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New Aspects of the Labour Theory of Value

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Introduction

Within the past 100 years the Marxian Labour Theory of Value (LTV) was the target of fierce debates and controversies. As Morishima¹ correctly stated already in 1972, it was a “great misfortune that economists have for a long time been divided between ‘orthodox’ and Marxian camps as a result of cliquishness; each school has lost touch with the others and has become inbred.” Today, after the implosion of the Socialist Countries, we can start a fresh try taking stocks and asking which parts of the Labour Theory of Value can be carried on into the future and which ones we have to abandon and throw them on the heap of garbage of history. In the author’s opinion one should not stop here and only refer to the reproduction of past positions of the LTV, but instead modify and, if necessary, (re)create and develop further parts of the Theory according to the changed basic conditions of the contemporary political-economic, ecological and social environment and taking into account the innovations in science and technology.

¹ Michio Morishima: Marx’s Economics – A Dual Theory of Value and Growth. Cambridge University Press, Cambridge, 1973: 1

This paper intends to illustrate the state of the art of the LTV by empirical data, to present a few new theoretical insights and to identify some promising fields of research within the framework of LTV and its application from an individual viewpoint.

Basic features

First some basics: The LTV is based on the assumption that human beings have to labour, in order to manage the metabolism of society with nature and with their fellow men and to transform natural substances into human materials. This transformation creates “values in use”¹. The meaning of the term “use value” is essential for a correct analysis. “Value in use” is in my opinion a very extensive and broad concept. It includes any good or service useful to somebody. Values in use can meet consumer needs directly, but can also function as means of production and auxiliary materials. The production of values in use can be done by a combination of means of production and auxiliary materials and manpower, but they might also be produced by nature. In principle, we can distinguish between two different kinds of values in use: Material values in use which are reified in goods and therefore remain fixed over a certain period of time, and “immaterial” values in use which disappear in the moment of their production. In common terms we could call them “goods” on the one hand, and “services” on the other. This difference is crucial not only for the understanding of the

1 “The word VALUE, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys. The one may be called 'value in use ;' the other, 'value in exchange.' The things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce any thing; scarce any thing can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.” Adam Smith: *An Inquiry into the Nature and Causes of the Wealth of Nations*. Methuen and Co., Ltd., ed. Edwin Cannan, London 1904. Fifth edition. Volume I, Chapter IV. <http://www.econlib.org/LIBRARY/Smith/smWN.html>

following paragraphs, but also for certain empirical properties of a real economy like possible growth rate or average rate of profit. While material products or goods (we use them synonymously) can be part of the surplus product (which in my opinion is always material), services cannot. Both kinds of values meet human needs, but services are restricted to consumption, and excluded from capital investment. This does not mean, however, that services would not be important for economic development; on the contrary, many services are essential for qualitative changes of the economy (like research activities, education and training, fine arts, literature).

Already with the emergence of humankind women and men started producing goods and services for each other. Their work could be directly seen and understood as a kind of care taking to their fellow (wo)men. In fact, one can say that division of labour separated people from each other – but at the same time they are bound to each other – creating communities and - society. Although in the course of history people always created “values in use” - although in different quantities and qualities - different social structures can be identified in the past and present societies how and by whom values in use were produced and appropriated. Today capitalistic relations of production dominate, i.e. the capitalists acquire the command over human labour by paying the workers more or less their costs of reproduction, and combine their work with machines, buildings, auxiliary materials, and services, in order to let them again produce machines, buildings, auxiliary materials and services, however in other composition. The reproduction of the worker is left to the households. If technology and wage rate permit it, the value of the output determined by the market is higher than the costs of its production: The difference forms the basis for the profit of the capitalists. In his anatomy of capitalistic society Marx identified the commodity as the basic element of wealth. A commodity needs a material substrate which carries exchange value, whose quantity is determined by the market. In the markets the outputs of the individual firms are compared with each other and the market determines (in the ideal case) a uniform price. In analogy to the theological discourse of Last Judgement of Roman Catholics, the bad ones are punished for being lazy (or inefficient), the good ones can proceed to the (neoliberal) paradise, i.e. those who produce high quality at low costs, receive an extra profit, while the other make losses and are expelled from the market. Thus the market works as a societal machinery of increasing efficiency which forces the entrepreneur to innovate permanently and to do everything to reduce production cost. In the first volume of “Kapital”, Marx looked for the qualitative and quantitative conditions at which individual goods can be exchanged in the market. In agreement with Adam Smith and David Ricardo he identified labour as being essential for the exchange, and labour time as its quantitative measure. Starting from there, Marx elaborated his theory and identified the labour value of a commodity as socially necessary average labour time. According to Marx, the labour value consists of two additive components, of the value c of constant capital, used in the production

