one which is determined exogenously. It might be influenced by different factors. Finding it's main determinants helps us to understand how distribution is and can be influenced, which allows us prepare oneself for negative effects or to even be able to consciously steer distribution in the "right" direction. Thus, we could avoid making false policies and the enforced policy would really lead to a juster distribution.

Furthermore, Sraffa's model is convincing and his reasoning is very clear (Robinson, 1961, p. 55). But up until now it is a theoretical construct. On the one hand, finding the determinants of the rate of profit might give it more practical use. On the other hand, exploring Sraffa's hint tests the consistency of the theory and makes falsification possible.

2 Classical theoretical foundations

The 'surplus' approach, developed by the French physiocrats and classical economists, had been the basis of value and distribution theory for a long time before the marginalist theory started to dominate the economic literature in the 1870s and relative values and the distributions of income were determined by the forces of demand and supply (Screpanti and Zamangi, 1993). These two seemingly consecutive schools of economics should not be viewed as theories that build upon each other, but rather as representatives of different paradigms (Feldman, 2012, p. 12). The shift of focus towards macroeconomic questions, the new insights that brought the new edition of the *Works and Correspondences of David Ricardo*, carefully compiled by Piero Sraffa and published in 1951, and Sraffa's *Production of Commodities by Means of Commodities* (1960) induced a revival of interest in classical theory (Dobb, 1973, p. 247), especially as a possible basis for critique of neoclassical theory. The research in different fields of the modern surplus approach has been very prolific in the last decades.

2.1 Determining classical income distribution

Compared to the neoclassical approach, where all distribution variables are determined endogenously and simultaneously, influenced by initial resource endowments and economic agents' preferences, following the classical surplus approach means tackling the different economic issues separately and isolating the main forces working for each of them. Neither is it required to build one model that gives answers to all question, nor has a unified approach to all problems to be followed (compare Roncaglia, 1988, p. 176). To determine the distribution among factors, one needs to determine one variable of distribution before the others. The independent variable must be either the real wage rate or the rate of profits, both of which are regarded as uniform over industries. The classical economists took the real wage rate as given, whereas Sraffa emphasised that it is more reasonable to let the rate of profit be determined outside the system (Sraffa, 1960, 44, p. 33). In the following, we will see the development of the surplus approach over the years. A clear understanding on this part is in the end crucially important to understand and interpret Sraffa's method.

The social surplus can be defined as the part of the output that is not needed in its own reproduction, the excess production. This characteristic can most clearly be seen in the first circular flow model of the economy: François Quesney's Tableau Economique. The economic system reproduces itself yearly. The physiocrates regarded agriculture as the only sector creating excess value, excluding manufactured goods on the basis of them being a "mere transformation of agricultural products" (Garegnani, 1984, p. 292, note 4). Beyond doubt, a political motivation is at the basis of this point of view (Roncaglia, 1987, p. 42). Later on, Adam Smith extended the concept of surplus to production in general and thus introduced — additional to rent — profit as a share of the social surplus. In the physiocrat model the annual surplus or 'produit net', as it was denoted, was

considered a gift of nature, remaining after the means of production, which included the subsistence of peasants, have been replaced. Thus, the wage was treated as given and fixed at subsistence level. This idea was inherited by the classical economists and Marx. The notion of subsistence, however, has been different over time. The common ground of these economic thoughts is not — as often wrongly assumed — the same idea of subsistence, but the opinion that wage is determined by "conditions... that are *distinct* from those affecting the social product and the other shares in it, and therefore best studied separately from them" (Garegnani, 1984, p. 295).

Piero Sraffa's *Production of Commodities by Means of Commodities* continues the discussion on distribution in the 20th century in classical tradition. He begins by observing that wages do not necessarily have to be at level of subsistence:

> *"We must now take into account the other aspect of wages since, besides the ever-present element of subsistence, they may include a share of the surplus."*
>
> (Sraffa, 1960, 8, p.9)

Thus, wages may consist of two parts if we allow them to take part in the surplus: the share for subsistence and the workers' part of surplus. The empirical implication would be that the real wage rate might change over time. On this basis, he suggests to treat the rate of profits as the independent variable instead of the wage. This way the share of wages in surplus is determined by factors acting through profit. Sraffa justifies this step as follows:

> *"The choice of wage as the independent variable in the preliminary stages was due to its being there regarded as consisting of specified necessaries determined by physiological or social conditions which are independent of prices or the rate of profits. But as soon as the possibility of variations in the division of the product is admitted, this consideration loses much of its force."*
>
> (Sraffa, 1960, 44, p.33)

Further he elaborates, that the wage "does not acquire a definite meaning until the prices of commodities are determined" (ibid.). And on the other hand:

> *"The rate of profits, as a ratio, has a significance which is independent of any prices, and can well be 'given' before the prices are fixed."*
>
> (ibid.)

Both options of independent variable, i.e. wage or rate of profit, are compatible with the surplus approach to distribution. Actually, the implication from Sraffa's choice is quite similar to the view of Smith and Marx, the only difference being that they saw the workers' part in surplus to be determined through the wage (see Garegnani, 1984, p. 321). Therefore, it does not matter what the exogenously fixed variable is.

The solution to the problem of distribution has to be separated in two disconnected questions. One determines the mechanisms which fixes the independent variable and has to be studied outside the 'core', which would simultaneously determine the dependent variable, relative prices and distribution. The other discusses the 'core' problem, of how dependent variable, relative prices and distribution interact. FIGURE (1) shows the problem in the case of the rate of profit being exogenously given. The factors on the ellipse are given and not part of the core problem, i.e. we determine distribution of the surplus for a given social product, given techniques, a given subsistence level and an externally fixed rate of profits.
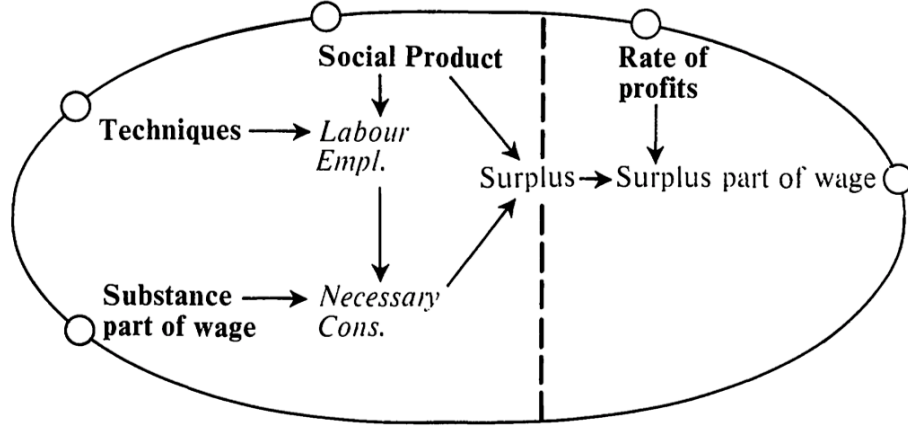
Figure 1: The 'core' of the surplus theories when admitting that wage may have a share in the surplus due to the rate of profit being determined exogenously (Garegnani, 1984).

2.2 How to derive the rate of profit

> *"The rate of profits and of interest must depend on the proportion of production to the consumption necessary to such production,..."*
>
> (Ricardo, Letters from 1814, [50] p.108)

Following (Garegnani, 1984) we can determine aggregated profits at given level of output as follows:

$$aggregated\ profits = social\ product - necessary\ consumption \ , \tag{1}$$

where the necessary consumption is given by multiplying the amount of workers by the wage and the rent of land is neglected, assuming there is enough fertile land (see Garegnani, 1984, p. 299). And from this the annual rate of profit is given by

$$rate\ of\ profit = \frac{social\ product - necessary\ consumption}{necessary\ consumption} \ . \tag{2}$$

The underlying assumption — which was advocated by both, Adam Smith and Ricardo — is that capital can here be represented entirely by wages advanced for the year.

The rate of profit, however, only receives a real meaning, when it is measured in value terms, as — normally — surplus and necessary consumption not necessarily consist of the same commodities or the same proportions of commodities. One possibility, as Sraffa points out in his introduction to Ricardo's *On the Principles of Political Economy and Taxation* (Ricardo, 1817), is to consider an agricultural economy, where corn is produced and everything can be measured and paid in corn. Corn is at the same time product and capital, needed as seeds to reproduce itself; wages are paid in corn and corn is also the only commodity consumed by workers. Profit can now be determined by the difference between total product in the end of a year and capital advanced, i.e. the stock of corn in the beginning of the year, without problems in measurement. Thus, the rate of profit is simply the ratio between profit and capital. The wage is considered as part of the capital advanced.

A further possibility to measure the rate of profit lies in valuing quantities in labour embodied. The establishment of the relation between the exchange value of commodities

and the quantity of labour necessary to produce these commodities is one Ricardo's great achievements (see Garegnani, 1984, p. 302). And this road leads him to initiate the process of exploring the connection between wages and profits and formally laying out the constraint that this relationship comprises for distribution.

