Note to

"On Absolute Value and the Value in Exchange of Commodities"

(original text as submitted on March 8, 1974)
(translated into English by the author Adrian Moons on March 8, 2024[1])

[1] This translation mainly aims to show how the idea of twofold valuation came about 50 years ago. The two methods of twofold valuation developed at that time are aimed at determining where and when the production circumstances of commodities in terms of directly and indirectly required labour have changed, also and especially when using capital commodities. The translation shows that the elaboration of the idea at the time still showed signs of being immature. Your writer takes the liberty of using footnotes here and there to point out barriers that stood in the way of the proper development of the idea.

As soon as people engage and devote themselves to the production of commodities and... especially if they specialize in the production of a certain type of commodities, as soon as people are guided in their work by the possibility of acquiring a variety of commodities through it – a person in possession of commodities enters the market for this purpose and offers his possession for sale, in exchange he obtains the commodities he wants – this fact, a transaction, is then established: commodities that have just been produced are supplied to the market, are transferred, change hands or are acquired into ownership of another person, thereby establishing rates for which the commodities are exchanged with each other.
One observes exchange rates. But also, and at the same time, one must pay attention to a second fact. Within the division of labour, labour power is used in certain ways. A person who works on a certain commodity, his labour power is deprived of other uses. From the variety of possibilities to use labour power, one has been chosen, which is evident from the exercise of that labour power.
The factual nature of the allocation of labour, how and in what way the division of labour has been implemented, is also observable.
Both type of facts interact. Producing commodities takes effort. However, given exchange rates, the prospect of being able to acquire a varied package of commodities with relatively little effort is tempting: everyone focuses on the production of a certain commodity and tries to produce commodities with more ease than others can. By producing one commodity in multiples and exchanging it for other commodities, one saves the trouble of having to produce these commodities themselves.
But the exchange rates are so erratic, how can someone insist on them and still devote themselves to the production of a particular commodity with great profit?

Even in a highly industrialized society, exchange rates show an erratic pattern. Period after period, commodities that are the result of a transformation process are brought onto the market where the exchange rates become visible with other commodities that have also left transformation processes. In every transformation process, commodities are converted into commodities of a certain type and groups of people realize such processes by working in separate firms. Is there a connection between the allocation of labour and exchange rates?
A superficial examination shows that exchange rates are influenced by many things. Although… only after an increase in demand: a sharp price increase precedes the change in the allocation of labour to meet an increased demand for commodities. On the other hand, price formation is sometimes restricted by the government. Or firms could be forced to lower their prices by fierce competition, while in another case a factory implements a price increase without much ado, as its position is unassailable.

One would like to bring order to this chaos and determine with certainty to what extent changes in exchange value are the result of changes in production technology.
Or better, one would like to contrast all observed changes in exchange value with the circumstances of production and changes therein, to determine to what extent a simplification in the production technique of a commodity affects its exchange value.
For example, a sector in which perfect competition prevails, the construction industry. If a house could be produced with half as much labour or with less use of machines, one would think that this advance in production technology would reduce houses' exchange value proportionately.
However, because the exchange value of a house is expressed in other commodities, one must also check whether no changes have occurred in the circumstances of production of these other commodities. In other words, insight is required into the technical progress of each sector, insight into the entire division of labour, into changes in the allocation of labour.

I introduce you to a concept of value that from the multitude of market rates and some data more…
In addition to the exchange values of commodities, one must know the total exchange value of all commodities that in a specific period definitively leave the sphere of the transformation processes, i.e. those that are consumed, and know how this total value of consumption finds its way, within, in the firms – a firm can use its income to replenish its stocks, possibly also to pay off machines or buy new ones and of course to pay wages to its labourers – and moreover, one must know how this total value is distributed over the allocation of labour: what is the result per worker of each firm, what is its income per worker after deduction of the income used to purchase the commodities it needs from other firms.
…and without the slightest presupposition, monopoly, oligopoly, perfect competition, all kind of markets, regardless of possible restrictions on price formation, prescribed maximum or minimum prices, whatever, a concept that enables to deduce from the actual exchange rates and some additional facts exactly whether and where the production circumstances have changed and to what extent.
Suppose that an equal quantity of labour is performed period after period, then the net product of this unchanging quantity of labour, regardless of whether it increases or decreases, or whether the composition of the product changes radically over time, I call this product invariable in value.
The scope of this concept of value, which includes more than just the possibility of measuring changes in production circumstances, can hardly be sufficiently described here. Its implications are enormous and one would like to shed her light on every theory. No. This concept is a starting point of theory.