of the commodity, and the newly added labour time, n . n is central for the understanding of Marx' theory of exploitation: Under capitalistic conditions it is split into two parts, variable capital v , which is given as wages to the workers, and surplus value m , which remains with the entrepreneur. v is called variable, because it is the only element in the production process creating more value than is needed for its production. Thus we end up with the famous formula of trinity: The labour value w of a commodity is made up of the sum of constant capital c , variable capital v and surplus value m :

$$w = c + v + m$$

With these basic definitions the essential variables of Marxian theory can be stated: rate of surplus value m/v , organic composition of capital $v/(c + v)$ and rate of profit $r = m/(c + v)$. The product of rate of surplus value times organic composition of capital equals the rate of profit.

Many speculations of political economists have been linked to this term. Marx himself formulated a tendency of the rate of profit to fall. Some of his successors used this formula to predict the break-down of capitalism with the following argument: If the rate of surplus value remains constant (an assumption frequently used by Marx himself) and accumulation and technological change proceeds, organic composition would have to fall and the rate of profit would have to go to zero: end of capitalism. But as one can easily show, this is wishful thinking. If we take for granted that all components of value are revaluated at replacement value, all components can be reproduced at less and less labour time (because of more and more automated production). In such a case all components of the rate of profit are linear function of life labour n . Nominator and denominator depend equally on n . If n goes to zero, r is an indefinite value $r = 0/0$. This does not mean that r becomes zero, but the quotient of the derivatives of nominator and denominator.

$$r = m/(c + v) = (a_1 * n + b_1) / (a_2 * n + b_2 + a_3 * n + b_3)$$

r becomes either $a_1/(a_2 + a_3)$ or – if the b_i 's are not zero - $b_1/(b_2 + b_3)$.

To modernize Marx' economic theory in terms of mathematics it has been an interesting step forward to apply linear algebra and the matrix calculus to it (like many others have done before: e.g. Leontief¹, Brody² and Morishima³). From there it becomes evident that Marx' theory can be seen in a dual way, from the point of view of (i) values in use and of (ii) unit values in exchange (or unit prices). A third level (iii) is possible in terms of values – meaning unit values – or unit prices – times the number of values in use – or number of units.

Let us present the formulae in this order: Firstly, from the point of view of values in use at level (i). The matrix of technical coefficients A represent the technology of the economy. Gross output x (a column vector) contains the amounts of values in use in the economy. By kind of use it can be split into intermediate goods Ax and final demand y .

$$Ax + y = x \quad (1)$$

Secondly, from a dual point of view one can break down the unit price/value p (a row vector) into the costs of intermediate goods used in production pA plus the value added per unit v .

1 Wassily W Leontief: Input-output economics. In: Scientific American, October 1951a: 15–21; Wassily W Leontief: Input-Output Economics. 2nd ed., Oxford University Press, New York, 1986. First ed. 1966.

2 Andras Brody: Proportions, Prices and Planning: A mathematical restatement of labor theory of value. North-Holland Pub. Co., Budapest, Amsterdam, 1970.

3 Michio Morishima: Marx's Economics – A Dual Theory of Value and Growth. Cambridge University Press, Cambridge, 1973.

$$pA + v = p \quad (2)$$

Finally on level (iii) we can write a synthesis (on the level of turnover):

$$\text{diag}(p) A \text{diag}(x) \mathbf{1} + \text{diag}(p) y = \text{diag}(p)x \quad (3a)$$

and

$$\mathbf{1}' \text{diag}(p) A \text{diag}(x) + v \text{diag}(x) = p \text{diag}(x) \quad (3b)$$

$\text{diag}(x)$ is a square matrix with the elements of the vector x as main diagonal. $\mathbf{1}$ is a column vector of ones, $\mathbf{1}'$ is the transpose of this vector.

Under the condition that unit labour values w are nothing else than a special price system (we will go into the details later) equation (2) can be written in the following form:

$$wA + n = w \quad (2a)$$

In (2a) we replace the vector of unit value added v by the row vector n (life labour per unit of output). wA is the cost of production expressed in labour time. A simple matrix transformation with the so called Leontief-Inverse $(E - A)^{-1}$ allows to solve (2a) for w (E means the unit-matrix with only ones in the main diagonal)

$$w = n(E - A)^{-1}. \quad (4)$$

w is identical with Marx' labour value (per unit) of the first volume of Kapital. His idea is that in an economy where commodities are exchanged according to their labour value, the value content before and after an exchange remains the same. Values in use produced by a certain amount of socially necessary labour time can be exchanged against other use values produced by the same amount of labour time. The exchange allows replacing one's goods by other goods which were produced by the same amount of labour time. While the qualities of use values change, the quantities of labour values remain the same before and after the exchange. This is the condition of the so called „equivalent exchange“.