Marx acknowledges this accomplishment, indicates that this constraint reveals the antagonism between classes, and follows the way paved by Ricardo for him (see Marx, 1968, III, p. 467; II, p. 166). He divides capital into two parts: variable capital describes the wages advanced and constant capital denominates the means of production. If it is assumed that constant capital consists of circulating capital, and thus is consumed during the period of production, profit can be computed as follows:

$$r = \frac{s}{c+v} = \frac{s/v}{c/v+1} \ , \tag{3}$$

r being the rate of profit, s the surplus value after deduction of necessary consumption and measured in "surplus labour", i.e. the labour that produces everything above necessary consumption, c the constant capital and v the variable capital. The ratio of constant capital over variable capital c/v describes the organic composition of capital which had always played an important role in Marx's argumentation. The problem in this specification lies in the fact that commodities do not exchange in terms of quantity of labour embodied. Ricardo was already aware of this difficulty (Ricardo, 1823). Marx did not deliver a satisfactory solution and this problematic issue was not resolved until Piero Sraffa published his *Production of Commodities by Means of Commodities* (1960). He found an invariable standard of value by constructing the standard commodity.

Piero Sraffa, as already specified above, chose the rate of profit as an exogenous variable, leaving the wage as a residual magnitude. Thus we cannot approach this by following Ricardo or Marx. The outside factors which he assumes to the determine the rate of profits are the "money rates of interest":

> "[The rate of profits] is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest."
>
> (Sraffa, 1960, 44, p.33)

2.3 The rate of profit and the rate of interest

The general rate of profits, as we have seen before, can be determined in the process of distribution as a residual part of the surplus after wages have been deducted. Like the variety of how the wage is fixed from outside the system determining distribution, there have been multiple concepts on what the rate of profit actually is and what its constituent parts are. The most confusing fact is that the rate of profit and the rate of interest are often used as synonyms in literature without further explanation. Schumpeter points out the cause for this difficulty:

> "Since business profit itself was conceived as being, essentially a return on capital goods, it followed that interest was identical with (not determined by) the net yield of capital goods."
>
> (Schumpeter, 1954, p. 647)

Envisioning the production process, Adam Smith defines the rate of profits as follows:

> *"[The revenue] derived from stock, by the person who manages or employs it, is called profit. That derived from it by the person who does not employ it himself, but lends it to another, is called the interest or the use of money. It is the compensation which the borrower pays to the lender, for the profit which he has an opportunity of making by the use of the money. Part of that profit naturally belongs to the borrower, who runs the risk and takes the trouble of employing it; and part to the lender, who affords him the opportunity of making this profit. "*

<div align="right">(Smith, 1776, p. 69-70)</div>

Thus, he clearly partitions the profit into two separate parts: one that is paid to the lender of the money for giving the opportunity of an endeavour and another for the "risk and trouble" of the entrepreneur. Logical deduction leads us to the implication that whenever one component changes, it may either influence the other component, the whole profits or even both. Smith sees the following connection.

> *"... as the usual market rate of interest varies in any country, we may be assured that the ordinary profits of stock must vary with it, must sink as it sinks, and rise as it rises. The progress of interest, therefore, may lead us to form some notion of the progress of profit."*

<div align="right">(Smith, 1776, p. 105-6)</div>

This must necessarily mean that there exists a causal relationship in one way or the other. However, the rate of interest is here described as a mere indicator. The actual direction of the relationship is not made clear.

David Ricardo does not describe this division in two components in his works. Nevertheless, he characterises profits as the motive for accumulation which will not take place if profits do not compensate for trouble and risk. Thus there exist some kind of minimum rate of profit:

> *"The farmer and manufacturer can no more live without profit, than the labourer without wages. Their motive for accumulation will diminish with every diminution of profit, and will cease altogether when their profits are so low as not to afford them an adequate compensation for their trouble, and the risk which they must necessarily encounter in employing their capital productively."*

<div align="right">(Ricardo, 1817, p.122)</div>

Ricardo mentions in several of his animated correspondences with Trower and Malthus the rate of profits and the rate of interest in one breath and indicates that the two magnitudes move together (Ricardo, Letters from 1814, [48] pp. 103-104, [50] p. 108, [53] p.113-114). He even goes further and argues that the rate of interest is determined by the rate of profits. Both variables move in the same degree, however not invariably. In a letter to Malthus he explains the at that time prevailing situation of low wages, high profits and in spite of that low interest rate:

> *"Although interest is undoubtedly ultimately regulated by profits, rising when they are high, and falling when they are low, yet there are considerable intervals during which a low rate of interest is compatible with a high rate of profit, and this generally occurs when capital is moving from the employments of war to those of peace."*

<div align="right">(Ricardo, Letters from 1817, [233] pp.199-200)</div>

The reader of the 21st century might ask what special economical implication the transition between war and peace entails. There were several historical occasions on which war was financed, casually speaking, by printing money. In England this led on more than one occasion to the suspension of the gold standard and in the 19th century culminated in the banking and currency school controversy. Thus, a transition from war to peace encompassed a re-appreciation of currency, an increase in its value, thus a fall in prices without the change in the value of goods or labour. This process "does not require any rise of profits — they may even fall" (ibid.). Ricardo studied the different effects of war and peace on the economy in Chapter XXI of his Principles (Ricardo, 1817, p.298). The causal relationships in these "considerable intervals" will be discussed later. First, however, we will examine the, as one might put in modern economic terms, long-run relationship.

In Chapter IV of his *Principles* Ricardo investigates "the cause of the permanent variations in the rate of profit, and the consequent permanent alterations in the rate of interest" (Ricardo, 1817, p.110). This formulation leaves no discussion to the causal link in this connection. There is, however, little on the nature of this relationship in his writings. In the *Evidence on the Usury Laws* from 1818 Ricardo is asked about the principle by which the rate of interest is regulated and he clearly states the kind of relationship and its transmission mechanism:

> *"It is regulated by the demand and supply, in the same way as any other commodity; but the demand and supply itself is again regulated by the rate of profit to be made on capital."*

<div align="right">(Ricardo, 1818, p. 346)</div>

In an earlier writing one can find a more detailed description of the mechanism, his rejection to the idea of a permanent influence of the quantity of money on the rate of interest and his criticism of British monetary policy at that time:

> *"This opinion is built upon the idea that the interest of money rises or falls according to the abundance of money.— If the Bank Directors could be convinced that this is an erroneous principle we might expect to see them adopt a very different system. The interest which a man agrees to pay for the use of a sum of money is in reality a portion of the profits which he expects to derive from the employment of a capital which that sum of money will enable him to obtain. In the interest which he is willing to pay he is guided solely by the probable extent of those profits. His profits are necessarily totally independent of the abundance or scarcity of the money which circulates commodities in the country."*

<div align="right">(Ricardo, 1810a, p. 374-5)</div>

Later, in his *Principle* he lines out this connection more clearly:

"It is so with respect to the interest for money; it is not regulated by the rate at which the Bank will lend, whether it be 5, 4, or 3 per cent., but by the rate of profits which can be made by the employment of capital, and which is totally independent of the quantity, or of the value of money.

(Ricardo, 1817, p. 363)

However, it is important to distinguish between 'the market interest rate' and the 'natural level of interest', i.e. an average or permanent interest rate around which the market rate fluctuates:

"The rate of interest, though ultimately and permanently governed by the rate of profit, is however subject to temporary variations from other causes."

(Ricardo, 1817, p. 297)

While average interest rate and general rate of profits move together, the quotes of every day market rate of interest do reflect the scarcity of abundance of money in the market. Thus, movements of the market interest rate do not correspond to movements in the rate of profits, they are merely temporary. The market interest rate is described to be gravitating towards the average rate of interest (Panico, 1988a, p.15). This process might be comparable to the gravitation of market prices towards normal or natural prices, which are determined by the social costs of production (Feldman, 2012, p. 9, note 11).

Ricardo only assumes a significant relationship between the permanent interest rate and the general rate of profits. Temporary variations of the market interest rate do not depend on the rate of profits. Panico (1988a, pp. 17-18) identifies three factors in Ricardo's writings that influence the market rate of interest and thus cause temporary variations around the natural level of interest: (1) an increased demand for credit by sellers when the market price of commodities falls below its natural level (Ricardo, 1817, p. 298), (2) speculation and anticipation of political and financial events (ibid.), and (3) variations of amount of money in circulation. Ricardo repeatedly emphasises in his works that changes in the quantity of money, very similar to changes in the quantity of gold (see Ricardo, 1810a, pp. 376-77), do not effect the rate of interest permanently:

"It is only during the interval of the issues of the Bank, and their effect on prices, that we should be sensible of an abundance of money; interest would, during that interval, be under its natural level; but as soon as the additional sum of notes or of money became absorbed in the general circulation, the rate of interest would be as high, and new loans would be demanded with as much eagerness as before the additional issues."

(Ricardo, 1810b, p. 91)

Finally, Ricardo also discusses the empirical difficulties and agrees with Adam Smith that rate of interest may be used as empirical indicator for the general rate of profits:

"Adam Smith has justly observed, that it is extremely difficult to determine the rate of the profits of stock. 'Profit is so fluctuating, that even in a particular trade, and much more in trades in general, it would be difficult to state the average rate of it. To judge of what it may have been formerly, or in remote periods of time, with any degree of precision must be altogether impossible.' Yet since it is evident that much will be given for the use of money, when

> *much can be made by it, he suggests that 'the market rate of interest will lead us to form some notion of the rate of profits, and the history of the progress of interest afford us that of the progress of profits.' Undoubtedly if the market rate of interest could be accurately known for any considerable period, we should have a tolerably correct criterion, by which to estimate the progress of profits."*

(Ricardo, 1817, p. 296)

Karl Marx's view on the rate of profit, the rate of interest and their interdependence is by far more complex. This might be attributed to his historical and materialistic approach.