But a concept must be subject to the requirement of verifiability, every concept must have its connection with reality, reality must be brought to life in it.
In this light, to meet the requirement of verification, I therefore show the scope of this concept, showing how there is coherence within reality. Directly from appearances of reality one can determine whether changes have occurred in production circumstances.
It is for this reason that you are advised to now take a look at the example I have added here. Two periods are compared in which production differs in size and composition, and it is also suspected that changes have occurred in production circumstances.
The example then shows how, in order to determine where production circumstances have changed, a twofold valuation is used. On the one hand, one determines for a sector what the percentage of the exchange value of a unit of product from this sector is in the exchange value of the total

production, on the other hand, the result per worker of each sector is expressed in the average result per worker.
This is how it works:
The exchange value of commodity A in period 1 per the exchange value of the total net production in that period divided by the result per worker in firm A per the average result per worker also calculated for period 1, this number minus this number times the technical progress ρA that has occurred in firm A from period 1 to period 2, is equal to the exchange value of good A in period 2 per the exchange value of the total production divided by the result per worker in that period per the average result per worker.

Example

Two periods are examined in which three firms are active, A, B and C. For the sake of simplicity, mutual deliveries are omitted, so each firm works exclusively with direct labour. 100 workers are employed each period. The data regarding the production structure are usually unknown. To demonstrate how the twofold valuation is able to detect any change in the production structure, the underlying production structure is first described, which makes it possible to directly determine the technical changes for latter verification.

I
The technical changes ρ are equal to the differences in required labour per unit of product in period 2 compared to the required labour in period 1.

	Period 1	Period 2
A	40 workers -> 4 units of A	25 workers -> 3 units of A
B	30 workers -> 2 units of B	35 workers -> 3 units of B
C	30 workers -> 6 units of C	40 workers -> 8 units of C

So

$$\rho_A=\frac{\frac{40}{4}-\frac{25}{3}}{\frac{40}{4}}=\frac{1}{6} \qquad \rho_B=\frac{\frac{30}{2}-\frac{35}{3}}{\frac{30}{2}}=\frac{2}{9} \qquad \rho_C=\frac{\frac{30}{6}-\frac{40}{8}}{\frac{30}{6}}=0$$

II
The twofold valuation requires familiarity with the following facts. First of all, the exchanges rates established on the market. The exchange rates can be expressed in any commodity, for example A, but in period 2 you can also use good B or C, for simplicity I will continue to use commodity A.

Period 1	Period 2		
A = A	A = A		A = 2C
B = 2A	B = 3A	or	B = 6C
C = A	C = ½A		C = C

Then one must know the total exchange value of the commodities that have definitively left the sphere of the transformation processes. This total is equal to the total value of consumption, which also equals the total result of business. It is also important to know how this result is distributed among the firms. Firms must report their results per period, i.e. the proceeds from the sale of their commodities minus the amount for which they have to purchase commodities from other firms in that period.

Result per firm

Period 1			Period 2		
	A	4xA = 4A	3xA = 3A		3x2C = 6C
	B	2x2A = 4A	3x3A = 9A	or	3x6C = 18C
	C	6xA = 6A	8x½A = 4A		8xC = 8C
Total result		14A	16A		32C

And finally, familiarity with the allocation of labour is required. One must know how many workers are employed in each firm.

Period 1		Period 2	
A	40 workers	A	25 workers
B	30 workers	B	35 workers
C	30 workers	C	40 workers

III

The first component of the twofold valuation expresses the exchange value of each commodity in the total of exchange values. For the second component, the result per worker is first calculated for each firm, followed by the average result per worker. Division of these two pieces of data creates the second component.

		Period 1			Period 2		
		A	B	C	A	B	C
1)	$\frac{unit\ exchange\ value}{total\ of\ exchange\ values}$	$\frac{1}{14}$	$\frac{2}{14}$	$\frac{1}{14}$	$\frac{1}{16}$	$\frac{3}{16}$	$\frac{½}{16}$
	result per worker	$\frac{4A}{40}$	$\frac{4A}{30}$	$\frac{6A}{30}$	$\frac{3A}{25}$	$\frac{9A}{35}$	$\frac{4A}{40}$
	$average\ result\ per\ worker$	$\frac{14A}{100}$			$\frac{16A}{100}$		
2)	$\frac{result\ per\ worker}{average\ result\ per\ worker}$	$\frac{10}{14}$	$\frac{20}{21}$	$\frac{10}{7}$	$\frac{12}{16}$	$\frac{45}{28}$	$\frac{10}{16}$