Material production vs. services

If some of the industries do not produce material products, but services, the axiom of “equivalent exchange” in a real capitalist economy would be violated. Let us show this by

means of a thought experiment: Let us assume that the first 10 sectors of an economy with 20 branches produce material products, and the last 10 services. If we take stock of the surplus product, we can see that only the sectors of material production contribute to it in physical form. If now – as is the case in a capitalist economy, also service sectors are able to make profits and to do investment, they would by parts of the surplus product. But then it is impossible for the producers of the surplus product (the first ten branches) to buy goods of the full value they have produced, because they have to share the surplus product (capital investments) with the service sectors. There is only one possibility how to save the principle of “equivalent exchange”: One can set up a price system which does not allow the service sectors to make profits. In the latter case all the services have to be accounted according to their cost of reproduction. The necessary goods for the production of services are completely produced outside the service sectors. But this also means that in service sectors there is no contribution to the labour values of the economy. Workers in the service sectors do produce neither labour value nor surplus value. On the contrary, in a first approximation they consume values from the sectors of material production. Otherwise the principle of “equivalent exchange” would be violated.

In the discussion of economists this difference between value producing and value creating sectors was reflected in various, but somewhat hidden ways: The first line of discussion was centred about “productive” and “non-productive labour”¹. One can trace this line back to Adam Smith: “The labour of some of the most respectable orders in the society is, like that of menial servants, unproductive of any value, and does not fix or realize itself in any permanent subject; or vendible commodity, which endures after that labour is past, and for

1 Zentralinstitut für Wirtschaftswissenschaften der Akademie der Wissenschaften der DDR: Produktive und unproductive Arbeit im Sozialismus – Literaturbericht über die Diskussion in sozialistischen Ländern, Berlin 1986. This publication was supported by the research project „economic growth and structural change (Nr. 2702)“ which was financed by the Anniversary Fund of the Austrian National Bank.

which an equal quantity of labour could afterwards be procured. ... Their service, how honourable, how useful, or how necessary so ever, produces nothing for which an equal quantity of service can afterwards be procured. ... In the same class must be ranked, some both of the gravest and most important, and some of the most frivolous professions: churchmen, lawyers, physicians, men of letters of all kinds; players, buffoons, musicians, opera-singers, opera-dancers, &c. ... Like the declamation of the actor, the harangue of the orator, or the tune of the musician, the work of all of them perishes in the very instant of its production.”¹ This assessment is closely linked to the way “productivity” is defined. In my opinion, it seems to be useful to distinguish three kinds of productivity.

Productivity(i) could be measured in the number of use values per life labour time independent of relations of production.

Productivity(ii) could be measured by total labour value created over life labour spent. This is the meaning of productivity by Adam Smith.

Productivity(iii) could be measured by the amount of profit acquired by the workers (measured in hours or in wages) for their master. The latter is the usual measure of profitability applied under capitalistic rule.

There are of course different variants of measurement. Important is, that productivity(ii) is zero with respect to services which cannot add to the surplus product or capital investment. Nevertheless, in real capitalism, service production can gain profits via productivity(iii).

The second line of discussion can be located around the different systems of national economic accounting, the System of National Accounts (SNA), used in the capitalistic world, and the Material Product System (MPS), used in the imploded Socialist Countries. While, “in the SNA, commodities are, broadly speaking, marketed products whether these be goods and services; whereas, in the MPS, the concept is restricted to material products and excludes

1 Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* f Book II, Chapter III, *Of the Accumulation of Capital, or of Productive and Unproductive Labour*
<http://www.econlib.org/LIBRARY/Smith/smWN.html>

many of the services included among commodities in the SNA.”¹ In the terminology we use throughout this paper one could state that SNA is counting “values in use” measured by market prices, irrespective of goods or services. On the contrary, the MPS focused mainly on goods production by allowing only for a few sectors which were linked with material production like transport or with the “reproduction of the labour force” like health care. Today, SNA is the surviving system more or less exclusively used and promoted by the United Nations and in a specialised form by the Member States of the European Union.

If we take stock of the economic activities of one country under the perspective of material products only, one could represent them by their (re)production cost. But it evident, that the origin of the material goods used for the production of services (intermediary products and consumption) is in the sectors of material production. And from this perspective, services would represent a second (or more) counting of material products, because the material products used for the production of services were already included in the accounts of the sectors of material production. The only kind of goods which is never counted double or multiple is the surplus product – in a very rigid definition of the term. Precise double accounting would be the case if services would not use services also (meaning the sub-diagonal matrices of services are zero).