> *"Since interest is merely a part of profit, paid according to our assumption by the industrial capitalist to the money-capitalist, the maximum limit of interest is marked by profit itself, and in that case the portion pocketed by the productive capitalist would be equal to zero."*

(Marx, 1894, p. 421)

Thus, Marx divides profits, similar to Adam Smith, into two parts — the profit of entrepreneurs and interest (compare Marx, 1894, p. 947) — where the size of the profit of entrepreneurs depends on the interest. A maximum interest consuming the profits will imply zero profits of entrepreneurs:

> *"Aside from exceptional cases, in which interest might be actually larger than profit and could not be paid out of profit, one might consider as the maximum limit of interest the entire profit minus that portion (to be subsequently analysed), which resolves itself into wages of superintendence. The minimum limit of interest is wholly undefinable."*

(Marx, 1894, p. 421)

The size of the two different components of profits is determined by a struggle "between two kinds of capitalists, the money capitalist and the industrial or the merchant capitalist" (Marx, 1894, p. 416).[1]

Pivetti (1991) illustrated the different views on profit and interest by a graphical interpretation, which I shall integrate into this study as they might be of additional value. i denotes the interest rate, r denotes the the normal rate of profit and t denotes the time.[2] In Figure 2a we see Adam Smith's view. Both magnitudes move together in step. The observed interest being the indicator for the rate of profits. The profits of enterprises stay a constant part of the interest. Figure 2b shows profit and interest always move in the same direction according to David Ricardo, even though not in step. The special case of interest being higher than profits is not being illustrated. Figure 2c shows the relationship intended by Karl Marx, where the rates of profit and interest do not necessarily have to move in the same direction. However, the profit is describes the maximum possible interest rate. Again, we do not see the special case of interests being above profits.
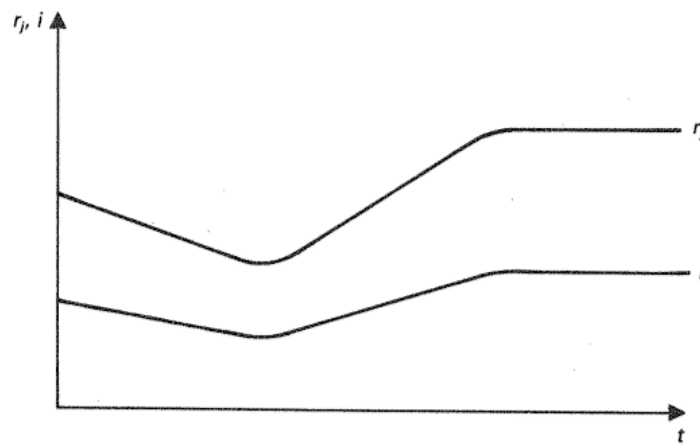
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[1] See for more detail on this subject (Panico, 1988a, ch. 2.2).

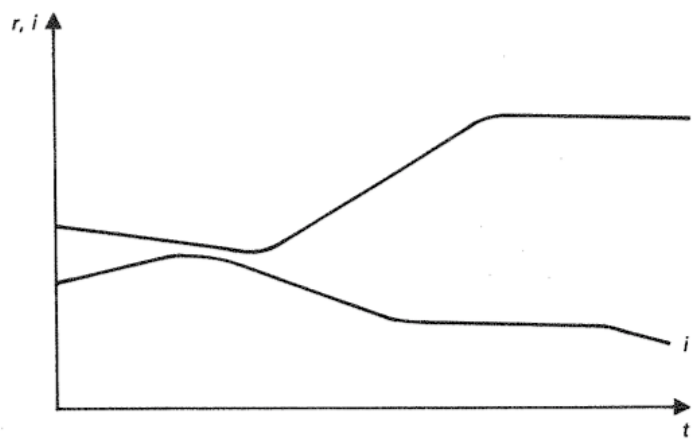[2] Pivetti allowed in his model the variation of profits over sectors j.

Figure 2: Movements of the rate of interest and rate of profit (Pivetti, 1991)
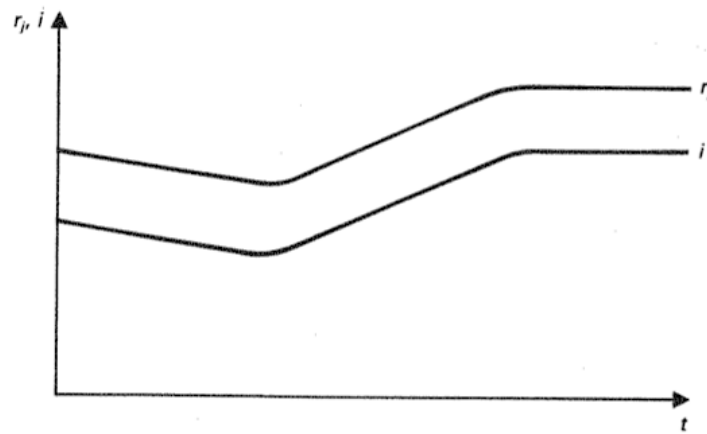
(a) according to Adam Smith

(b) according to David Ricardo

(c) according to Karl Marx

3 Sraffa's basic model

Sraffa models a capitalist economy in classical tradition, which stands in a sharp contrast to dominant marginalist theory models. Joan Robinson's comment in her review of *Production of Commodites by Means of Commodities* illustrates the differences:

> *"Evidently we are in a capitalist economy, but to avoid the ambiguities which have clustered around the word, capital is never mentioned. There is profit, but no enterprises; wages, but no pay-packets; prices, but no markets."*
>
> (Robinson, 1961, p. 53)

David Ricardo was already aware of the problems in Adam Smith's price theory, that was later labelled 'Adding-Up Theory' by Piero Sraffa, namely the interdependence of prices and distribution, and tried to solve it in a one-sector model where everything is measured in corn. One of Sraffa's main achievements is that he was able to find a solution to this problem for a multiple-commodity world — in a mathematically elegant way, by analytical methods which had not been at Ricardo's disposal — without foundering on the transformation problem like Marx did, thus opening the road for further research in classical tradition and for critique on the neoclassical theory.

Before diving straight into the model, first of all the assumptions have to be laid out clearly. Else we might draw false conclusion and oversee limitations. We need to keep in mind that the notion of equilibrium is different from that of the marginalist approach. There is no need for one analytical construct that explains everything inside its boundaries. The variables which are endogenous to the system are only the variables in its 'core'. We examine a circular system where output level and the techniques are given. This means that prices and quantities have to be explained in two different theoretical constructs (see also Feldman, 2012, p. 9, note 14) and technological progress is an exogenous factor. Further, we have to be aware that in classical economics we distinguish between two notions of prices for producible goods: short-term market prices and long-term production prices, named "natural prices" by Adam Smith (compare Smith, 1776, pp. 72-81). The latter describes the price that is paid when the output equals effectual demand, i.e. those who are willing to pay the production price. Should the demand exceed (fall below) output, this will lead to an higher (lower) market prices. Thus, the market price is determined depending on the natural price and circulates around it. Adam Smith described this relationship as follows:

> *"The natural price, therefore, is, as it were, the central price, to which the prices of all commodities are continually gravitating."*
>
> (Smith, 1776, Vol. 1, p. 60)

The prices which interact with distribution in Sraffa's model are formally of course natural prices, denominated by him as "normal prices". We assume an economy with n reproducible commodities, i.e. n industries. Like Ricardo we allow only for circulating capital. The stock of inputs at the beginning of the period is fully used for production process to achieve a certain amount of output, and we do not consider such things as machines. Wages, however, are paid at the end of the period. We consider the model in its simplest version: land is free and we exclude joint production. There are no mobility restrictions neither for capital nor for labour across industries, which ensures uniform compensation for the means of production, i.e. wages and profits. The production of

a commodity requires a certain amount of hours of work. We assume all workers are equally productive for simplicity, alternatively we could interpret this as the time need by an average worker. Additionally, a number of inputs in form of other commodities is required. The stocks at the beginning of the period will be fully reproduced during the production process if the system is economically viable. The surplus on top of this reproduction is the net output. We normalise the output of each commodity to 1. Thus, we can set up a system of n equations:

$$\mathbf{p} = \mathbf{A}\mathbf{p}(1+r) + \mathbf{l}\,w \ , \tag{4}$$

where $\mathbf{A}$ denotes a $n \times n$ semi-positive input-output matrix. Its coefficients a_{ij} number the amount of input of commodities i needed in production of one unit of commodity j. $\mathbf{l}$ is a positive column vector of n labour input coefficients and $\mathbf{p}$ a column vector of nominal prices. w and r are both uniform — scalars — and represent the wage rate and the rate of profits.[3] Obviously, with techniques given, this system has $n+2$ unknown variables: w, r and $p_j \ \forall j = 1, \ldots, n$.

A given rate of profit will lead us to a structure of prices which will imply exactly this rate of profit in every industry, measured by a proportion net output to inputs needed which are valued by these prices. The values of invested capital and output are functions of the rate of profits and thus have no independent meaning. How money values could variate is depicted in an colourful example in Robinson and Eatwell (1973, p. 186).