The technical progress ρ_A of firm A is now determined as follows:

$$\frac{\frac{exchange\ value\ A}{total\ of\ exchange\ values}}{\frac{result\ per\ worker\ A}{average\ resultat\ per\ worker}_1} = \frac{1}{1-\rho_A}\frac{\frac{exchange\ value\ A}{total\ of\ exchange\ values}}{\frac{result\ per\ worker\ A}{average\ result\ per\ worker}_2}$$

Thus $\frac{\frac{1}{14}}{\frac{10}{14}}=\frac{1}{1-\rho_A}\frac{\frac{1}{16}}{\frac{12}{16}}$ -> $\frac{1}{1-\rho_A}=\frac{12}{10}$ -> $\rho_A=\frac{1}{6}$

Likewise

$\frac{\frac{1}{7}}{\frac{20}{21}}=\frac{1}{1-\rho_B}\frac{\frac{3}{16}}{\frac{45}{28}}$ -> $\frac{1}{1-\rho_B}=\frac{9}{7}$ -> $\rho_B=\frac{2}{9}$

$\frac{\frac{1}{14}}{\frac{10}{7}} = \frac{1}{1-\rho_C} \frac{\frac{1}{32}}{\frac{10}{16}}$ -> $\frac{1}{1-\rho_C} = 1$ -> $\rho_C = 0$

These results are identical to the technical progress resulting directly from the production structure as described above.
The exchange values determined on the market in the example were chosen arbitrarily. If in period 2 one were confronted with an exchange value of good B of 6A instead of 3A, even then the same results are obtained, even then the completely changed numerical arrangement – after all the total result as well as the total of exchange values becomes 25A – will show that compared to period 1 the technical progress in firm B is still equal to 2/9.
Thus, whatever influences act on actual prices, it does not matter, the valuation is invariant to changes in the exchange rates, while nevertheless, remarkably, exchange values are used almost exclusively in determining technical progress.

A sceptic would say why do I need such a complicated valuation: whether the production circumstances have changed I can read directly from your data. From the result of a firm, by dividing it by the exchange value of the commodity it produces, I know the size of its production. And given the amount of labour, I have direct familiarity with the production structure. And he deduces technical progress without looking at the total amount of work done, without using the concept of value.
But my sceptic has a harder time talking if one wants to see reality through this example and is faced with numerous deliveries of commodities between firms. The production structure can then no longer be easily deduced from the result. To determine the net result, one must first deduct the purchase of the commodities required in the transformation process from the gross proceeds. The result may now have been influenced by changes in the exchange values of those intermediate commodities. Technical progress may also have occurred in their production process. They must be checked for this, as well as the production of commodities that these supplying firms have to purchase themselves.
There is a chain of checks to be carried out that runs through the entire allocation. It also becomes impossible to determine the technical progress of a sector separately in the case of mutual deliveries. This is only possible if one is aware of the technical progress in all sectors, if one determines the technical progress of each sector simultaneously.

I take the floor again, my sceptic reads along in agreement. Changes in the production structure must be determined for the entire allocation at the same time. For all products offered on the market, for all transformation processes, it must be checked simultaneously whether there have been any changes in the production circumstances of each individual commodity. Once again, the twofold valuation should be used.
The appendix gives an idea of how to imagine this valuation – and there are still many problems before it can really be applied effectively to reality – as well as an idea of how to approach, how the twofold valuation can be used in the case of the most complicated production structure in such a way that the technical progress of each sector can be calculated. Some more information is required for this: one must know how much each sector receives from other sectors, the amount of exchange value of these supplies.

Thus, a problem results in which all commodities are expressed through their exchange value in the same commodity. My sceptic, however, is confronted with another problem, if he hopes to deduce the production structure from all my data, a problem of a dimension equal to the number of different commodities. An unsolvable problem, or… he will also make these commodities comparable. He has to take a step. But even before he is forced to take this step and replace commodities with labour quotas, by distinguishing direct and indirect labour, he falls short on the point of simplicity.
If my sceptic has unravelled the totality of exchange value amounts and is faced with this totality of commodity transactions in one period, he observes another total of transactions in a next period. From the differences that emerge in the size and composition of the commodities produced, he wants to determine where, in which sector, production circumstances have changed. But from these commodity transactions, commodities that are either transported outside the sphere of the transformation processes for consumption, or that remain within it and are supplied to each other by the firms themselves, he cannot deduce the production structure as it has operated over a period of time: he still lacks data on the use of durable and previously purchased machines, machines that may not yet need to be replaced.
Or… He makes himself familiar with the production structure by making the assumption that the machines that have now been purchased are the replacement investments of each sector separately. So, he must regard both periods that he wants to compare as belonging to a stationary economy. He must presuppose a stationary economy. But I reject every presupposition.
In short, he falls short[2].