Before we illustrate the computation of labour values on the basis of empirical data from Austria, I would like to present Austrian gross output data² at actual prices 2003 and their decomposition for 57 branches of production based on the Austrian input-output statistics. Figure 1 shows the structure of the gross output at actual prices divided by constant capital³

1 Richard Stone: *Mathematical Models of the economy and other essays*. Chapman and Hall, London 1970. Chapter XIII: A Comparison of the SNA with the MPS: 201-233; 201.

2 See http://www.statistik.at/web_de/statistiken/volkswirtschaftliche_gesamtrechnungen/input-output-statistik/index.html

3 Because of lack of data constant fixed capital was neglected. Mathematically speaking would it be easy to include also fixed constant capital and not only circulating capital.

(green), variable capital (blue) and surplus value (red). The branch of production with the highest relative surplus value is „leasing“ (no. 46), followed by „real estate“ (no. 45)¹. It is also worth mentioning that the last branch of production, services of private households, shows negative surplus values.

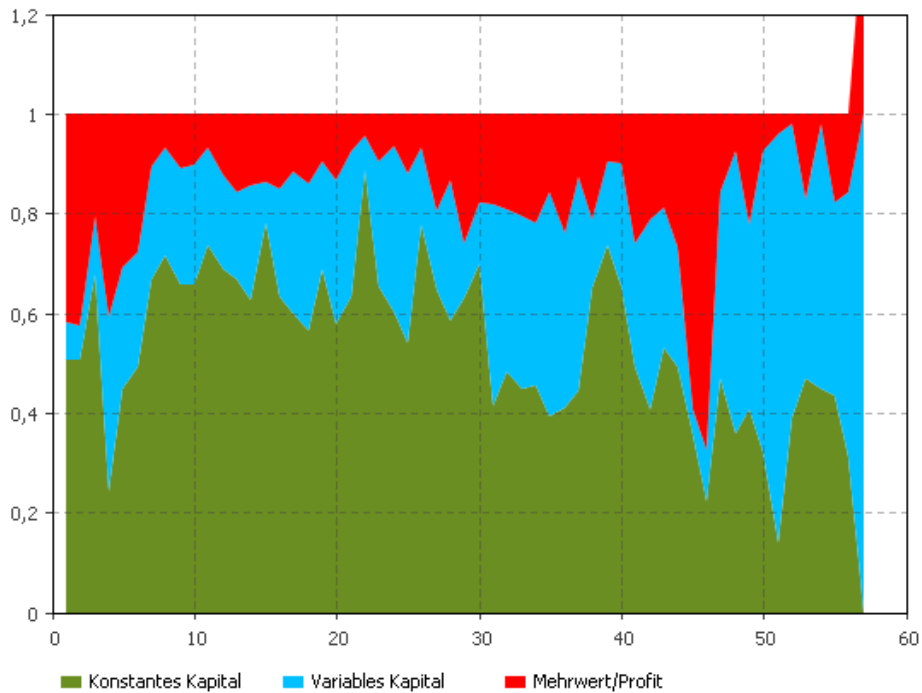


Figure 1: Actual prices, Austria 2003, 57 branches of production

¹ The names of 59 branches of production one can find at http://www.statistik.at/web_de/static/aufkommens-_und_verwendungstabelle_2003_019869.xls, where three branches are aggregated to one sector: “Crude oil, gas and ore mining” to end up at 57

Figure 2 presents the rate of profit, the rate of surplus value and the organic composition of capital for the 57 branches of production. One can see high rates of surplus values also in the branches no. 1 and 2., agriculture and forestry, because of a low fraction of salaried labour.