In addition to the choice of external distributive variable, we still need one more factor to be determined. The homogeneity of this linear equation system implies that if $\mathbf{p}, w$ is a solution, than $\lambda\mathbf{p}, \lambda w$ for any λ is a solution as well. Therefore, we can solve the system by choosing a numéraire. The choice of the numéraire can be made arbitrary from a mathematical point of view, however from an economic perspective there are three alternatives which can be regarded as relevant for different monetary regimes (Feldman, 2012, p.16): gold standard, labour standard and composite commodity standard. Sraffa chooses for this purpose the ingenious standard commodity as "money of account" (Sraffa, 1960, 56 ,p. 48):

> *"The beauty of this is that, as the wage reckoned in terms of this standard rises, the prices of some of the commodities composing it (in which wages are a high proportion of cost) rise, and others (in which profits are a high proportion of cost) fall, to just such an extent as to balance each other, and leave the ratio of the value of the surplus to the value of the means of production unchanged. This provides a technically determined ratio of surplus to means of production which is independent of the division of the surplus between wages and profit"*
>
> (Robinson, 1961, p. 55)

Even though Sraffa purposed a specific closure to this system (i.e. the rate of profit determined by the monetary rates of interest) which would deliver a unique structure of prices, from a theoretical point of view it remains open to many different possibilities and extensions.

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[3] The sum of wage and profit rate will be smaller than one.

4 Piero Sraffa and the "money rates of interest"

Now it is time to turn to the main topic of this study, i.e. to bring more light into the question of what Sraffa might have meant, when he suggested in *Production of Commodities by Means of Commodities* (1960), that the rate of profit is determined "by the level of the money rates of interest" (Sraffa, 1960, 44, p.33).

To get a first insight into possible interpretations, I will start with the existing models proposed by Carlo Panico (1988a) and Massimo Pivetti (1991). The starting point of both is Sraffa's basic model from 1960. But the interpretation of how the rate of profits is determined "by the level of the money rates of interest" (Sraffa, 1960, p. 33) leads them down two completely different roads. This might be attributed to the fact that they have a different point of view on the development of Sraffa's thoughts. Panico argues that *Dr. Hayek on Money and Capital* (1932) is at best only a "half-way house" (Panico, 1988a, p. 26). Pivetti on the other hand simply sees it as of no consequence and even wrong on some matters. The main difference in their models therefore lies in the way they treat money.

4.1 The two main rivalling models: Pivetti and Panico

Massimo Pivetti emphasizes that "there is no produced money commodity in his model" (Pivetti, 1991, p. 71). To what extent this implies a model without money is to be seen. The money rate of interest (singular) is defined either as the rate on long-term government securities or an arithmetical average of this rate and the ordinary rate of interest on "reasonable secured long-term private loans" (Pivetti, 1991, p. 21). Pivetti describes the rate of interest as a "monetary phenomenon". The interest rate is fixed by monetary authorities outside the production system. Money credit is issued only by this outside monetary authority, there are no banks in the core of the system issuing bank credit. Thus, the money rate of interest is exogenously determined, and money itself is produced outside the system.

The mechanics which connect the rate of interest with the rate of profits lies in the ratio of prices to money wages. Pivetti (1991, pp. 69-70) assumes the money rate of interest to be "an autonomous determinant of normal money production costs, together with money wages and production techniques". It is assumed to govern the ratio of prices to wages. Pivetti (ibid.) argues that competition among firms in each industry will cause a lowering (increase) in the rate of interest to cause a lowering (increase) of the ratio of prices to wages and thus decrease (increase) the rate of profit. The prices of k commodities are expressed in money and a composite wage commodity w (the money wage) is introduced by defining its price:

$$A_w p_a + B_w p_b + \cdots + K_w p_k = p_w \ . \tag{5}$$

The real wage w_r is dependent on the value of p_w and thus reads as follows:

$$w_r = \frac{w}{p_w} \ . \tag{6}$$

Further profits (P) are divided formally into two components, interest (I) and the normal profits of enterprise (PE).

$$P \ = \ I + PE \ . \tag{7}$$

17

The determinants of the former have already been stated. The latter is industry dependent and defined as follows in the equation of the rate of profits:

$$r_j \;=\; i + \varrho_j i \, , \tag{8}$$

where $\varrho_j \; \forall j = a, \ldots, k$ is a ratio between the profit of enterprises for each industry j and the rate of interest, characterising "any real or fancied advantage which one employment may possess over another or forgoes" (Pivetti, 1991, p.65). Privetti assumes that custom and convention enter into its determination, which are presumably stable over time. Thus, the magnitude of ϱ_j poses for k additionally exogenously determined variables.

Here Pivetti bases his proposition the following statement:

> "A capitalist, in seeking profitable employment for his funds, will naturally take into consideration all the advantages which one occupation possesses over another. He may therefore be willing to forego a part of his money profit, in consideration of the security, cleanliness, ease, or any other real or fancied advantage which one employment may possess over another... Let us suppose that all commodities are at their natural price, and consequently that the profits of capital in all employments are exactly at the same rate, or differ only so much as, in the estimation of the parties, is equivalent to any real or fancied advantage which they possess or forego."

> (Ricardo, 1817, p. 90)

This quote ensures that no misinterpretations are made. The system is not intended to be a system of market prices. We are still in the world of normal prices. Roncaglia (1988, p.173) describes this as the Marxian idea (as understood by Pivetti), where PE are determined endogenously as a residual magnitude, being replaced by exogenously determined PE, corresponding — because of competition among capitalists — to an objective evaluation of the entrepreneur's 'risk and trouble'. Serrano (1993, p. 118) interprets the profit of enterprise as a "sectoral risk premium".

In the end we have a system of $2k+2$ equations and $2k+2$ unknowns, $k+1$ commodity prices including the price of the composite wage commodity, the k normal rate of profits $r_a, r_b, \ldots, r_k$ and the real wage. Thus the introduction of an additional numéraire is not necessary. The money wage itself poses basically as numéraire.

Bose (1996, p. 612-3) criticises Pivetti's model as unrealistic due to banishment of money and credit from the system, the exclusion of joint production and land, and the choice of the wage standard. The second point might be repelled by the argument that Pivetti simply presented Sraffa's basic model which surely can be extended. The purpose is another — to explore Sraffa's hint. Moreover, Bose notes that this model does not hold true to Sraffa's initial intention for only a single money rate of interest which is determined outside the system. Roncaglia (1988, p. 173) sees deficiencies in two aspects: (1) the long-term interest rate, while affecting prices, is assumed to not influence investment or levels of production and (2) the system is determined by the real rate of interest, while the observable magnitude, the money rate of interest, is derived ex-post by taking exogenously given inflation into account.

Carlo Panico, compared to Pivetti, does not fully eliminate 'produced money'. He offers two explanations of how the rate of profits is influenced by the money rate of interest, derived from the analysis of liquidity preferences performed by Keynes in Chapter 17 of

his *General Theory* and from the study of Marx's writings; and chooses to combine these aspects. The connection between the rate of profits and the rate of interest is established by external factors determining the liquidity premia of monetary assets (e.g. deposits, loans) and real assets (production). Panico (1988a, pp. 186-7) explicitly puts money credit inside the production system by assuming that banking is only one sector among many. The 'normal' production sectors supply the banking sector with material inputs while the former supplies them, the industrial sectors, with credit. All in all n sectors producing n commodities. This framework actually allows for the possibility of different rates of interest on different kinds of loan (short-term, long-term etc.). By these assumptions conclusions from the analysis of Marx are introduced. To simplify the structure he additionally assumes that debts are settled at the end of each cycle and bank loans to exist only in the form of short-term loans earning the same interest as short-term bonds. The following equilibrium conditions for the own rates of money interest for all real and financial assets are derived from Keynes writing's, according to which in equilibrium all financial and real assets have equal own rates of interest[4]:

$$\tau \;=\; i - \sigma_b \tag{9}$$
$$\tau \;=\; r - \sigma_k \,, \tag{10}$$

where τ is the rate of interest on deposits, i the short-term rate of interest σ_b is the discount rate or risk premium on a short-term bond and depends on the expectations of the future level of short-term rate of interest affected by monetary policy, while σ_k represents the risk premium of investment projects. When σ_k is considered equal for all entrepreneurs, the rate of profits is uniform. Deposit transfers are used to make payments.

The production system is described by the following two equations:

$$(\mathbf{A}\mathbf{p} + \mathbf{l}\,w)(1+r) + \mathbf{q}i - \mathbf{d}\tau = \mathbf{p} \tag{11}$$
$$(\mathbf{K_b}\mathbf{p} + l_b w)(1+r) + D\tau = Qi \,, \tag{12}$$

where the first equation represents the industrial sectors and the second the banking sector. i is the short-term interest rate, $\mathbf{q}$ the additional credit input vector of the industrial sectors, denominating the amount of loans in money terms per unit of product of each industry, and $\mathbf{d}$ the deposit vector of the industrial sectors, describing the amount of deposit per unit of output of each industry. $\mathbf{K_b}$ is the material input vector of the credit industry, defining amount of input of commodities needed for production of loans, l_b describes labour employed by the banking sector, D is the total amount of deposits and Q is the total amount of bank loans. Ultimately, we have $n+3$ equations and $n+4$ unknowns - n prices, the short-term rate of interest i, the rate of interest on deposits τ and the uniform wage and profit rates. Similar to Pivetti, but explicitly, he chooses now the money wage rate as numéraire.