He falls short, where my valuation method first shows fullness. The power of the concept of considering the product of the same quantity of labour to be invariable in value over time.
A difficult step.
For just as the structure of production is unknown to my sceptic, so this structure of production is also unknown to me.
In the example above, I have presented you with a verification based on a simple production structure. I have shown how the results of the twofold valuation correspond to the technical progress that can also be derived directly from the production structure. A difficult step must be taken, one must see how this method of verification gets stuck in the assumption of a stationary economy.
Or more sharply, the concept of technical progress that has just been defined in the example on the basis of the production structure, whereby this structure is in turn defined by the quantities of labour required to produce a commodity, this concept also breaks down on the premise of stationary economy if one wants to make this concept – by which technical progress results from a change in the production structure, from less required labour – also to be applicable in the event that the production structure includes transformation processes of commodities in commodities of a

[2] More explicitly, in the handling of capital commodities he falls short. By assuming a stationary economy in which investments are equal to the required replacement investments, these capital commodities can be treated in the same way as the intermediate commodities that firms supply to each other. But it must be noted that one only gains insight into the direct and indirect labour required for the replacement investments and not into the indirect labour stored in the capital commodities that are not replaced. This problem is addressed in the main text of the note, however not always in clear terms.

different kind[3] than the commodities which sectors supply to each other. All use of commodities would then have to be reduced to the same denominator, the same as in the example where every production process is characterized only by the use of labour. But this tracing of the commodities transformed in a period back to the labour that created these commodities is only possible and only provides an exact picture of the production structure under the premise of a stationary economy.

Like my septic, to make this concept of technical progress workable, one must construct a production structure in terms of direct and indirect use of labour. One would think that this would show the difference with my sceptic.
"From the concept of value he has developed a method that works without knowledge of the production structure, he deduces directly from reality whether the production circumstances have changed. He now says that these results can be verified if reality corresponds to a stationary economy, after all, then the production structure can also be derived directly from the allocation of labour. He rejects his sceptic because reality cannot be a stationary economy, and shows that his method can only be verified in theory."
This view is simplistic and the idea of merely theoretical verification must be rejected. Reality is not a stationary economy and the concept of technical progress is therefore blurring. Nevertheless, it is difficult to conceive of technical progress other than in terms of labour required. A limited imagination forces one to resort, as it were, to the premise of the stationary economy. Or... one should say in a stationary economy I see the basis of any concept of technical progress emerge most clearly, any concept of changes in production circumstances finds its basis in changes in required labour, in changes in the allocation of labour.

What do I mean by technical progress, what do I really mean by it?
First of all, I use this concept in a different sense than those who want to indicate by means of a number the extent to which technical production possibilities have increased[4].
It is actually better to speak from now exclusively about changes in production circumstances. After all, I consider technical progress to be negative if, for example, production becomes less efficient due to a decrease in demand, a decrease that is also so small that the machine park cannot be reduced. Both situations may possibly belong to a stationary economy, so that in that case one can determine to what extent the units of this commodity will be produced relatively with more use of labour, directly and indirectly.
But the concept that changes in production circumstances derives from required labour seems to fail if one looks for a further connection with reality, if one also wants to read from changes in production circumstances whether the investments in a certain period were of the right size, or that an investment that initially seemed pointless and left large capacity unused for a number of periods, turns out to have been useful in later periods.
To what extent can I get such information if I want to trace all changes in production circumstances to required labour? Such a concept does not distinguish between too much or too little investment in a period, it pretends that the actual investments belong to a stationary economy and in case of too much investment it decides on a deterioration in production circumstances, or vice versa if investments are postponed, to an improvement.

[3] This refers to capital commodities that can contribute to the production of commodities over several periods.
[4] Here the measurement of technical progress from the development of the absolute quantity of direct and indirect labour required for the production of a commodity is rejected. The twofold valuation only measures changes in direct and indirect labour required for production.

The concept that aims to trace changes in production circumstances to use of labour, cannot, precisely because it only takes into account use of labour, encompass reality. It is based on the premise that the allocation of labour in each period represents a stationary economy.