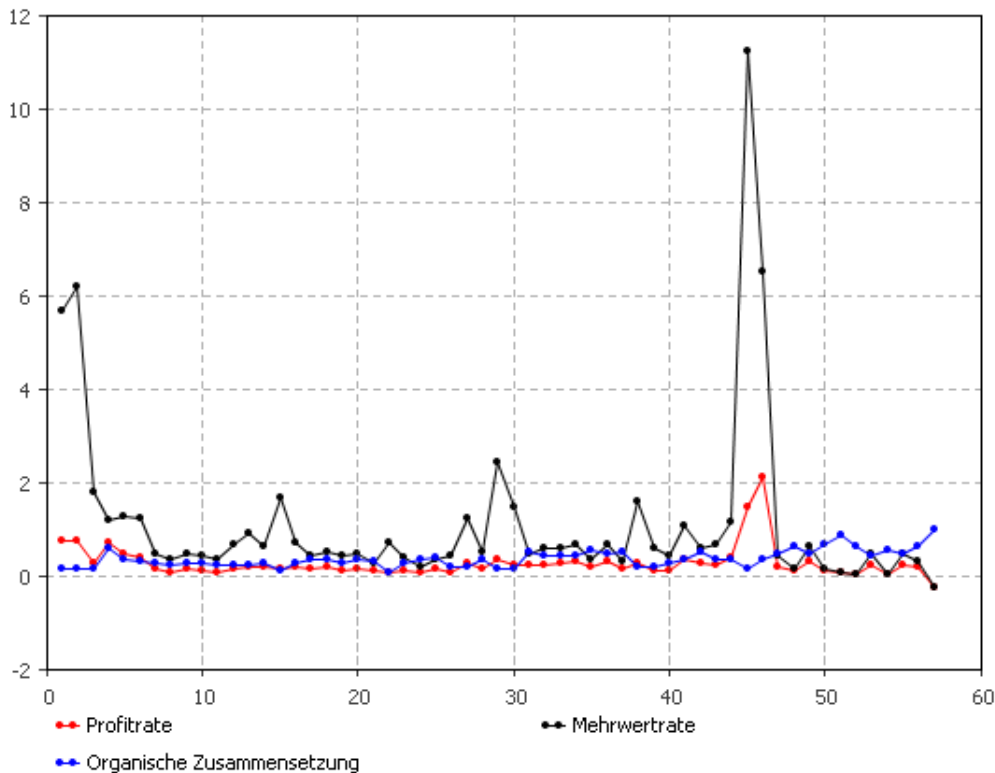


Figure 2: Actual prices, Austria 2003, 57 branches of production, Marxian indicators

Labour values in Austria 2003 (only material production creates value)

Without presenting details of the mathematics behind, in figures 3 we show what would be the structure of the labour values in an economy where only sectors which are productive(ii) are seen as value creating. In the following figure one can see easily that there is no surplus value in the sectors 33 to 57 (all those represent services). Positive surplus values only come up in the sectors 1 to 32. Maybe it is worth to mention that for the computation of figure 3 the purchase of services was no longer seen as purchases out of the surplus value, but are accounted as intermediary values in use which increase the value of constant capital, and at the same time reduce the surplus values of the material sectors.

In my opinion this should be a way determining labour values without violating the principle of „equivalent exchange“. This consistency comes at a certain price: Services are

excluded from acquiring profits which is not the case in real capitalist economies. We are dealing with the economy on a rather abstract level. If we allow the service sectors making profits and to invest them we have to transform the labour values into prices of production or to apply any similar transformation. But, in the result all these transformations violate the principle of „equivalent exchange“.