> *"The conclusion of this analysis is that persistent changes in the interest rates affect distribution and price formation. A rise in the interest rates tends to raise the rate of profit and prices, while a fall in the interest rates tends to lower the rate of profit and prices. However, it is impossible to say a priori what the actual path of the adjustment processes will be, since they may take*

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[4] The equation for the long-term rate of interest ($\tau = i_L - \sigma_L$), originally mentioned by Panico (1988a, p. 178), has been dropped, as it plays no role due to the simplifying assumption.

different directions according to the existing historical situations."

(Panico, 1988a, p.177-8)

Here again Bose (1996, p. 614) criticises the exclusion of land and joint production, the choice of numéraire and the missing external influence of all rates of money interest, not only just the one money rate of interest.

Schefold (1993, p. 480) sees Pivetti's views on monetary policy as controversial. Further, he criticises the limit of the influence of "historical forces" on the rate of profits to the influence of the interest rate rather than allowing for other factors to play a role, such as the wage bargain. And the main problem he sees in the neglect of the quasi-rents contained by the profits of enterprise which can arise due to two different forces - competitive advantages, dynamics in the case of technical progress, and level of demand. Both are only eliminated if assuming a stationary economy.

Mongiovi and Rühl (1993, p. 93) are of the opinion that both models ultimately fail to explain distribution. They highlight several points of criticism. The main ones are the requirement of the interest rate being fixed permanent or lasting and the systematic relationship between level of debt and output.

> *"The models of Pivetti and Panico help to clarify some aspects of the distributional role of finance. But the forces which regulate distribution in a monetary economy are evidently to complex too be reduced to simple mechanisms described in such models."*

(Mongiovi and Rühl, 1993, p. 94)[5]

However, we must not concern ourselves with most of these critiques because the object of the study is 'merely' to search for a sensible interpretation of Sraffa's hint. Both models do not fulfil the requirements of being such an interpretation. Here, I agree with Roncaglia (1988), who emphasizes that Sraffa's model is not intended to explain everything inside its core. In order to examine the hint given on behalf of the determination of the rate of profit there is no need to construct a model which integrates the rate of interest or its transmission channels into the system.

> *"The idea of different analytical levels is common in modern science; for instance, the interpretation of how symbols interact in the human mind is developed 'at a different level of abstraction' from the interpretation of the interaction of neurons in the human brain."*

(Roncaglia, 1988, p. 176)

This objection is of particular importance in the quest of making sense of Sraffa's hint and understand what the author himself meant. Because the hint is merely a hint. It is very possible that Sraffa had not in mind to integrate it into the model, but rather to explore the connection on a different analytical level. Or one might say, according to the clearness of the statement, he already has done so. The implication is that one has to apply a "wider notion of consistency" in the search for a reasonable interpretation.

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[5] Which might be a too simplistic attitude. If it is too complex, why even bother?

4.2 Sraffa on money and interest

Thus, the problem at hand deals with analysing the factors affecting income distribution and not determining the equilibrium levels of prices. Furthermore, agreeing with Schefold (1993), interest will presumably not be the only factor affecting the rate of profits. While not uniquely determining wage and profit rates, past history - i.e. habits, conventions and institutional factors - the main element effecting them in systematic way (Roncaglia, 1988, p. 177). Basing research on the assumption that these factors are relatively constant over time basically evades the purpose. Thus, while recognizing their tremendous influence[6] and allow for a dynamic in the relationship, we also have to consider other aspects.

Theoretical aspects, developed by classical economists, arose due to the economic and social environment of the times they witnessed. This aspect might also be attributed to Sraffa. Unfortunately, this task would be very time and space consuming if done in good conscience. As this is not the main objective of this study, I will leave this to exercise for the future. Good evidence might be found in Sraffa's dissertation thesis (Sraffa, 1920)[7] which makes empirical observations of the Italian banking system and inflation during and after the war, studying especially monetary aspects. However, from a first impression of this text we might draw a working hypothesis that Sraffa had a an extensive knowledge of the functioning of different monetary systems from experience. Additionally, a closely inspection of his scholarly environment will be of value. It introduces the most important concepts and decreases the risk of misinterpretation.

Remembering what Kurz (2012) emphasised[8], we should first of all ascertain which ideas have remained permanent in Sraffa's research programme and which have been discarded over time. This turns out to be complicated. Sraffa's attitude towards the Quantity Theory of Money may pose as an illustrative example. In his dissertation thesis Sraffa does not question his belief in the Quantity Theory (de Cecco, 1993, p. 2). Later on, in his dispute with Hayek, while not rejecting it, he revised his version of it (compare Sraffa, 1932a, pp. 42, 46-49). This is a similar path of development as the one Keynes has passed trough (compare Panico, 1988b, p. 20). To some extent, Sraffa has certainly been influenced by Keynes and the group around Keynes in his further intellectual formation, and probably not only on this subject.

Panico (1988b, p. 8) argues that there even was a continuous long-time interaction between Sraffa and Keynes. The similarity in their monetary views and in their development reflect that, especially when comparing the transition from *L'inflazione monetaria in Italia* to *Production of Commodities by Means of Commodities* and from *A Tract on Monetary Reform* to *The General Theory*. Sraffa's interest in economics started similar to Keynes (and Ricardo) with monetary problems (de Cecco, 1993, p. 1). Keynes was the one who brought Sraffa to Cambridge in 1927 and supported him until his death in 1948. Evidence from Keynes's letters indicates that the two regularly spent hours discussing economic theory (Keynes, 1973, p. 3, 12) and Sraffa actively participated in "Keynes's group" (Panico, 1988b, p. 19) where he made regular critical contributions.[9] The reader will notice some similarity in their terminology. It might be of crucial impor-

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[6] The influence of the monetary regime on the formulation of the model is described by Feldman (2012).

[7] Translated from the Italian by Wendy J. Harcourt and Claudio Sardoni, 1993.

[8] For an elaboration see Chapter 1.

[9] Evidence on this can be found in the letter exchange between Sraffa and Keynes (Keynes, 1973, pp. 207-211), in a letter from Kahn to Keynes (Keynes, 1973, pp. 212-3) and in Keynes rejoinder to Robertson (Keynes, 1973, pp. 229, note 3) from 1931.

tance to know the extent to which Sraffa and Keynes agreed. We cannot simply assume that Sraffa agreed with most of Keynes views. Again this is a point which would need a more extensive study and this partly has been done by Panico (1988b) and Kurz (2010). One can definitely say that Keynes and Sraffa influenced each other tremendously, if only being each other's critical voice. They may have disagreed on some aspects, but they certainly borrowed each other's concepts. The most prominent example can be found in Chapter 17 of Keynes's *General Theory* (Keynes, 1936, p .223, note 1).

Picking up Joan Robinson's remark (Robinson, 1978, p. xii), Kurz (2010) emphasises, on the contrary, that Sraffa has been "secretly sceptical" about some of Keynes's ideas. He describes Sraffa as loner: "Highly respected and even feared by his colleagues, he was hardly ever fully understood" (Kurz, 2010, p. 184). He was reluctant to talk about his research, the difficulties he encountered and the results he obtained, and confided only in Maurice Dobb and the mathematicians he reached out to for support.

> *"Sraffa kept his cards very much to himself and typically disclosed them only in the moment in which he was absolutely sure that what he had to offer was both new and sound. Unlike Keynes he was horrified by the vision of circulating half-baked ideas and leave it to others to straighten them out."*
>
> (Kurz, 2010, p. 184)

One of the reasons might also have been that he knew how different his research programme was.

Kurz believes, and finds evidence for it in two of Sraffa's unpublished papers and in annotations in his copy Keynes's *General Theory*, that Sraffa and Keynes had numerous disagreements. In fact, Sraffa was of the opinion that Marshallian theory should be discarded, Keynes on the other hand, like most of his contemporaries at Cambridge, held on to the Marshallian concepts. Yet, their opinion on the validity of neoclassical theory turns out to be similar.

> *"They were both engaged in a project destined to provide an alternative to contemporary mainstream economics, but they did not directly join forces in this regard. They approached the project from different points of view and they reached different conclusions as to how to best challenge a doctrine they considered problematic if not outright wrong.*
>
> (Kurz, 2010, p. 185)

Nevertheless, the relationship between Keynes and Sraffa was one of great respect towards each other.

Returning to meaning of the expression "the level of the money rates of interest", the questions arises where a more precise description can be found in Sraffa's work and whether the works of Keynes and "Keynes's group" might shed more light on it. In Sraffa's highly critical comment on Hayek's *Prices and Production* from 1931 (Sraffa, 1932a) the main discussions revolves around the money rate of interest and the own rates of interest of different commodities, which might be the referred "money rates of interest". However, before going any further, one needs to ask the question whether this position has changed over time? In the introduction to *Production of Commodities by Means of Commodities* Sraffa explicitly states that "the central propositions had taken shape in the late 1920's" (Sraffa, 1960, p. vi). If we assume that the dependence of the rate of profits on the money rates of interest has been a part of these propositions, we can explore this road further.