For the second time I allow myself a simplistic representation of matters, imagine that someone thinks:
"I understand that a determination of technical progress on the basis of a production structure derived directly from the movements of commodities over a period, from the actual allocation of labour, pretends that this allocation and use of supplied commodities belongs to a stationary economy, does not provide an accurate view of actual technical progress. The numbers that this provision attributes to the sectors may give a distorted picture. But what guarantee do I have that his method of twofold valuation will not produce a distorted picture?"
And he goes further and suspects that the twofold valuation results in exactly the same distortion, assigning the same numbers to the sectors, as the method that deduces changes in production circumstances directly from the production structure. But this presumption is incorrect and any conclusion that the twofold valuation does not provide a better understanding of changes in production circumstances is premature.
On the contrary.

I split the method of twofold valuation into two: two independent, twofold valuations.
In a moment I will demonstrate their operation within a stationary economy and show how they add a wealth of information to the method that deduces changes in the circumstances of production directly from the production structure, they make it possible to reconstruct the whole of production within a stationary economy.
But because these methods are constructed from data derived from reality, both methods transcend the premise of a stationary economy and are able to provide – in the same way as they do for the stationary economy – a picture of reality, of the production circumstances, they show how and where changes are taking place.
What does it mean, to provide an image of reality? The two methods combine data from reality in a certain way, they create structure within that reality. Is that what you call providing an image of reality? No. A structure only evokes an image of reality if a concept breaks through within this structure. As is the case with both methods of twofold value determination. These structure reality in such a way, in such a way changes in production circumstances are described that such collection of data and processing within a fictitious reality, within a stationary economy, leads to the same outcomes as when changes in production circumstances in that stationary economy are traced back to changes in quantified required labour.

But you say, reality is not a fictional economy, how can I still find this concept of required labour in the series of numbers produced by both methods?
That is the problem. This concept of labour requirements, the basis of any understanding of changes in production circumstances, can only be clearly articulated in a stationary economy. Beyond that, the concept of what is meant by a change in production circumstances becomes obscured and it is so difficult to grasp that one in the wording always looks back for its basis.
By comparing the series of numbers, one wants to determine to what extent reality deviates from a stationary economy, and one wants to know to what extent those numbers are also numbers that reflect changes in the required labour. Or alternatively, to what extent one can deduct from the

series of numbers that the changes in the production circumstances they represent are based on changes in required labour[5].
However, the concept of required labour provides guidance for both methods and support in a special way.
After all, within a stationary economy every method of twofold valuation has been defined, i.e. if a method is used within a stationary economy, it delivers results that do not contradict the concept based on quantified required labour. As it were, this concept verifies the two methods separately. But then both methods also verify each other. Through this concept of required labour, both methods can be linked together.
Based as they are on the concept that describes the production circumstances and traces them back to required labour, this concept can be dropped between the two methods, this concept is no longer necessary for their verification.
Because they are composed of data derived from reality, both methods can also be subject to the requirement of verification if the data used is no longer derived from the fictional reality of the stationary economy, but represents reality itself.
It is precisely the verification that can be carried out every period again and that must always again comply and be absolutely valid, that verification provides support for the image of reality. From the verification I know that the picture that both methods provide me of the changes in production circumstances is reliable.

The distinction between the methods of twofold valuation lies in the use of different definitions of the result.
You have already become acquainted with the first definition, the first method of twofold valuation is based on a definition that equates the result of a firm with the proceeds from the sale of commodities in a period minus the amount for which commodities were purchased in that period (*thus minus not only the amount of intermediate commodities but also of purchased capital commodities*) [6].
The concept of value also allows a second definition of the result. I have shown you a large number of definitional equalities, the total of consumption, their total exchange value, is equal to the total result and if you want to complete this circle, the total result is equal to the benefits that firms make to those entitled to consume (*or to buy capital commodities*). In the second definition, the result is measured by the benefits it makes to individuals who can thus seize the commodities (*including capital commodities*) that leave the transformation processes[7]. These data can also easily be derived from reality.
One does not need to know exactly how a firm will spend the incoming funds. Investment decisions, a decision regarding replacement or expansion of a firm's machinery, or reservation or lending to other firms, regardless of these types of decisions, one does not need to know about them. If a firm

[5] The goal expressed in this paragraph is precisely what the twofold valuation will achieve.
[6] For clarification, from now on I will occasionally add italic text between brackets.
[7] This is where your translator must intervene. The definition of the result in the second method is equal to the proceeds of all sales minus only the intermediary deliveries. This implies that the result in this definition in a period is equal to the total exchange value of consumption and investment commodities together that are produced in that period. I eagerly refer to *A Reappraisal of Ricardo's Principles – On measuring technical change*.

expands significantly, spends the entire proceeds from sales on purchasing new capital commodities and borrows from another firm to pay wages and dividends, the money borrowed and paid out is the result of this firm.[8]
Based on these payments, which are equal to the total exchange value (*of consumption and investment commodities*) within a period, a valuation is again possible. In a familiar manner, the commodities are again expressed in their total exchange value, but this total is now attributed to the allocation of labour in a different way.