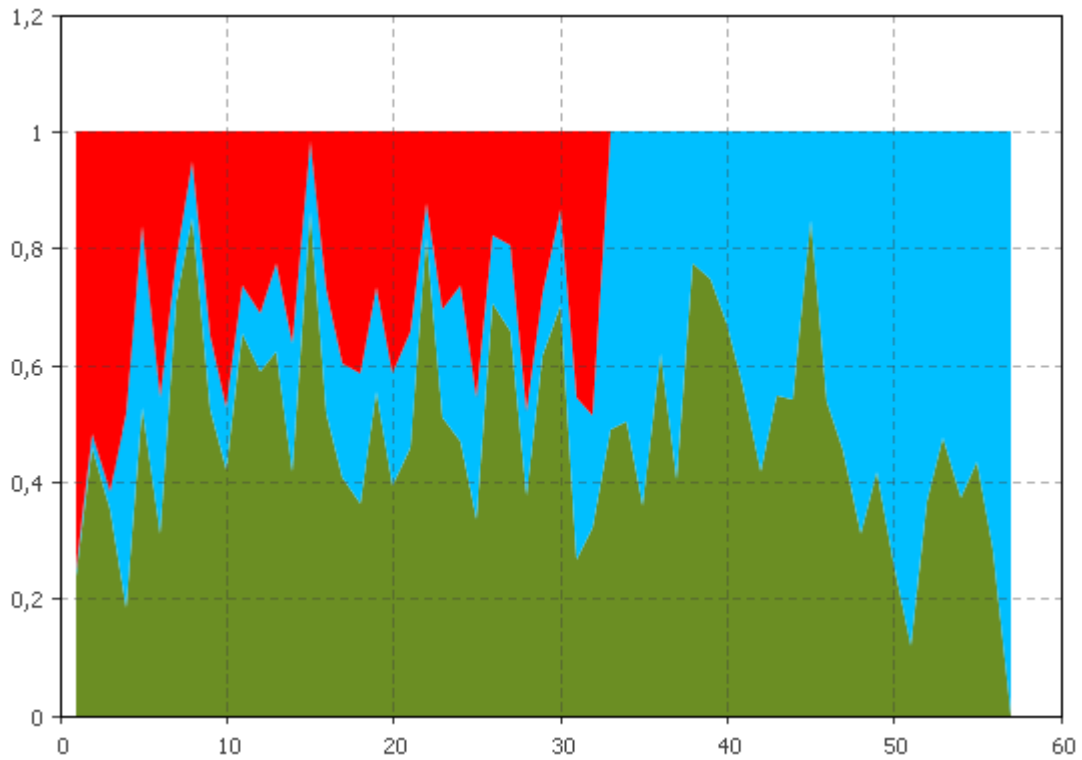


Figure 3: Labour values (only material production creates value), Austria 2003, 57 branches of production

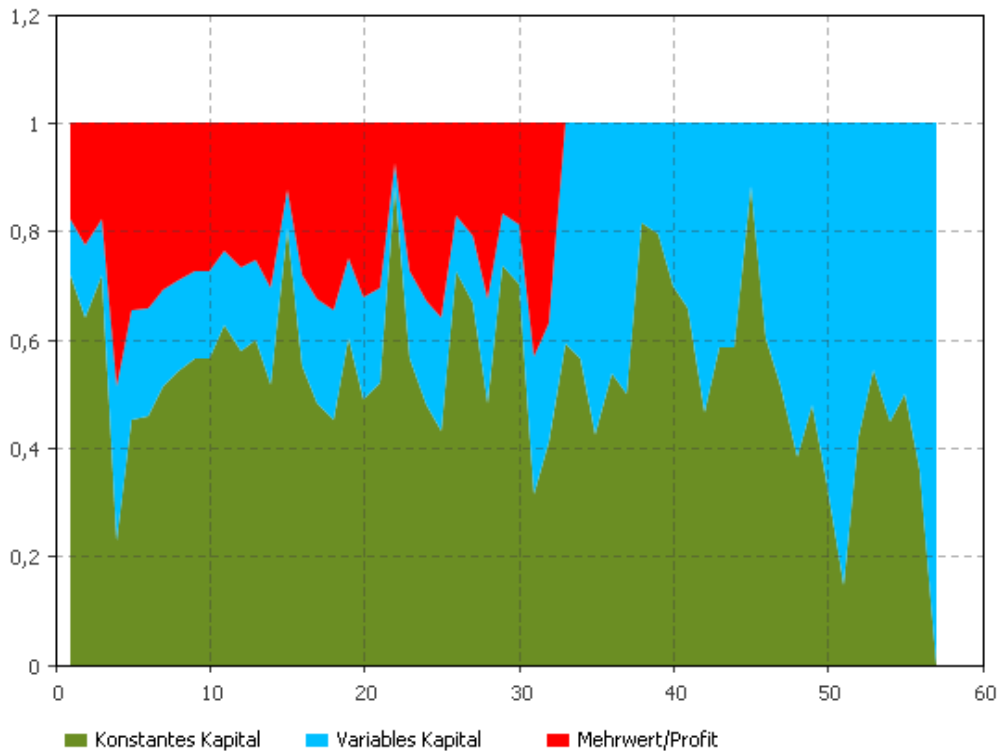


Figure 4: Labour values (only material production creates value), equal rates of surplus value, Austria 2003

Figure 4 and 5 show presentations on the highest level of abstraction possible for a concrete economy. It does not only abstract from the actual price system and replaces it by a price system generated by labour time, but it abstracts also from differences in the rates of surplus value (as Marx has frequently done).