4.2.1 The essence of money

Sraffa starts his argumentation by analysing the nature of money. This might be helpful to understand its effects on the economy and thus on income distribution. He criticises the assumption of "neutrality of money" on grounds of dynamics of the monetary economy not being those of an economy with barter trade:

> "... a state of things in which money is 'neutral' is identical with a state in which there is no money at all..."
>
> <div align="right">(Sraffa, 1932a, p. 42)</div>

He emphasizes that money is a commodity which has to be acknowledged to be part of the production system to be able to influence relative prices as it does:

> "Such a theory, according to [Hayek], ought simply to consider the influence of money on the relative prices of commodities which is excellent, provided that money itself is one of the commodities under consideration; ..."
>
> <div align="right">(Sraffa, 1932a, p. 44)</div>

But the difficulty lies in the fact that money is not a simple commodity:

> "... money is not only the medium of exchange, but also a store of value, and the standard in terms of which debts, and other legal obligations, habits, opinions, conventions, in short all kinds of relations between men, are more or less rigidly fixed."
>
> <div align="right">(Sraffa, 1932a, p. 43)</div>

He even defines through which transmission channels it is noticeable:

> "The money which [Hayek] contemplates is in effect used purely and simply as a medium of exchange. There are no debts, no money-contracts, no wage-agreements, no sticky prices in his suppositions."
>
> <div align="right">(Sraffa, 1932a, p. 44)</div>

Bose (1996) picks up these suggestions and constructs a model which introduces different money commodities[10] to the system. A simplified representation looks as follows:

$$\mathbf{B}_{NM}\,\mathbf{p}_{NM} + \mathbf{B}_M\,\mathbf{p}_M = \left(\mathbf{A}_{NM}\,\mathbf{p}_{NM} + \mathbf{A}_M\,\mathbf{p}_M\right)(1+r) + \mathbf{l}\,w \;, \tag{13}$$

where the index NM stands for no-money commodities and the index M for money commodities. $\mathbf{A}$ and $\mathbf{B}$ are the respective input and output matrices.

At this instant, one might be inclined to ask the following question: What is the normal price of money? It is definitely more than the cost of its production, which in itself is a contradiction. But, as we have seen above, money is special. What is most commonly believed among young economics students: the price for money is the rate of interest. This is not true, else if the rate of interest was 10% I would be able to buy 10€ from someone with 1€. Students or an older generations familiar with Marx will straight away give you the right answer. The price of money is what you must give up to get it.

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[10] More precisely: a money-commodity (currency notes of a denomination of £1) and money credit reflecting lending and borrowing separately (reflecting money rates of interest).

If 1€ can buy 3 bread roll the price of money will be 3 bread rolls. The exchange rate is such a price. Bose simply normalises the price of money to 1.

As the suggested model again endogenises elements outside the core, it is not relevant for our quest. Nevertheless, it is a noteworthy theoretical formulation which would need a critical discussion from a theoretical point of view.

Bose (1996, p. 611) himself interprets the difference between the publications of 1932 and 1960 as shift of focus from monetary aspects towards real aspects of production and points to de Brunhoff:

> *"This comment does not lead into any elaboration of a theory of money."*
> (de Brunhoff, 1990, p. 35)

The purpose of *Production of Commodities by Means of Commodities* is to provide a basis for the critique on marginalist theory. The system is constructed in such manner that it "bear[s] on the foundations of orthodox doctrine" (Robinson, 1961, p. 57).

> *"It is, however, a peculiar feature of the set of propositions now published that, although they do not enter into any discussion of the marginal theory of value and distribution, they have nevertheless been designed to serve as the basis for a critique of that theory"*
> (Sraffa, 1960, p. vi)

Bearing in mind this purpose of Sraffa's work, Brunhoff reasons:

> *"Sraffa had no need of a theory of money to make an authoritative critique of the marginalist idea."*
> (de Brunhoff, 1990, p. 36)

Brunhoff bases her opinion on a statement of Garegnani:

> *"Now, money is not dealt with in* **Production of Commodities** *because logic does not allow for it. The relations studied in* **Production of Commodities** *are these of the core which are also those necessarily entailed by the fact that under competition (or any other market form) the price of a commodity entails a distribution of the social product among the participants in the production of the commodity in question. Money cannot therefore enter into those relations..."*
> (Garegnani in de Brunhoff, 1990, p. 36)[11]

Thus, she notes, the analytical link between the monetary rate of interest and the rate of profits seems to be missing. Steedman agrees with Brunhoff on that:

> *"And as matter of logic, Sraffa's virtual silence with respect to money in the 1960 work is sufficiently explained by the assumption that Sraffa took money to be irrelevant to the particular task in hand - that of providing the basis for a critique of the marginal theory of value and distribution (Sraffa, 1960, p. vi). One does not necessarily consider unimportant everything to which one does not refer within a specific context."*
> (Steedman, 1990, p. 40).

This statement basically leads us back to the opinion of Roncaglia (1988), already discussed at the end of chapter 4.1, p. 17: Sraffa did not intend to explain everything inside the "core" of the model and suggested to analyse those problems on different analytical levels.

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[11] The formulation is quoted is from an earlier version of Garegnani (1990, 21, p. 124).

4.2.2   The own rates of interest

As mentioned earlier (chapter 4.2), the "money rates of interest" might refer to the concept of "own rates of interest" laid out by Sraffa himself while criticising Hayek's belief of the existence of one "natural" rate of interest (Sraffa, 1932a). He starts with rejecting the concept of equalisation of "equilibrium" interest rate and "natural" interest rate. Sraffa emphasises, objecting Hayeks interpretation of Wicksell's theory[12], the possibility differences between own rates of interest and thus a deviation from "equilibrium" is not merely a characteristic of monetary economy:

> "If money did not exist, and loans were made in terms of all sorts of commodities, there would be a single rate, which satisfies the conditions of equilibrium, but there might be at any one moment as many 'natural' rates of interest as there are commodities, though they would not be 'equilibrium' rates. The 'arbitrary' action of the banks is by no means a necessary condition for the divergence; if loans were made in wheat and farmers (or for that matter the weather) 'arbitrarily changed' the quantity of wheat produced, the actual rate of interest on loans in terms of wheat would diverge from the rate on other commodities and there would be no single equilibrium rate."
>
> (Sraffa, 1932a, p. 49)

He stresses, that this is not an unrealistic situation:

> "Loans are currently made in the present world in terms of every commodity for which there is a forward market."
>
> (Sraffa, 1932a, pp. 49-50)

Sraffa was very familiar with the functioning of capital markets. Therefore, this fact might have been obvious to him. He gives an illustrative example:

> "When a cotton spinner borrows a sum of money for three months and uses the proceeds to purchase spot, a quantity of raw cotton which he simultaneously sells three months forward, he is actually 'borrowing cotton' for that period."
>
> (Sraffa, 1932a, p. 50)

The interest the cotton spinner pays for borrowing cotton is a commodity rate of interest and is defined by Sraffa as follows:

> "The rate of interest which he pays, per hundred bales of cotton, is the number of bales that can be purchased with the following sum of money: the interest on the money required to buy spot 100 bales, plus the excess (or minus the deficiency) of the spot over the forward prices of the 100 bales."
>
> (Sraffa, 1932a, p. 50)

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[12] *"In a money economy, the actual or money rate of interest may differ from the equilibrium or natural rate, because the demand for and the supply of capital do not meet in their natural form but in the form of money, the quantity of which available for capital purposes may be arbitrarily changed by the banks."* on pp. 20-21 in von Hayek, F. A. (1931). *Preise und Produktion.* Wien: Julius Springer.

For better understanding, I will try to express Sraffa's idea mathematically, following Kurz (2010, pp. 195-6). Assume θ is the number of periods after which the loan will be paid back. The spot price for 100 bales of cotton is denominated by p_t payable in period t and the corresponding θ periods forward price by $p_t^{F,\theta}$ which will be paid in period $t+\theta$. The money rate of interest on a loan at time t for θ periods will be $i_{t,\theta}$. From the first part of Sraffa's definition we get:

$$i_{t,\theta}^C \, p_t^{F,\theta} = M \; , \tag{14}$$

where $i_{t,\theta}^C$ represents the commodity own rate of interest of cotton between t and $t+\theta$, measured in cotton. Typically the rate of interest on loan is paid when the loan itself is paid back. Thus the amount of cotton bales is priced by forward price.[13] Multiplying the forward price of 100 bales times the commodity rate of interest which represents here the amount of bales divided by amount of bales for which the forward rate is defined, i.e. 100 in this case, gives us the amount of money M we are searching for.