I spoke of the total exchange value of commodities, but to be sure I point out that it is incorrect to want to express the commodities as a percentage of the total sales of commodities, a total that is greater than the sales of consumer commodities. One might think that the occurrence of intermediate deliveries would change the valuation in this direction. The incorrectness of this idea becomes apparent, for example, if a merger occurs between two sectors. In the future, their mutual supplies will withdraw from the market. The merger affects the total sales. However, the total exchange value of the commodities that leave the sphere of the transformation processes remains unchanged by such a merger. I would like to clarify the operation of both methods of twofold valuation and their characteristics using an example.

Suppose there are five identical firms that use machines with a lifespan of five years, and in each period it is one firm's turn to replace its machine. Suppose further that the allocation of labour is in equilibrium and that no technical progress occurs.
The first method of twofold valuation now shows the following picture of a firm.
Every five years the firm experiences a sharp decline in results, possibly even negative. The amount involved in replacing a machines will be fully charged to the period in which it is replaced. However, the periods in between provide a positive result.
The twofold valuation, whose components, the exchange value of one commodity per the total of exchange values and the result and average result per worker, remain unchanged, then signals a change in the production circumstances when a machines is replaced while in fact the production process continues unchanged. In this way, the valuation always shows which firm replaces its machine.
But for all firms together, if one looks only at the sector as a whole and wants to indicate the changes in production circumstances, in that case, because in the example the sector belongs to a stationary economy, the valuation corresponds exactly, concludes to the same results as when changes in production circumstances are deduced directly from the production structure of this sector. For the individual firms, however, the valuation shows a sudden deterioration, then an improvement that lasts for some time. It shows when the machines are replaced, while cumulatively the valuation shows no change in production circumstances. Cumulatively, it determines exactly to what extent production can be achieved with less labour required[9].

The cumulative valuation, the first method. I'll add the second.
Based on the result that equals the payments, the valuation shows the same unchanging picture for all five firms in each period. The five firms pay out the same amounts per period, but because the

[8] Here too, it turns out in a complicated way that the result is considered to be equal to the total of consumption and investment.
[9] This first method corresponds exactly to the first approach of twofold measurement of technical change as described in *A Reappraisal of Ricardo's Principles – On measuring technical change*, p. 18.

firms have to make major expenditures every five years, they always put money aside in the other periods, they make reserves. Or… it is also possible that each period four firms invest their undistributed proceeds for the short term and enable a fifth firm to replace its machines.
If less has to be paid for the purchase of the machine, if the machine's exchange value permanently declines, at the same time the five firms can also reduce the price of their product, regardless of whether they already use the cheap machine. The firms need to reserve less and can therefore pay out more or lower their sales prices equally. The twofold valuation shows no change in the circumstances of production, it is insensitive to these kinds of changes in the exchange rates.
But suppose the machines do not become cheaper, they remain the same price, but the use of a new machine makes labour savings possible, then the valuation immediately shows the technical progress if a firm actually uses the new machine. In each period for five years, it is one firm's turn to see its result per worker increase sustainably.
However, the credit structure between the firms could be such that it allows the other firms that cannot yet benefit from technical progress, to share in this benefit through a higher credit price. The second method of twofold valuation then indicates a change in the production circumstances of each firm, the technical progress is observed for all together over a period of five years[10]. The connection between the firms is so strong that they can be considered as one.
In the stationary economy of this example, this method decides on exactly the same changes in the production circumstances for all firms taken together, as one decides on the basis of the production structure. Or… in a stationary economy, regardless of the intertwining of the sectors through credit, in each period the method of valuation based on the payments for the entire allocation always yields the same figure as the average of technical progress that can be derived directly from the production structure.