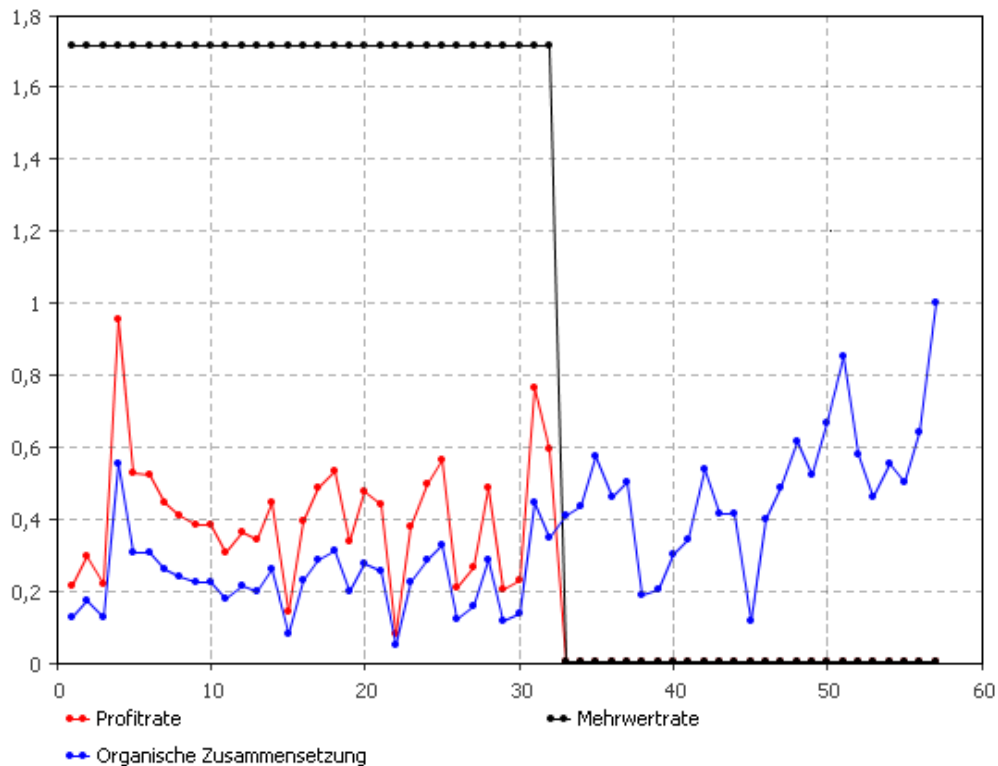


Figure 5: Labour values (only material production creates value), equal rates of surplus value, Marxian indicators

Prices of production

Figure 6 shows the value structure in Austria after the transformation of labour values into prices of production which is nothing else than a solution to the so called “transformation problem”. The idea behind goes back to Marx: Because of competition between capitalists seeking for higher rates of profit, capital moves between the branches of production leading to equalized profit rates. Although it might not be true that in reality profit rates are equal, the

construction of a price system with equalized rates of profits is theoretically useful. It is interesting to note that Marx's transformation did not end up at a "correct" system of prices of production (as von Bortkiewicz¹ has shown long ago, Marx ended up with output prices different from input prices), but that he did an essential step into the right direction. If one repeats Marx' step by adding profits at equal rates expressed in terms of the input price system, one can show that after some iterations one ends up at the „correct“ prices of production. At the same time it can be shown that it does not matter at what price or value system one starts: each iteration process will end up at the same prices of production. The result: all branches of production, sectors of material production and services gain profits. The rate of profit is high (25%), for sake of simplicity it includes government activities and not only private enterprises.

1 Ladislaus von Bortkiewicz: Wertrechnung und Preisrechnung im Marxschen System. Published in three parts in: Archiv für Sozialwissenschaft und Sozialpolitik, Part I: Vol. XXIII, Heft 1, 1906: 1-50. The remaining parts were published in: Vol. XXV, 1907: 10-51 und 445-488.