The second part of Sraffa's definition implies that the amount of money M corresponds to the sum of two components. The "interest on the money required to buy spot 100 bales" is the monetary value defined by the spot price p_t and corresponds to the product $i_{t,\theta}p_t$. The "excess of the spot price over the forward price" is simply the difference between p_t and $p_t^{F,\theta}$. The spot price being higher than the forward price implies additional costs and vice versa implies a reduction of costs. Thus we get:

$$M = i_{t,\theta}p_t + (p_t - p_t^{F,\theta}) \tag{15}$$
$$= (1 + i_{t,\theta})p_t - p_t^{F,\theta} \; . \tag{16}$$

The cotton's own rate of interest can now be defined as

$$i_{t,\theta}^C = \frac{M}{p_t^{F,\theta}} = \frac{(1+i_{t,\theta})p_t - p_t^{F,\theta}}{p_t^{F,\theta}} \tag{17}$$
$$= (1 + i_{t,\theta})\frac{p_t}{p_t^{F,\theta}} - 1 \; . \tag{18}$$

If the market price of cotton exceeds (or falls below) its natural price, i.e. if demand for cotton does not correspond to the given supply, the money rate of interest and cotton rate of interest in terms of cotton will not be equal. Sraffa describes the dynamics as follows:

> "... immediately some will rise in price, and others will fall; the market will expect that, after a certain time, the supply of [one commodity] will increase, and the supply of [another commodity] fall, and accordingly the forward price, for the date on which equilibrium is expected to be restored, will be below the spot price in the case of the former and above it in the case of the latter; ..."
>
> (Sraffa, 1932a, p. 50)

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[13] In point of fact, Sraffa's definition contains an ambiguity here: it does not clearly state whether the commodity rate of interest must be expressed in terms of spot or in terms of forward quantities. I hereby follow Kurz (2010), who proposes to use the forward rate. The fact that Sraffa does not object to Keynes's restatement in his margin notes of *The General Theory* poses as evidence for the validity of this hypothesis. However, this position might be disputable. Ranchetti (2005, p.130-2) offers some evidence for the alternative, in letters from Keynes to Sraffa on the publication of Sraffa (1932a). Inference depends on interpretation. A discussion on this topic can be found in Naldi (2015).

Sraffa emphasizes that this is indeed the same mechanism as the gravitation of market prices towards natural prices:

> "*It will be noticed that, under free competition, this divergence of rates is as essential to the effecting of the transition as is the divergence of prices from the costs of production; it is, in fact, another aspect of the same thing.*"

> (Sraffa, 1932a, p. 50)

However, in the long-run prices depend on the physical real costs of production and, setting aside different degrees of risk, no change in price should be expected (Kurz, 2010, p. 197) :

> "*In equilibrium the spot and forward price coincide, for cotton as for any other commodity; and all the 'natural' or commodity rates are equal to one another, and to the money rate.*"

> (Sraffa, 1932a, p. 50)

Therefore

$$\frac{p_t}{p_t^{F,\theta}} = 1 \tag{19}$$

$$i_{t,\theta}^C = (1 + i_{t,\theta}) - 1 \tag{20}$$

$$\iff i_{t,\theta}^C = i_{t,\theta} \ . \tag{21}$$

Additionally, Sraffa emphasizes that in either case:

> "*And, for each commodity, there will be different rates for loans of different length.*"

> (Sraffa, 1932a, p. 50)

In Chapter 17 of his *General Theory* Keynes's lays out his interpretation of money rates of interest. He remarks that Piero Sraffa was the one who first pointed out this relationship to him (Keynes, 1936, p. 223, note 1). But his position is far more complex.

4.2.3 Sraffa's critical position towards Keynes's interpretation

Sraffa kept a working copy of Keynes's *General Theory* in his library. The annotations on the margins of Chapter 17 are of particular interest. In them, Sraffa points out the contradicting definitions Keynes gives for the own rates of interest. Keynes starts by defining the money rate of interest:

> "*The money-rate of interest — we may remind the reader — is nothing more than the percentage excess of a sum of money contracted for forward delivery...*"

> (Keynes, 1936, p. 222)

This is basically the operation of a loan: One sells money at a spot rate and buys it at a forward rate. The percentage difference between those sums of money will constitute the interest paid on it.

Further, to explain the notion of a commodity interest, Keynes (1936, p. 223) gives a numerical example which exactly replicates equation (18). Similar to Sraffa, he describes a transaction for 100 quarters of wheat.

$$\text{spot price:} \qquad p_t = \pounds 100 \qquad (22)$$

$$\text{periods ahead:} \qquad \theta = 1 \text{ year} \qquad (23)$$

$$\text{forward price:} \qquad p_t^{F,1Y} = \pounds 107 \qquad (24)$$

$$\text{interest on loan:} \qquad i_{t,1Y} = 5\% \qquad (25)$$

$$\text{wheat rate of interest:} \qquad i_{t,1Y}^{W} = (1 + i_{t,1Y})\frac{p_t}{p_t^{F,1Y}} - 1 \qquad (26)$$

Keynes defines the wheat rate of interest as the sum of wheat which can be bought for the forward price $p_t^{F,\theta}$ by the sum of money which one gets after a year. This is exactly the same definition as given by Sraffa.

$$\text{total percentage of money payed back:} \qquad (1 + i_{t,1Y})\frac{p_t}{p_t^{F,1Y}} = 98,13\% \qquad (27)$$

$$\text{wheat rate of interest:} \qquad i_{t,1Y}^{W} = -1,87\% \qquad (28)$$

> "... there is no reason why their rates of interest should be the same for different commodities... For the relation between the 'spot' and 'future' contracts, as quoted in the market, is notoriously different for different commodities."
>
> (Keynes, 1936, p. 223)

Later, however, Keynes defines the own rates of interest of distinct commodities in terms of three different characteristics which he interprets as interest parts (Keynes, 1936, pp. 225-6): (1) the yield or produced output q, (2) the carrying cost c which describes costs of wastage, and (3) the liquidity premium l paid for "the potential convenience or security given by this power of disposal". Meaning

$$i_{t,\theta}^{C} = q - c + l \; . \qquad (29)$$

On the margin of the passage explaining this issue, Kurz (2010, p. 199) finds the following comment made by Sraffa: "this contradicts definitions of pp. 222-3". Thus, Sraffa saw two incompatible definitions of own rates of interest here. And what is even more important, he does not agree with the last one. Indeed, we find more specific evidence in his two manuscript fragments inspected by Kurz (2010, pp. 201-202).[14] Accordingly, Sraffa finds the concept of liquidity preference is especially disputable. He argues that there "is no such thing as the liquidity preference curve" (ibid.). The argument that liquidity were always an advantage, even though a diminishing one, is not generally true. Banks form such a counterexample: while on the one hand they must remain solvent and liquid, on the other hand they must generate revenue and to achieve it they will become less liquid. Keynes acknowledges:

> "The conception of what contributes to 'liquidity' is a partly vague one, changing from time to time and depending on social practices and institutions."
>
> (Keynes, 1936, p. 240)

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[14] Unfortunately, Kurz gives only few direct citations. I must depend on his interpretation.

And Sraffa fully agrees on that. Further, he notes that the benefit from carrying a commodity has nothing to do with its commodity rate of interest. People do not borrow money to keep it, they borrow to spend it on something:

> "Sraffa concludes 'that K. has in the back of his mind two wrong notions, which have entirely misled him', namely, (i) that commodities are borrowed to be kept until the end of the loan, and (ii) that only durables can be borrowed."

> (Kurz, 2010, pp. 201-202)

Moreover, Keynes introduces *a* as the expected increase in of money prices of a commodity:

$$i_{t,\theta}^{MC} = q - c + l + a \,. \tag{30}$$

Adding *a* to equation (29) will introduce money as the standard of value and express the own rates of interest in terms of money - the commodity rate of money interest. Sraffa argues, however, that the mentioned yield on a commodity will be anticipated and, therefore, already incorporated into its forward price. Thus, adding up *q*s and *a*s will involve double counting.

Sraffa observes the difficulty of money as the standard of value of which Keynes seemed to loose track:

> "The point is, that in the case of the rate of the article chosen as standard, the effect upon it of the expected depreciation is concealed."

> (Sraffa in Kurz, 2010, p. 200)

This is a point he also emphasises in *Production of Commodities by Means of Commodities*:

> "It is impossible to tell of any particular price-fluctuation whether it arises from the peculiarities of the commodity which is being measured or from those of the measuring standard."

> (Sraffa, 1960, 23, p. 18)

Thus, if we want for example to account for the influence of inflation in the production system, which Sraffa regarded as important factor determining income distribution (compare Sraffa, 1920, p. 16), we have to integrate money as a commodity and not use it as the standard of value as Bose (1996) does. The difficulty will be in picturing its asymmetric effects.[15]

The essential conclusion from Kurz (2010) is that even though Sraffa agreed with Keynes initial formulation of the own rates of interest, he saw crucial problems in his later elaborations. The idea of a liquidity premium was too blurry a concept for him. And he confidently rejected the latter's concept of commodity rates of money interest - own rates of interest in terms of money as the standard of value. Thus, we should not look too much to Keynes if we want to make sense of Sraffa's hint.

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[15] Sraffa was thoroughly aware of the fact and highly criticised the Italian policy of deflation: *"But it is likely that this method would redress only some of the injustices of inflation, while it would create new ones and, even more seriously, it would have effects on production and trade, the consequences of which are incalculable."* (Sraffa, 1920, p. 22).

4.3   Figuring out Sraffa's intention

After a thorough investigation and all facts at hand, we can finally enter the discussion of the sense of the statement that the rate of profits "is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest". I will follow my guiding questions as I have laid out before in chapter 4.2 (p. 21).

(i) *What is a money rate of interest?*
This is unfortunately the only question that can be answered clearly. At least for interest paid on money. We could define it through the forward price as Keynes (1936, p. 222) does. Alternatively it is simply the interest paid on a loan for a certain amount of time. An inspection of the determinants of the money rate of interest defeats the purpose of this study and, therefore, will be left out.