By using both methods of twofold valuation in coherence, one sees how much more information is provided: a view of changes in production circumstances, broader and more differentiated than when within a stationary economy one adds a number to each sector from which one calculates the change in required labour per unit of product. In reality, however, such numbers cannot be added to the sectors, one has no knowledge of the production structure. However, one can construct series of numbers that suggest changes in required labour.
The first method requires familiarity with the total exchange value of the (*intermediate and investment*) commodities that the firms supply to each other, regardless of whether a firm also directly pays for the supplied commodities. The second method, on the other hand, expresses what total consumption (*and investment commodities*) are brought onto the market by all firms. Here one must know the amounts that firms transfer to each other and what changes occur in debt or asset positions (*you should ignore this last sentence: it became redundant by adding investment commodities to consumption*).
But the data, required to be known in both methods, can all be derived directly from reality. It is clear that an enormous amount of work remains to be done before the methods find their general formulation.

[10] This is not right. The description of the second method unnecessarily resorts to the financing structure. This gives rise to confusion and can also be missed by simply equating the result of all firms in a period with the consumption and investment commodities produced and marketed in that period. The second method then immediately shows where new machines make labour savings possible. Even though firms are linked by their financing structure, the method shows where in which firm labour savings are actually achieved.

Awesome, so much work. Although the approach in the appendix for the first method can be relatively easily extended to the second method. The search for the general formulation is considerably facilitated by the certainty that both methods (*in principle*) must amount to the same results in the long run and on average.
The first method of valuation cumulatively provides a reliable picture of the changes in the required labour for each sector separately. From the example it will be understood that the verification between the two methods consists in that the changes in the production circumstances of all sectors, on average and over a large number of periods, (*in principle*) must correspond to the average determined by the second method.

(*In principle, on the condition that actual investment, for example, always correspond to the investment required for production. However, if there is overinvestment or investment in production capacity that is not or only partially put into use, the first method will show that the direct and indirect labour associated with those unnecessary investment has a negative influence when determining the sum with the labour savings achieved elsewhere.*
In the second method, in which investments are treated equally as consumer commodities, it is only determined to what extent these investment commodities have actually been put into use. The second method then supplements the first by showing the labour savings resulting from the actual use of the new investments. This reveals a second reason why the measured technical progress can differ between the two methods: if relatively more and more capital is required for production, the labour effort required for this will be well reflected in the first method. However, the second method does not provide insight into this additional labour effort.
With this comment I hope to have equipped the reader sufficiently to read the rest of the note without further comments and only to have an eye for the way in which the two methods of twofold valuation were arrived at.)

The second method seems to refer only superficially to the concept of required labour, after all it seeks connection and gives an impression of the possibilities that firms open up to enlarge consumption. Whether they obtain these opportunities through technical progress in their own firm, or whether a firm increases its results by sharing in the proceeds of another firm, increased returns arising from a change in production circumstances made possible by the granting of credit to the first firm: the second method does not immediately look back at where, in which firm, production circumstances have changed.
But in addition to the first method, which shows which firm has purchased machines in a period, a lot can be derived from the numbers of the second method: the picture of the first method becomes more clear by adding the results of the second method. Or more specifically, using the first method one can find out to what extent sectors are intertwined through lending, and to what extent technical progress in one sector also improves the results of other sectors. It will be seen to what extent technological progress is the result of joint action and only becomes possible through the granting of credit.

Although the second method does not directly identify in which firm the production circumstances have changed, it also does not provide an accurate picture of the changes in the production circumstances of the allocation as a whole.

Again, this image must be corrected using the first method. After all, it is possible that excessive investments have been made in a given period. The second method, its figures for the allocation as a whole would give a distortion and indicate a deterioration in production circumstances, according to the changes in required labour reflected therein.
Only afterwards can one determine whether too much has indeed been invested in a period, and whether part of this production capacity has remained permanently unused. Or it will be seen that when this capacity is put into use at a later date, it will worsen production circumstances in the capital commodities industry due to a decrease in demand for its product.
In that case, the initial conclusion of a deterioration would have been correct. Be that as it may, the first method immediately shows whether more than normal investments are made in a period, immediately it determines whether the purchase of new machines is accelerated in a period.
In this way, the cyclical movement within the allocation is also reflected, a movement that makes it difficult to directly connect with the concept of required labour. Although... one must clearly see what the influence of this business cycle is, it only clouds the view of the concept of required labour insofar as shifts occur within the allocation of labour, within the labour employed, with relatively more direct labour being spent in one period to producing commodities that leave the sphere of transformation processes than in the other period.
After all, in the event of a business cycle in which more labour is employed in one period than in another period, this fact alone does not cloud the method of valuation. It will be corrected accordingly.
The concept of value calls the flow of commodities that leave the sphere of the transformation processes only then invariable in value if the total quantity of labour employed remains the same in each period.