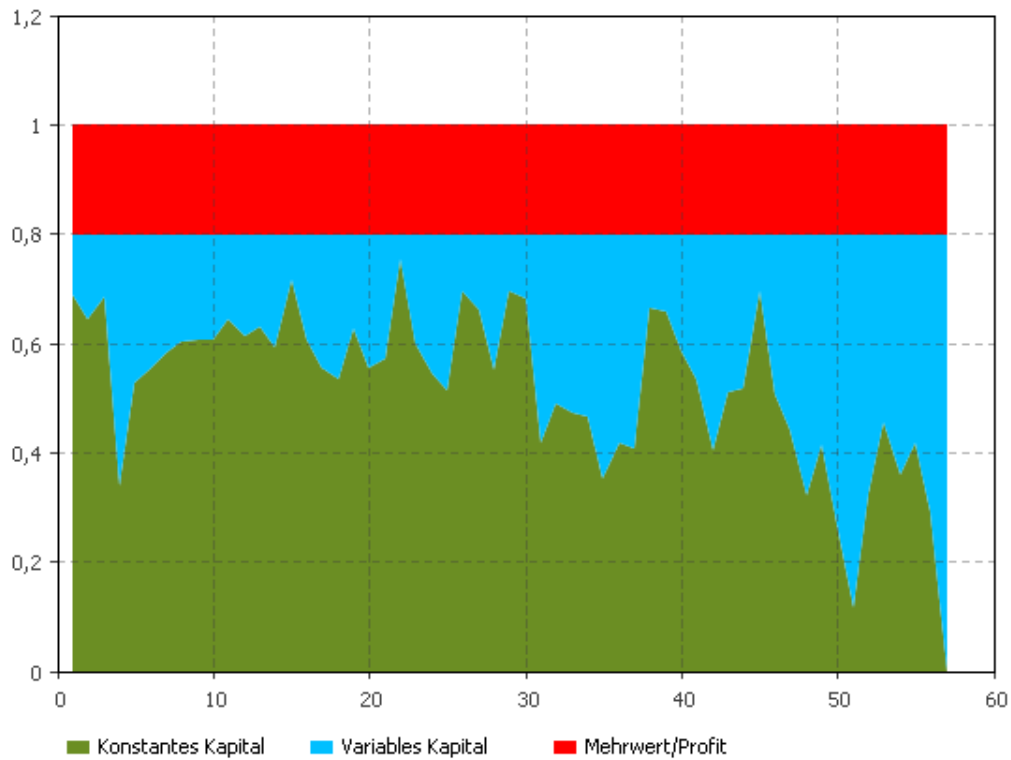


Figure 6: Prices of Production, Austria 2003, 57 branches of production

If we would have followed Marx' example and would have determined output prices by adding profits with equal rates to capital advanced, we get figure 7 as a result.

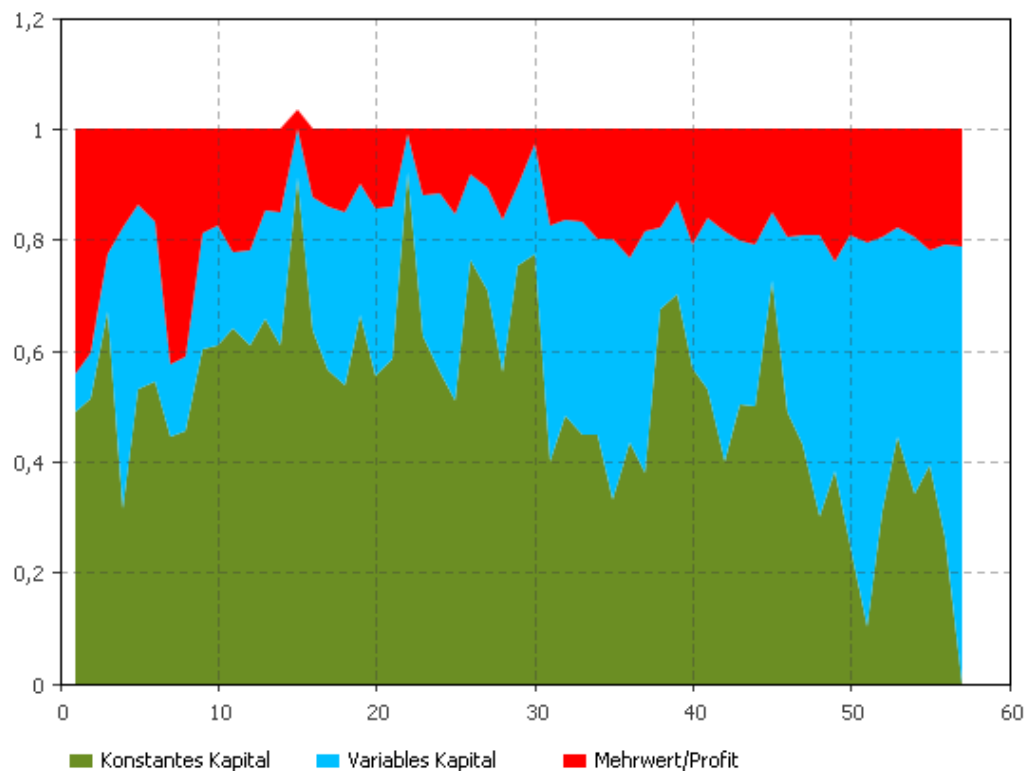


Figure 7: Marx' solution of the transformation problem (one iteration only),

Austria 2003, 57 branches of production

If we continue the iteration process, one can see that the correlation coefficient between actual prices and the iterative prices up to iteration no. 5 goes up to its maximum of 0,9537. Further iteration shows a slight decline of the correlation coefficient towards 0.9524 (Table 1). In our findings for Austria, prices of production are the best predictor of actual prices. Labour values computed as if all sectors would have been value creating have a correlation coefficient of only 0.883.

Iteration	Correlation
1	0,802
2	0,90131617
3	0,9416969
4	0,95211631
5	0,95373425
6	0,95349443
7	0,95306224
8	0,95273999
9	0,95253944
10	0,9524236
11	0,95235923