Can we find another definition of money rate of interest besides the one Keynes proposed as the commodity rate of money interest, which Sraffa rejected? Not directly. Sraffa does not use the term in plural in his published work. However, a recently published paper by Nerio Naldi (2015) makes the following interpretation based on a discussion of *Dr. Hayek on Money and Capital* between Keynes and Sraffa and one of Sraffa's notes on Keynes's first example of commodity rates of interest in *The General Theory*:

> "Sect.I. Commodity rates. OK. as far as it goes, but irrelevant"
>
> (Sraffa in Naldi, 2015, p. 26)

There was an argument between Keynes and Sraffa on the choice of terms in which the commodity rate of interest should be expressed. In the end, Sraffa did not specify whether the forward or the spot price should be used. Naldi (2015, pp. 19-20) argues that Keynes insisted on a valuation by forward rate, whereas Sraffa preferred the spot rate. Further, he emphasises the purpose of Sraffa's formulation was to reconstruct an economy without money. If following "strictly the logic of the analogy with a non-monetary economy", the commodity interest rate of cotton is derived by dividing by the monetary costs of borrowing cotton, the sum of money M, by $p_t^{F,\theta}$, as we have done in chapter 4.2.2 (p. 25). On the other hand, if we are in a monetary economy the costs have to be monetary (Naldi, 2015, p. 23):

$$i_{t,\theta}^{CM} = \frac{M}{p_t} = \frac{(1+i_{t,\theta})p_t - p_t^{F,\theta}}{p_t} \tag{31}$$

$$= (1+i_{t,\theta}) - \frac{p_t^{F,\theta}}{p_t} \ . \tag{32}$$

This interpretations would explain the note quoted above. Thus, every commodity rate of interest in monetary terms could be a money rate of interest. However, this might be a daring hypothesis as it requires many assumptions.

(ii) *By what criterion we differentiate money rates?*
If we pick up the interpretation from the last paragraph, each commodity will have its own money rate of interest in the case if we are not in equilibrium and thus all rates will be equal:

> "... there may be as many 'natural' rates as there are commodities."

(Sraffa, 1932a, p. 50)

But this is just one potential interpretation. Another possibility would be to introduce loans for different durations:

> *"And, for each commodity, there will be different rates for loans of different length."*

(Sraffa, 1932a, p. 50)

Furthermore, we could also consider Keynes's suggestion that

> *"... the rate of interest is not even the same in terms of two different moneys, e.g. sterling and dollars."*

(Keynes, 1936, p. 224)

However, Sraffa models a closed economic system. Therefore, while this is certainly a true statement, these are very unlikely those "money rates of interest" that Sraffa intended. This leaves us with options one and two for further inspection.

(iii) *How does the rate of profit depend on the money rates of interest?*
Now, this is the trickiest question. Let us start by recalling Sraffa's original wording. An interpretation might change with a slightest change in wording. Therefore, we have to be careful:

> *"[The rate of profits] is accordingly susceptible of being determined from **outside** the system of production, **in particular** by the **level** of the **money rates of interest**."*

(Sraffa, 1960, 44, p. 33, emphasis added)

The key words have been emphasised. The first part of the sentence only reminds us, that here we refer to exogenous determination of the rate of profit i.e. outside the system. Thus, for finding an interpretation, endogenising the variables determining profit is not useful. Further, "in particular" indicates that that the "money rates of interest" are merely one determinant of the rate of profits. It is important to keep this in mind. We are not searching for a full explanation of the determination of the rate of profits. The "money rates of interest" might explain only partly or only for some time spans. And, finally, it is the level of those interest rate that is crucial.

Roncaglia (1988, p. 174) presents four points in the interpretation of Sraffa's suggestion:

1. Sraffa tries to warn against a "simplistic interpretation of the wage-profit counter-position" such as for example Marx's position of a class conflict centred bargain applied to real wage.

2. Sraffa implicitly expresses his preference for the link from interest rates to profits over the post-Keynesian assumption of a causality from the rate of growth towards profits, however leaving out any opinion on the classical reverse influence of the rate of profits on economic growth.

3. The reference to the interest rate does not exclude other factors influencing profits, but defines it merely as the main factor.

4. Sraffa points straight to the compatibility with Keynes's analysis where the influence of monetary factors over real variables is recognised.

I definitely agree with **(1)** and **(3)**. But, as it is not the topic, I skip the discussion of **(1)**. As for **(3)**, Feldman argues that

> "a critical revision of the literature reveals the non-existence of a general closure of the classical price system. Even when many theories are consistent from a formal point of view, the 'right' assumptions depend on historical and institutional conditions, such as the specificities of the monetary system, finance conditions (outside vs. inside financing), the rate of economic growth, strength of labour unions, market structures and political regimes."
>
> (Feldman, 2012, p. 15)

This accentuates Sraffa's and Roncaglia's statement. The other two points, however, still have to be discussed. Let us start with **(4)**. It is questionable whether Sraffa really pointed straight towards Keynes. As we have seen in chapter 4.2.3 (p. 27), Sraffa was noticeably unimpressed by his observations in chapter 17 of *The General Theory*. However, this does not imply Sraffa himself had not his own interpretation of where the influence of monetary factors lies.Therefore, I might be inclined to agree partly with **(4)**, as we have seen from the example of Sraffa's views on inflation that he acknowledged the influence of monetary factors. The interpretation suggested in **(ii)** is only one exposition. In case of **(2)** there seem to be no grounds — at least in the evidence discussed — why this should be the case. Basically this contradicts statement **(3)**.

Keeping this in mind, we turn to the critical question. What we definitely know is how the rate of profit depends on the one money rate of interest. A business venture should at least be able to pay the same amount of profit as the money invested would bring without any effort in the money market. Assuming, some kind of Modigliani–Miller theorem applies, it actually would not matter whether the entrepreneur invests his own money or whether he borrows it. The second option might be somewhat more illustrative. If production is enabled by loans and those are not explicitly modelled as inputs, the entrepreneur will only undertake a troublesome business venture if he expects to be able to pay back the loan. Therefore, the profit must be at least as high as the interest to pay. This should be clear and is one interpretation of:

$$P = I + PE \tag{33}$$

It is easier to see if we picture that all firms buy together a certain amount of input which will be reproduced with a surplus. Now, if normal prices do not change, the spot and forward price of inputs will be equal. Thus, the costs incurred[16] will only be the rate of interest on money. However, even if assuming potentially changing normal prices, the spot price of inputs will deviate from the forward price. As we are outside of the core problem of distribution it would be consistent to assume this change does not occur due to changes in distribution, but due to changes in one of the other given factors i.e. the output level or the technique. Therefore, a change in normal prices induced by either changes in output or technique will render the costs dependent not only on the money rate of interest but also the different commodity rates of interest. Because these interest are

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[16] This is the case where a firm operates on a loan. In the case where it owns the capital these can be regarded as opportunity costs.

measured in money they all become money rates of interest accounting for the monetary economy. Thus, economic growth implicitly influences the rate of profits by influencing own interest rates. Therefore, this hypothesis poses a strong opposition to Roncaglia's statement **(2)**. Another possible interpretation on this ground might be proposed by the following observation:

> "While Sraffa rejected the **marginalist** theory of demand and supply, it was of course clear to him that 'effectual demand' and thus gross output levels matter in ascertaining prices and the unknown distributive variable. He said so explicitly and repeatedly in his papers throughout the three periods of his constructive work, in his 1960 book and later."
>
> (Kurz, 2012, p. 1536)

Expected price changes in that do not reflect deviations from normal prices. Sraffa repeatedly emphasised that money is not just another commodity. Money is special because contracts are made in terms of money and thus are "rigidly fixed" (Sraffa, 1932a, p. 43). Contracts are not fixed at normal prices, for the market only knows market prices.

In fact, these two hypotheses are compatible with one another.

However, as markets do not trade at normal prices and the entrepreneur does not know beforehand whether he will sell all his production, there is still a certain part of the rate of profit - the "risk and trouble" - that is not explained by the money rate of interest. In addition, this argumentation gives further ground for why the question has to be tackled on a different analytical level outside the core. The distribution problem is based on a completely different mechanism.

Even though this might be a conclusive explanation, it should not be forgotten that it stands and falls with the assumptions made in **(ii)**.

5 Conclusion

This study systematically collected evidence on possible interpretations of Sraffa's hint. The models of Massimo Pivetti and Carlo Panico were not found to be able to deliver an interpretation of Sraffa's actual intention. They constitute merely the authors' own elaborations and therefore two models which are incompatible with Sraffa's original system, which is constructed in classical tradition of not endogenising elements outside the core. I found that Sraffa acknowledged the significance of a monetary economy and critically viewed Keynes's development of the concept of own rates of interest, which originally was his suggestion. The peculiar missing definition of the price by which the amount of cotton returned as interest should be priced (Keynes, 1936, Chapter 17, pp. 222-3) and the argument between Keynes and Sraffa on this topic lead us to the conclusion that by the money rates of interest Sraffa might have meant commodity own rates of interest measured in money terms. This interpretation should however not be confused with Keynes's 'commodity rate of money interest'. The proposition stands and falls with the assumption that, in the dispute over the price that should be used to calculate the own rates of interest, Sraffa preferred the spot price because it lead to an expression in monetary terms.

The material inspected was limited. Sraffa did not publish much during his lifetime and the excerpts from his notes and manuscripts are rare. Furthermore, they were not

picked by the intention of answering the question of this investigation by the authors. A further inspection of Sraffa's writings with the explicit target of finding contradicting evidence is definitely needed. And at this point, there is no possibility to avoid a trip to Cambridge if this quest is to be continued.

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