It is clear that the total exchange value of the commodities that leave the sphere of the transformation processes in a period must always be linked to the quantity of labour performed in that period. If this quantity changes, the total exchange value must also be changed in equal percentages. Therefore, if ten percent more labour is performed in a next period, the total exchange value, the total result of this period, must be corrected and multiplied by 1/10, by the factor that represents the change in the quantity of labour performed.
This correction is sufficient to maintain the best possible view of production circumstances, a view that naturally allows for a better understanding of the labour required as the sectors become more gradual in their activity. Possibly then both methods attribute the same figure to a firm that exactly reflects the changes in labour required.
The methods differ when the firms become less similar to firms from a fictitious, stationary economy. And it is precisely from these differences that many details can be deduced. It can be seen whether old machines have been replaced by new, possibly similar ones, or whether a sector has undergone major restructuring. But one can also read whether such a sector has had to pay a high price for the credit, if after the restructuring the result per worker cannot be significantly increased, while cumulatively significant technical progress appears.

The Twofold Valuation – capital letters I reserve for these two methods of twofold valuation – provides such a structure in reality that one can regain the concept that changes in production circumstances can be traced back to changes in required labour. A concept that, it seemed, can only

be clearly expressed in an allocation of labour that represents a stationary economy, after all, then one can see how a change in required labour finds its way into changes in the allocation of labour, as conversely one can determine from changes in the allocation of labour the changes in required labour per unit of product.
Now, this allocation of labour is observable in reality. The two methods of twofold valuation illustrate this allocation of labour and suggest changes in required labour.
One must pay attention to commodities that are being brought onto the market in the period that they have just been completed. And on the one hand, determine the exchange rates of these commodities, but on the other hand, one must see how their total exchange value provides a numerical illustration of the allocation of the labour that created these commodities.
Absolute value is opposed to a flow of commodities. The quantity of labour that maintains this flow, if this quantity of labour remains the same period after period, then the total of commodities that are supplied to the market for consumption and which can show great differences in size and composition, is said to be invariable in value.

Appendix

Even in the case of mutual deliveries, it must be possible to determine where production circumstances have changed using the twofold valuation.
However, the general form of the method is not easy to formulate. One can try to figure it out and look for an example of the formulation that has general validity within the space of this example.
Another example.
And one must be sure of oneself and know that for a series of examples the specific formulations will show general features, know that all these formulations can be brought under one denominator, that these are specializations of the general formulation of the twofold valuation.
This appendix gives four examples. Three closely related, the last completely different.

The starting situation in the series of three is always the same. The production structure is as follows:

Period 1

A	5 workers	->	10 units of commodity A
B	5 workers + 5 units of commodity A	->	5 units of commodity B

The first example varies the exchange ratio between commodity A and B. Regardless of these changes, valuation can precisely determine technical progress if it is reflected in an increase in firm B's production.
So

Period 2

A	5 workers	->	10 units of commodity A
B	5 workers + 5 units of commodity A	->	10 units of commodity B

B's production will rise in period 2 to 10 or even 50 units, it doesn't matter. The formulation for this example in which firm B's input is kept unchanged is

$$\begin{pmatrix} 1 & 0 \\ \frac{totexchv}{exchv\ inputB} & 1 \end{pmatrix} \begin{pmatrix} \frac{exchv\ A}{totexchv} \\ \frac{respw\ A}{avrespw} \\ \frac{exchv\ B}{totexchv} \\ \frac{respw\ B}{avrespw} \end{pmatrix} = \langle 1, \frac{1}{1-\rho_B} \rangle \begin{pmatrix} 1 & 0 \\ \frac{totexchv}{exchv\ inputB}(1-\rho_B) & 1 \end{pmatrix} \begin{pmatrix} \frac{exchv\ A}{totexchv} \\ \frac{respw\ A}{avrespw} \\ \frac{exchv\ B}{totexchv} \\ \frac{respw\ B}{avrespw} \end{pmatrix}$$

where

exchv	exchange value of a commodity
totexchv	total of exchange values
respw	result per worker of a firm
avrespw	average result per worker
exchv input B	exchange value of the input that B receives from A.

(*I will leave out the other examples because they are also incorrectly looking for a general formulation. Incorrect, because they are only aimed at filling in the cells of the matrix next to the*

main diagonal with values equal to 1. The paper "A Reappraisal of Ricardo's Principles – On measuring technical change" shows that it is precisely the filling in of the main diagonal that determines the correct formulation of the twofold valuation. I would also like to refer to the Excel file "Measuring technical change" that shows how the twofold valuation works.)